Appendix B - Full Application Checklist

SNC Reference#: ______________
Project Name: **Wolf and Grizzly Creek Municipal Watershed Protection**
Applicant: **Plumas County Fire Safe Council**
Please mark each box: check if item is included in the application; mark "N/A" if not applicable to the project. "N/A" identifications must be explained in the application. Please consult with SNC staff prior to submission if you have any questions about the applicability to your project of any items on the checklist. All applications must include a CD including an electronic file of each checklist item, if applicable. The naming convention for each electronic file is listed after each item on the checklist. (Electronic File Name = EFN: "naming convention". file extension choices)
Submission requirements for all Category One and Category Two Grant Applications

1. **X** Completed Application Checklist *(EFN: Checklist.doc,.docx,.or .pdf)*
2. **X** Table of Contents *(EFN: TOC.doc,.docx, or .pdf)*
3. **X** Full Application Project Information Form *(EFN: SIform.doc, .docx, or .pdf)*
4. **X** CCC/Local Conservation Corps Document *(EFN: CCC.pdf)*
5. **X** Authorization to Apply or Resolution *(EFN: authorization.doc, .docx, or .pdf)*
6. **X** Narrative Descriptions *(EFN: Narrative.doc or .docx)*
    a. **X** Detailed Project Description (5,000 character maximum for section 5a only)
        X Project Description including Goals/Results, Scope of Work, Location, Purpose, etc.
    b. **X** Workplan and Schedule
    c. **X** Restrictions, Technical/Environmental Documents and Agreements
        X Restrictions / Agreements *(EFN: RestAgree.pdf)*
        X Regulatory Requirements / Permits *(EFN: RegPermit.pdf)*
    d. **X** Organizational Capacity
    e. **X** Cooperation and Community Support
        X Letters of Support *(EFN: LOS.pdf)*
    f. **X** Tribal Support Narrative *(EFN: tribal.doc, docx)*
    g. **X** Long Term Management and Sustainability
        X Long-Term Management Plan *(EFN: LTMP.pdf)*
    h. **X** Performance Measures
7. **X** Budget documents
    a. **X** Detailed Budget Form (EFN: Budget.xls, .xlsx)
8. **X** Supplementary Documents
    a. **X** Environmental Documentation
        X California Environmental Quality Act (CEQA) documentation *(EFN: CEQA.pdf)*
        X National Environmental Policy Act (NEPA) documentation *(EFN: NEPA.pdf)*
    b. **X** Maps and Photos
        X Project Location Map *(EFN: LocMap.pdf)*
        X Parcel Map showing County Assessor's Parcel Number(s) *(EFN: ParcelMap.pdf)*
        N/A

X Topographic Map *(EFN: Topo.pdf)*
X Photos of the Project Site *(10 maximum) (EFN: Photo.jpg, .gif)*

c. Additional submission requirements for Fee Title Acquisition applications only
Acquisition Schedule *(EFN: acqSched.doc,.docx or .pdf)* **N/A**
Willing Seller Letter *(EFN: WillSell.pdf)* **N/A**
Real Estate Appraisal *(EFN: Appraisal.pdf)* **N/A**

d. **X** Additional submission requirements for Site Improvement / Restoration Project applications only
Land Tenure Documents *(EFN: Tenure.pdf)*
Site Plan *(EFN: SitePlan.pdf)*
Leases or Agreements *(EFN: LeaseAgmnt.pdf)*

I certify that the information contained in the Application, including required attachments, is accurate, and that I have been authorized to apply for this grant.

Michael DeLasaux

Signed *(Authorized Representative)* Date: August 27, 2015

Michael De Lasaux, Chair

Name and Title *(print or type)*

Table of Contents

SIERRA NEVADA CONSERVANCY
PROPOSITION 1 – Watershed Improvement Program Project Information Form

SNC REFERENCE #

PROJECT NAME Wolf and Grizzly Creek Municipal Watershed Protection

APPLICANT NAME *(Legal name, address, and zip code)*

Plumas County Fire Safe Council
PO Box 1255
Quincy California, 95971

AMOUNT OF GRANT REQUEST $500,000

TOTAL PROJECT COST $625,000

PROJECT LOCATION *(County with approx. lat/long, center of project area)*

Project will occur in Plumas County: Ingalls and Jenkins: Lat 39 56'31.41"N, Lon 120 31'40.85"W. Round Valley: Lat 40 6'35.65"N, Lon 120 58'31.73"W

SENATE DISTRICT NUMBER	**ASSEMBLY DISTRICT NUMBER**
1	1

PERSON WITH MANAGEMENT RESPONSIBILITY FOR GRANT CONTRACT

Name and title	*Phone*	*Email Address*
☒ Mr. ☐ Ms. Michael De Lasaux	530 283-6125	mjdelasaux@ucdavis.edu

TRIBAL CONTACT(S) INFORMATION

Name: Wade McMaster

Phone Number: 530 283-7795

Email address: wmcmaster@fs.fed.us

COUNTY ADMINISTRATOR OR PLANNING DIRECTOR CONTACT INFORMATION

Name: Randy Wilson

Phone Number: 530 283-7011

Email address: randywilson@countyofplumas.com

NEAREST PUBLIC WATER AGENCY CONTACT INFORMATION

Name: Indian Valley Community Services Distric

Phone Number: 530 284-7224

Email address: chrisgallagher@frontier.com

Please identify the appropriate project category below and provide the associated details *(Choose One)*

- [x] Category One Site Improvement
- [ ] Category Two Pre-Project Activities
- [ ] Category One Acquisition

Site Improvement/ Acquisition Project Area	**Select one primary Pre-Project deliverable**
Project Area:	☐ Permit
Total Acres: 500	■ CEQA/NEPA Compliance
SNC Portion (if different): 500	☐ Appraisal
	☐ Condition Assessment
Acquisition Projects Only For Acquisitions Only	☐ Biological Survey
	☐ Environmental Site Assessment
☐ Appraisal Included	☐ Plan

Hi Nils,

Nick Johnson and Keith Welch, the Conservation Supervisors at our CCC Redding and Chico locations have responded to the partnership for your project: Wolf and Grizzly Creek Municipal Watershed Protection. The CCC is very interested in all the work components of this project. Work could be performed by the Redding and Chico centers depending on the project locations.

Please include this email and the Consultation Review Document below with your application as proof that you reached out to the CCC. Feel free to contact Nick Johnson Nicholas.Johnson@ccc.ca.gov and Keith Welch Keith.Welch@ccc.ca.gov directly if your project receives funding.

Thank you,

Wei Hsieh, Manager

Programs & Operations Division

California Conservation Corps

1719 24th Street

Sacramento, CA 95816

(916) 341-3154

Wei.Hsieh@ccc.ca.gov

California Conservation Corps

Proposition 1 - Water Bond

Consultation Review Document

Applicant has submitted the required information by email to the California Conservation Corps (CCC):

✓ Yes (applicant has submitted all necessary information to CCC)

After consulting with the project applicant, the CCC has determined the following:

✓ It is feasible for the CCC to be used on the project and the following aspects of the project can be accomplished (deemed compliant).

- The CCC is very interested in all the work components of this project. Work could be performed by the Redding and Chico centers depending on the project locations.

APPLICANT WILL INCLUDE THIS DOCUMENT AS PART OF THE PROJECT APPLICATION.

Hello Nils,

Thank you for contacting the Local Conservation Corps. Unfortunately, we are unable to participate in this project. Please include this email with your application as proof that you reached out to the Local Conservation Corps.

Thank you,
Dominique

California Association of Local Conservation Corps

Proposition 1 - Water Bond

Consultation Review Document

Applicant has submitted the required information by email to the Local Conservation Corps (CALCC):

✓Yes (applicant has submitted all necessary information to CALCC)

After consulting with the project applicant, the CALCC has determined the following:

✓It is NOT feasible for CALCC to be used on the project (deemed compliant)

APPLICANT WILL INCLUDE THIS DOCUMENT AS PART OF THE PROJECT APPLICATION.

Plumas County Fire Safe Council

FireSafe COUNCIL

Resolution 2015-02

BEFORE THE BOARD OF DIRECTORS OF THE
Plumas County Fire Safe Council,
COUNTY OF PLUMAS, STATE OF CALIFORNIA

IN THE MATTER OF: Sierra Nevada Conservancy proposal

RESOLUTION NO: 2015-02 APPROVING THE APPLICATION BY THE PLUMAS COUNTY FIRE SAFE COUNCIL TO THE SIERRA NEVADA CONSERVANCY (SNC) FOR FUNDS TO IMPLEMENT FUEL REDUCTION WORK ON NATIONAL FOREST SYSTEM LANDS ADMINISTERED BY THE UNITED STATES FOREST SERVICE.

BE IT RESOLVED that the Board of Directors of the Plumas County Fire Safe Council hereby approves the submission of a grant proposal to the Sierra Nevada Conservancy for the implementation of fuel reduction work on public lands at three locations in the Plumas National Forest. The proposed project will take place between fall 2015 and winter 2018.

BE IT FURTHER RESOLVED that the Chair of the Board – Michael De Lasaux of said Board be and hereby is authorized to sign and execute said agreement on behalf of the Plumas County Fire Safe Council,

The foregoing resolution was duly passed and adopted by the Board of Directors of the Plumas County Fire Safe Council via an email vote, held on the 24th day of August 2015 by the following vote:

AYES:

Michael De Lasaux
Mike Callagahan
Jerry Sipe
Deb Bumpus
Shane Vargas
Jim Hamblin
Chuck Bowman

NOES: None

ABSENT: None

Michael De Lasaux

Michael De Lasaux, Chair

#1

INTERNAL REVENUE SERVICE
P. O. BOX 2508
CINCINNATI, OH 45201

DEPARTMENT OF THE TREASURY

Date: MAY 0 2 2003

PLUMAS COUNTY FIRE SAFE COUNCIL INC
P. O. BOX 1225
QUINCY, CA 95971

Employer Identification Number:
74-3067126
DLN:
17053361026002
Contact Person:
THOMAS M KALLMAN ID# 31383
Contact Telephone Number:
(877) 829-5500
Accounting Period Ending:
August 31
Addendum Applies:
No

COPY

Dear Applicant:

Based on information you supplied, and assuming your operations will be as stated in your application for recognition of exemption, we have determined you are exempt from federal income tax under section 501(a) of the Internal Revenue Code as an organization described in section 501(c)(3). We also determined that you are a private foundation within the meaning of section 509(a) of the Code.

Based on the information you submitted with your application, we have determined that you are likely to qualify as a private operating foundation described in section 4942(j)(3) of the Code. Accordingly, you are treated as a private operating foundation for your first year. After that, you will be treated as a private operating foundation as long as you continue to meet the requirements of section 4942(j)(3).

This ruling satisfies the good faith determination requirement of section 53.4942(b)-3(b)(2) of the Excise Tax Regulations.

If you change your sources of support, your purposes, character, or method of operation, please let us know so we can consider the effect of the change on your exempt status and foundation status. If you amend your organizational document or bylaws, please send us a copy of the amended document or bylaws. Also, let us know any changes in your name or address.

As of January 1, 1984, you are liable for social security taxes under the Federal Insurance Contributions Act on amounts of $100 or more you pay to each of your employees during a calendar year. You are not liable for the tax imposed under the Federal Unemployment Tax Act (FUTA). However, since you are a private foundation, you are subject to excise taxes under Chapter 42 of the Code. You also may be subject to other Federal excise taxes. If you have any questions about excise, employment, or other Federal taxes, please let us know.

Donors may deduct contributions to you as provided in section 170 of the Code. Bequests, legacies, devises, transfers, or gifts to you or for your use are deductible for federal estate and gift tax purposes if they meet the applicable provisions of sections 2055, 2106, and 2522 of the Code.

Letter 1075 (DO/CG)

Donors may deduct contributions only to the extent their contributions are gifts, with no consideration received. Ticket purchases and similar payments in conjunction with fundraising events may not necessarily qualify as deductible contributions, depending on the circumstances. See Publication 1391, which sets forth guidelines on when payments made by taxpayers for admission to, or other participation in fundraising activities for charity are deductible as charitable contributions.

You are required to file Form 990-PF, Return of Private Foundation or Section 4947(a)(1) Trust Treated as a Private Foundation. Form 990-PF must be filed by the 15th day of the fifth month after the end of your annual accounting period. A penalty of $20 a day is charged when a return is filed late, unless there is reasonable cause for the delay. However, the maximum penalty charged cannot exceed $10,000 or 5 percent of your gross receipts for the year, whichever is less. For organizations with gross receipts exceeding $1,000,000 in any year, the penalty is $100 per day per return unless there is reasonable cause for the delay. The maximum penalty for an organization with gross receipts exceeding $1,000,000 shall not exceed $50,000. This penalty may also be charged if a return is not complete, so please be sure your return is complete before you file it.

You are not required to file federal income tax returns unless you are subject to the tax on unrelated business income under section 511 of the Code. If you are subject to this tax, you must file an income tax return on Form 990-T, Exempt Organization Business Income Tax Return. In this letter we are not determining whether any of your present or proposed activities are unrelated trade or business as defined in section 513 of the Code.

You are required to make certain returns available for public inspection for three years after the later of the due date of the return or the date the return is filed. The returns required to be made available for public inspection are Form 990-PF, Return of Private Foundation or Section 4947(a)(1) Nonexempt Charitable Trust Treated as a Private Foundation, and Form 4720, Return of Certain Excise Taxes on Charities and Other Persons Under Chapters 41 and 42 of the Internal Revenue Code. You are also required to make available for public inspection your exemption application, any supporting documents, and your exemption letter. Copies of these documents must be provided to any individual upon written or in person request without charge other than reasonable fees for copying and postage. You may fulfill this requirement by placing these documents on the Internet. Penalties may be imposed for failure to comply with these requirements. Additional information is available in Publication 557, Tax-Exempt Status for Your Organization, or you may call our toll free number shown above.

You need an employer identification number even if you have no employees. If you did not enter an employer identification number on your application, we will assign a number to you and let you know. Please use that number on all returns you file and in all correspondence with the Internal Revenue Service.

If we have indicated in the heading of this letter that an addendum applies, the addendum enclosed is an integral part of this letter.

Because this letter could help resolve any questions about your exempt status and private foundation status, you should keep it for your records.

If you have any questions, please contact the person whose name and telephone number are shown in the heading of this letter.

Sincerely yours,

Lois G. Lerner

Lois G. Lerner
Director, Exempt Organizations
Rulings and Agreements

Bylaws of the Fire Safe Council of Plumas County

ARTICLE 1. OFFICES

Section 1. Principal Office: The corporations' principal office is fixed and located at 326 Main Street, Quincy, CA 95971.

The Board of Directors (herein called the Board) is granted full power and authority to change said principal office from one location to another. Any such changes shall be noted in the bylaws, and this section may be amended to state the new location

ARTICLE 11. MISSION STATEMENT AND GOALS

Section 1. Mission Statement:

The mission of the Fire Safe Council is to reduce the loss of natural and manmade resources caused by wildfire through pre-fire activities.

The goals of the Fire Safe Council of Plumas County are:

1. Serve community and neighborhood fire safety needs.
2. Improve fire safety by reducing dangerous fuel loads.
3. Reduce the potential for fire loss damage.
4. Educate the public about fire threat and fire prevention measures.
5. Improve circulation for evacuation.
6. Coordinate a County-wide Fire Plan, with the cooperation of local fire agencies.
7. Assist local fire departments in meeting their mission and goals
8. Operate through in-kind donations and financial contributions.
9. Promote a healthy forest.
10. Improve air and water quality.
11. Reduce vegetation waste stream to landfills.

ARTICLE III. MEMBERSHIP

Section 1. MEMBERS: The Fire Safe Council shall have Members from all elements of the community. Persons shall be recognized as Members after attending two meetings. All Members are eligible to vote and are encouraged to participate in and develop this council.

ARTICLE 1V. DIRECTORS

Section 1. Powers: Subject to the limitations of the articles and these bylaws, the activities and affairs of this corporation shall be conducted, and all corporate powers shall be exercised by or under the direction of the Board. The Board may delegate management of the activities of the corporation to any person or persons, a management company, or committee, however composed, provided that the activities and affairs of the corporation shall be managed and all corporate powers shall be exercised under the ultimate direction of the Board. Without prejudice to such powers, but subject to the same limitations, it is expressly declared that the Board shall have the following powers enumerated in these bylaws:

a) To select and remove all other officers, agents, and employees of the corporation, prescribe powers and duties for them as may not be inconsistent with law, the articles, or these bylaws, and require from them security for faithful service.

b) To adopt, make and use a corporate seal, and to alter the seal from time to time, as the Board deems best.

Section 2. Number of Directors: The authorized number of directors shall be no less than 5 and no more than 15, until changed by amendment to these bylaws. The actual number of Directors shall be determined by a majority vote of the Members. The following list is for the purpose of identifying various agencies, associations, communities, private sector professions and other job descriptions, which may be drawn from for this council's Board. This list may be added to, changed, or reduced, by approval of the Board. The Members shall consider the experiences and background of potential candidates, and shall strive to provide representation from all stakeholder groups, as well as provide the Board with the skills needed to effectively carry out its Mission Statement.

- Local Fire Agencies
- State Agencies
- Federal Agencies
- Air and Water Management
- Private Business Sector(which includes insurance and realty companies)
- County Agencies
- Members at Large
- Homeowner Associations

Section 3. Term of Office: The Board of Directors shall be selected by a majority vote of the Members. Directors shall be elected biannually at any regular or special Board meeting held for that purpose.

Each Director shall hold office for two (2) years until the second Annual Meeting for election of the Board of Directors as specified in these bylaws, and until his or her successor is elected and qualifies, or the Board of Directors declares that a Director's position is vacant by reason of death, resignation or removal of the Director. The first Board shall decide which Board Members shall serve a one-year term, and which will serve a two-year term. This will effectively help the Board to never be without experienced Directors at any given time.

Each Director shall be eligible to be elected to consecutive full terms.

Section 4. Vacancies: Subject to provisions of Section 5226 of the California Nonprofit Public Benefit Corporation Law, any Director may resign effective upon providing written notice to the Chairperson of the Board, the Vice Chairperson, or Secretary, unless the notice specifies a later time for the effectiveness of such resignation. If the resignation is effective at a future time, a successor may be selected before such time, to take office when the resignation becomes effective.

Vacancies on the Board shall be filled by a majority vote of the Board. Each Director so selected shall hold office until the next scheduled annual election regardless of term expiration date.

A vacancy or vacancies on the Board shall be deemed to exist in the case of death, resignation, or removal of any Director, or if the authorized number of Directors is increased.

The Board may declare vacant the office of a Director who has been declared of unsound mind by a final order of the Court, or convicted of a felony, or found by a final order of judgment of any Court to have breached any duty arising under Article 3 of the California Nonprofit Public Benefit Corporation Law.

No reduction of the authorized number of Directors shall have the effect of removing any Director prior to expiration of the Director's term of office.

Section 5. Nomination of Directors: The Chairperson will appoint, at the November meeting, a Nominating Committee consisting of two Members, and two Directors. The Nominating Committee shall select a slate of individuals to fill the positions on the Board then expiring, and shall submit its slate to the Members at the December meeting. Subject to guidelines established by the Board, the committee will attempt to select candidates who meet the same general qualifications as the Directors whose terms are expiring. The committee will also strive to select individuals who possess skills and qualifications needed to assist the Board to effectively carry out its Mission and Goals. Each individual will be contacted beforehand and permission obtained to submit his or her name as a candidate.

Section 6. Election of Directors: The Members shall elect Directors to fill the vacancies then expiring at its Annual Meeting in January. Each candidate shall be voted on individually by voice vote. A candidate shall be considered elected if he or she receives a majority "yes" vote of the Members present and eligible to vote. Immediately following the election, the new Directors shall be seated. The newly constituted Board of Directors shall then elect its officers in accordance with the procedure outlined in Article V. Section 2. Officers

Section 7. Compensation: Directors shall serve without compensation.

Section 8. Right of Inspection: Every member has the right to inspect all records, books, and documents of every kind of the corporation of which such person is a member.

ARTICLE V. OFFICERS

Section 1. Officers: The officers of the corporation shall be the Chair, Vice Chair, Secretary, and Treasurer.

Section 2. Election: The officers of this corporation shall be chosen–annually by a majority vote of the Board at the Annual Meeting in January, following the election and seating of the new Board of Directors. Officers shall serve at the pleasure of the Board, and shall hold office until their resignation, removal, or other disqualification from service, or until their respective replacements are elected.

Section 3. Subordinate Officers: The Board may elect, and may empower the Chairperson to appoint, such other officers as the business of the corporation may require.

Section 4. Removal and Resignation: Any officer may be removed, either with or without cause, by the Board at any time with total consent of all remaining Board Members. Any officer may resign at any time by giving written notice to the corporation. Any such resignation shall take effect at the date of the receipt of such notice, or at any time thereafter, as stated in the resignation notice.

Section 5. Vacancies: A vacancy in any office because of death, resignation, removal, disqualification, or any other cause, shall be filled in the manner prescribed in these bylaws for regular election or appointment to such office, provided such vacancies shall be filled as they occur, and not on an annual basis.

Section 6. Chairperson: The Chairperson is the general manager and chief executive officer of the corporation, and has, subject to the control of the Board, general supervision, direction, and control of the business and officers of the corporation. The Chairperson shall preside at all meetings of the Board. The Chairperson has the general powers and duties of management usually vested in the office of Chairperson and general manager of a corporation, and such other powers and duties as may be prescribed by the Board.

Section 7. Vice Chairperson: In the absence or disability of the Chairperson, the Vice Chairperson shall perform all necessary duties of the Chairperson. The Vice Chairperson shall also perform such other duties as from time to time may be prescribed by the Board.

Section 8. Secretary: The Secretary shall keep a book of minutes of all meetings of the Board and its committees. The Secretary shall keep at the principal office in the County of Plumas the original or a copy of the corporation's articles and bylaws, as amended to date. The Secretary shall keep the seal of the corporation in safe custody, and shall have other powers and duties as prescribed by the Board.

Section 9. Treasurer: The Treasurer is the chief financial officer of the corporation, and shall keep and maintain adequate and correct records of all financial activities of the corporation. The books of account shall at all times be open to inspection by any Director or member of the Fire Safe Council. The Treasurer shall deposit all funds and other valuables in the name and to the credit of the corporation with such depositories that may be designated by the Board. The Treasurer shall disburse the funds of the corporation as authorized by the Board, and shall render all records to the Board as requested at any time. The Treasurer shall prepare an annual budget, and submit a monthly financial report to the Board at each regular meeting. The Treasurer shall have any other duties as may be prescribed by the Board.

Article V1. Meetings:

Section 1. Place of Meeting: Meetings of the Board of Directors shall be held at any place within the county of Plumas that has been designated from time to time by the Board. In the absence of such designation, regular meetings shall be held at the principal office of the corporation.

Section *2.*Annual Meetings: The Board shall hold an Annual Meeting for the purpose of organization, selection of Officers, and transaction of other business. Annual meetings of the Board shall be held with call or notice on a day in January set by the Board.

Section 3. Regular Meetings: Meetings of the Board shall be held with call or notice on such dates and at such time as may be fixed by the Board.

Section 4. Special Meetings: Special meetings of the Board for any purpose may be called at any time by the Chairperson, Vice-Chairperson, Secretary, or any two Directors.

Section 5. Executive Sessions*:* The Board, on the affirmative vote of a majority of the Directors present at a meeting at which a quorum has been established, shall be entitled to adjourn at any time for the purpose of reconvening in executive session to discuss litigation in which the Council is or may become a part, personnel matters, or business of a similar nature. Prior to adjourning into an executive session, the topic(s) to be discussed in such session shall be announced, in general terms, to the Members in attendance at the meeting. Nothing herein shall be construed to obligate the Board to first call an open meeting before meeting in executive session with respect to the matters described above.

Section 6. Notice*:* Notice of regular meetings shall be given to the Members not less than 72 hours prior to the meeting. Notice of the time and place of meetings of the Board of Directors shall be given by one of the following methods: (A) by personal delivery of written notice; (B) by first class mail, postage prepaid; (C) by email; (D) telephone communication, either to the Director or to a person at the Director's home or office who would reasonably be expected to communicate such notice to the Director. All such notices shall be given or sent to the Director's address, email address or telephone number as shown on the records of the Council.

Section 7. Agendas: An agenda shall be prepared and given to the Members not less than 72 hours prior to the meeting. Non-agenda items may be considered at the meeting, with approval of a majority of the Board Members present, with the exception of the following matters: (A) appointment to fill a vacancy on the Board or a committee chairperson; (b) removal of a Director or committee chairperson; (C) adoption or revision of a budget, or authorization for the expenditure of non-budgeted funds in excess of $500.

Section 8 Quorum: A majority of the authorized number of Directors constitutes a quorum for the transaction of business, except to adjourn as provided in Section 9 of this Article. Every act or decision done or made by a majority of the Directors present at a meeting duly held at which a quorum is present shall be regarded as an act of the Board.

Section 9. Adjournment: A majority of the Directors present, whether or not a quorum is present, may adjourn a Director's meeting to another time and place. If the adjournment is for more than 24 hours, notice must be given to all Directors, present or not.

Section 10. Action Without a Meeting: Any action required or permitted to be taken by the Board may occur without a meeting. All Directors must consent to the action taken verbally, if not in writing. The action should then be ratified by the Board at its next regular or special meeting, and the action taken recorded in the minutes of that meeting.

Section 11. Robert's Rules of Order: All meetings of the Board of Directors and committees will be governed by Robert' Rules of Order, insofar as such rules are consistent with these bylaws, the Articles of Incorporation of this Council, or with any applicable provision of law.

Article V11. Committees

Section 1. Committees: The Board may appoint one or more committees, and delegate to such committee any of the authority of the Board, except with respect to:

a) Approval of any action which the California Nonprofit Benefit Corporation Law also requires approval of the Members, or approval of a majority of all Members;

b) Filling of vacancies on the Board or any committee chairperson;

c) Amendment or repeal of the bylaws, or adoption of the new bylaws;

d) Amendment or repeal of any resolution of the Board which by its expressed terms is not so amendable or repealable;

e) Appointment of other committees of the Board or the chairperson thereof;

f) Approval of any self-dealing transactions, as such transactions are defined in Section 5233(a) of the California Nonprofit Public Benefit Corporation Law.

Any such committees must be created by resolution adopted by a majority of the authorized number of Directors in office, provided a quorum is present. Unless the Board or such committee shall otherwise provide, the regular and special meetings and other actions of any such committee shall be governed by the provisions in these bylaws. Minutes shall be kept for each committee and presented at the next Board meeting.

ARTICLE V111. INDEMNIFICATION

Section 1. Right of Indemnification: To the fullest extent permitted by law, this corporation shall indemnify its Directors, officers and other persons described in Section 7237(a) of the California Corporations Code, including persons formerly occupying any such positions, against all expenses, judgments, fines, settlements and other amounts actually and reasonably incurred by them in connection with any proceeding as that term is used in that section, and including an action by or in the right of the corporation, by reason of the fact that the person is or was described in that section. Expenses, as used in these bylaws, shall have the same meaning as in Section 7237(a) of the California Corporation Code.

Section 2. Approval of Indemnity: On written request to the Board by any person seeking indemnification under Section 7237(a) or Section 7237(c) of the California Corporation Code, the Board shall promptly determine under Section 7237(e) of the California Corporation Code whether the applicable standard of conduct set forth in Section 7237(b) or Section 7237(c) has been met, and if so, the Board shall authorize indemnification. If the Board cannot authorize indemnification because the number of Directors who are parties to the proceeding with respect to which indemnification is sought prevents formation of a quorum of Directors who are not parties to that proceeding, the Board shall promptly call a meeting of Members. At that meeting, the Members shall determine under Section 7237(e) whether the applicable standard of conduct set forth in Section 7237(b) or Section 7237(c) has been met, and if so, the Members present at the meeting in person or by proxy shall authorize indemnification.

Section 3. Advancement of Expense: To the fullest extent permitted by law, and except as otherwise determined by the Board in a specific instance, expenses incurred by a person seeking indemnification under Sections 1 and 2 of this article, and of these bylaws, in defending any proceeding, covered by these sections, shall be advanced by the corporation before final disposition of the proceeding, on receipt by the corporation of an undertaking by or on behalf of that person that the advance will be repaid unless it is determined that the person is entitled to be indemnified by the corporation for those expenses.

ARTICLE 1X. INSURANCE

Section 1. Right to Purchase Insurance: The corporation shall have the right to purchase and maintain insurance to the full extent permitted by law on behalf of its officers, Directors, or agents in such capacity, or arising out of the officers', Directors', or agents' status as such.

ARTICLE X. OTHER PROVISIONS

Section 1. Amendments: These bylaws may be amended, or repealed and replaced, by two-thirds approval of the Board Members present and eligible to vote, provided that a quorum of the Board has been established.

Section 2. Construction and Definitions: Unless the context otherwise requires, the general provisions, rules, construction and definitions contained the General Provisions of the California Nonprofit Public Benefit Corporation Law shall govern the construction of these bylaws.

Section 3. Record of Revisions:

Rev No.	DESCRIPTION OF REVISION	AUTHORITY FOR REVISION	EFFECTIVE DATE
1.	Approval of Bylaws	Members	June 12, 2002
2	Amend Board Terms & Director vote method	Board	February 8, 2007
3.			
4.			

2465643

State of California

SECRETARY OF STATE

I, *BILL JONES*, Secretary of State of the State of California, hereby certify:

That the attached transcript of 2 page(s) has been compared with the record on file in this office, of which it purports to be a copy, and that it is full, true and correct.

IN WITNESS WHEREOF, I execute this certificate and affix the Great Seal of the State of California this day of

SEP - 9 2002

Bill Jones

Secretary of State

Sec/State Form CE-107 (rev. 9/98)

ARTICLES OF INCORPORATION
OF
PLUMAS COUNTY FIRE SAFE COUNCIL, INC.

I

The name of the corporation is PLUMAS COUNTY FIRE SAFE COUNCIL, INC.

II

A. This corporation is a nonprofit public benefit corporation and is not organized for the private gain of any person. It is organized under the Nonprofit Public Benefit Corporation Law for public and charitable purposes.

B. The specific purpose of this corporation is to support county-wide fire safe or firewise planning, education and fire risk reduction activities of the Plumas County Firesafe Council. The primary objectives of this corporation shall be to raise, obtain, invest and disburse funds for the Plumas County Fire Safe Council; and to receive funds and donations in order to carry on the purposes of the corporation; and to have and exercise all rights and powers now or hereafter conferred on non-profit corporations under the laws of the State of California.

C. This corporation is organized and operated exclusively for charitable purposes within the meaning of Section 501(c) (3) of the Internal Revenue Code or the corresponding provision of any future United States internal revenue law. Notwithstanding any other provision of these articles, this corporation shall not, except to an insubstantial degree, engage in any activities or exercise any powers that are not in furtherance of the purposes of this corporation and the corporation shall not carry on any other activities not permitted to be carried on (a) by a corporation exempt from federal income tax under Section 501(c) (3) of the Internal Revenue Code or the corresponding provision of any future United States internal revenue law, or (b) by a corporation, contributions to which are deductible under Section 170(c) (2) of the Internal Revenue Code or the corresponding provision of any future United States internal revenue law.

III

The name and address in the State of California of this corporation's initial agent for service of process is:

Michael De Lasaux, P.O. Box 1225, Quincy, California, 95971.

IV

A. No substantial part of the activities of this corporation shall consist of carrying on propaganda, or otherwise attempting to influence legislation, except as provided in Section 501(h) of the Internal Revenue Code of 1986, and this corporation shall not participate or intervene in (including publishing or distributing statements) any political campaign on behalf of or in opposition to any candidate for public office.

B. All property of the corporation is irrevocably dedicated to the purposes set forth in Article II, above. No part of the net income or assets of this corporation shall inure to the benefit of any directors, officers, trustees, private shareholders or members, or to the benefit of any individual.

C. Upon the dissolution of the corporation, after paying or adequately providing for its debts, obligations and liabilities, the remaining assets of this corporation shall be distributed to one or more organization(s) organized and operated exclusively for charitable purposes and which has established its tax exempt status under Section 501(c) (3) of the Internal Revenue Code or the corresponding provision of any future United States internal revenue law, and which has established its tax exempt status under Section 23701d of the California Revenue and Taxation Code or the corresponding provision of any future California revenue and tax law.

Dated: August 20, 2002

Michael De Lasaux, Incorporator

Bylaws of the Fire Safe Council of Plumas County

ARTICLE 1. OFFICES

Section 1. Principal Office: The corporations' principal office is fixed and located at 326 Main Street, Quincy, CA 95971.

The Board of Directors (herein called the Board) is granted full power and authority to change said principal office from one location to another. Any such changes shall be noted in the bylaws, and this section may be amended to state the new location

ARTICLE 11. MISSION STATEMENT AND GOALS

Section 1. Mission Statement:

The mission of the Fire Safe Council is to reduce the loss of natural and manmade resources caused by wildfire through pre-fire activities.

The goals of the Fire Safe Council of Plumas County are:

1. Serve community and neighborhood fire safety needs.
2. Improve fire safety by reducing dangerous fuel loads.
3. Reduce the potential for fire loss damage.
4. Educate the public about fire threat and fire prevention measures.
5. Improve circulation for evacuation.
6. Coordinate a County-wide Fire Plan, with the cooperation of local fire agencies.
7. Assist local fire departments in meeting their mission and goals
8. Operate through in-kind donations and financial contributions.
9. Promote a healthy forest.
10. Improve air and water quality.
11. Reduce vegetation waste stream to landfills.

ARTICLE III. MEMBERSHIP

Section 1. MEMBERS: The Fire Safe Council shall have Members from all elements of the community. Persons shall be recognized as Members after attending two meetings. All Members are eligible to vote and are encouraged to participate in and develop this council.

ARTICLE 1V. DIRECTORS

Section 1. Powers: Subject to the limitations of the articles and these bylaws, the activities and affairs of this corporation shall be conducted, and all corporate powers shall be exercised by or under the direction of the Board. The Board may delegate management of the activities of the corporation to any person or persons, a management company, or committee, however composed, provided that the activities and affairs of the corporation shall be managed and all corporate powers shall be exercised under the ultimate direction of the Board. Without prejudice to such powers, but subject to the same limitations, it is expressly declared that the Board shall have the following powers enumerated in these bylaws:

a) To select and remove all other officers, agents, and employees of the corporation, prescribe powers and duties for them as may not be inconsistent with law, the articles, or these bylaws, and require from them security for faithful service.

b) To adopt, make and use a corporate seal, and to alter the seal from time to time, as the Board deems best.

Section 2. Number of Directors: The authorized number of directors shall be no less than 5 and no more than 15, until changed by amendment to these bylaws. The actual number of Directors shall be determined by a majority vote of the Members. The following list is for the purpose of identifying various agencies, associations, communities, private sector professions and other job descriptions, which may be drawn from for this council's Board. This list may be added to, changed, or reduced, by approval of the Board. The Members shall consider the experiences and background of potential candidates, and shall strive to provide representation from all stakeholder groups, as well as provide the Board with the skills needed to effectively carry out its Mission Statement.

- Local Fire Agencies
- State Agencies
- Federal Agencies
- Air and Water Management
- Private Business Sector(which includes insurance and realty companies)
- County Agencies
- Members at Large
- Homeowner Associations

Section 3. Term of Office: The Board of Directors shall be selected by a majority vote of the Members. Directors shall be elected biannually at any regular or special Board meeting held for that purpose.

Each Director shall hold office for two (2) years until the second Annual Meeting for election of the Board of Directors as specified in these bylaws, and until his or her successor is elected and qualifies, or the Board of Directors declares that a Director's position is vacant by reason of death, resignation or removal of the Director. The first Board shall decide which Board Members shall serve a one-year term, and which will serve a two-year term. This will effectively help the Board to never be without experienced Directors at any given time.

Each Director shall be eligible to be elected to consecutive full terms.

Section 4. Vacancies: Subject to provisions of Section 5226 of the California Nonprofit Public Benefit Corporation Law, any Director may resign effective upon providing written notice to the Chairperson of the Board, the Vice Chairperson, or Secretary, unless the notice specifies a later time for the effectiveness of such resignation. If the resignation is effective at a future time, a successor may be selected before such time, to take office when the resignation becomes effective.

Vacancies on the Board shall be filled by a majority vote of the Board. Each Director so selected shall hold office until the next scheduled annual election regardless of term expiration date.

A vacancy or vacancies on the Board shall be deemed to exist in the case of death, resignation, or removal of any Director, or if the authorized number of Directors is increased.

The Board may declare vacant the office of a Director who has been declared of unsound mind by a final order of the Court, or convicted of a felony, or found by a final order of judgment of any Court to have breached any duty arising under Article 3 of the California Nonprofit Public Benefit Corporation Law.

No reduction of the authorized number of Directors shall have the effect of removing any Director prior to expiration of the Director's term of office.

Section 5. Nomination of Directors: The Chairperson will appoint, at the November meeting, a Nominating Committee consisting of two Members, and two Directors. The Nominating Committee shall select a slate of individuals to fill the positions on the Board then expiring, and shall submit its slate to the Members at the December meeting. Subject to guidelines established by the Board, the committee will attempt to select candidates who meet the same general qualifications as the Directors whose terms are expiring. The committee will also strive to select individuals who possess skills and qualifications needed to assist the Board to effectively carry out its Mission and Goals. Each individual will be contacted beforehand and permission obtained to submit his or her name as a candidate.

Section 6. Election of Directors: The Members shall elect Directors to fill the vacancies then expiring at its Annual Meeting in January. Each candidate shall be voted on individually by voice vote. A candidate shall be considered elected if he or she receives a majority "yes" vote of the Members present and eligible to vote. Immediately following the election, the new Directors shall be seated. The newly constituted Board of Directors shall then elect its officers in accordance with the procedure outlined in Article V. Section 2. Officers

Section 7. Compensation: Directors shall serve without compensation.

Section 8. Right of Inspection: Every member has the right to inspect all records, books, and documents of every kind of the corporation of which such person is a member.

ARTICLE V. OFFICERS

Section 1. Officers: The officers of the corporation shall be the Chair, Vice Chair, Secretary, and Treasurer.

Section 2. Election: The officers of this corporation shall be chosen annually by a majority vote of the Board at the Annual Meeting in January, following the election and seating of the new Board of Directors. Officers shall serve at the pleasure of the Board, and shall hold office until their resignation, removal, or other disqualification from service, or until their respective replacements are elected.

Section 3. Subordinate Officers: The Board may elect, and may empower the Chairperson to appoint, such other officers as the business of the corporation may require.

Section 4. Removal and Resignation: Any officer may be removed, either with or without cause, by the Board at any time with total consent of all remaining Board Members. Any officer may resign at any time by giving written notice to the corporation. Any such resignation shall take effect at the date of the receipt of such notice, or at any time thereafter, as stated in the resignation notice.

Section 5. Vacancies: A vacancy in any office because of death, resignation, removal, disqualification, or any other cause, shall be filled in the manner prescribed in these bylaws for regular election or appointment to such office, provided such vacancies shall be filled as they occur, and not on an annual basis.

Section 6. Chairperson: The Chairperson is the general manager and chief executive officer of the corporation, and has, subject to the control of the Board, general supervision, direction, and control of the business and officers of the corporation. The Chairperson shall preside at all meetings of the Board. The Chairperson has the general powers and duties of management usually vested in the office of Chairperson and general manager of a corporation, and such other powers and duties as may be prescribed by the Board.

Section 7. Vice Chairperson: In the absence or disability of the Chairperson, the Vice Chairperson shall perform all necessary duties of the Chairperson. The Vice Chairperson shall also perform such other duties as from time to time may be prescribed by the Board.

Section 8. Secretary: The Secretary shall keep a book of minutes of all meetings of the Board and its committees. The Secretary shall keep at the principal office in the County of Plumas the original or a copy of the corporation's articles and bylaws, as amended to date. The Secretary shall keep the seal of the corporation in safe custody, and shall have other powers and duties as prescribed by the Board.

Section 9. Treasurer: The Treasurer is the chief financial officer of the corporation, and shall keep and maintain adequate and correct records of all financial activities of the corporation. The books of account shall at all times be open to inspection by any Director or member of the Fire Safe Council. The Treasurer shall deposit all funds and other valuables in the name and to the credit of the corporation with such depositories that may be designated by the Board. The Treasurer shall disburse the funds of the corporation as authorized by the Board, and shall render all records to the Board as requested at any time. The Treasurer shall prepare an annual budget, and submit a monthly financial report to the Board at each regular meeting. The Treasurer shall have any other duties as may be prescribed by the Board.

Article V1. Meetings:

Section 1. Place of Meeting: Meetings of the Board of Directors shall be held at any place within the county of Plumas that has been designated from time to time by the Board. In the absence of such designation, regular meetings shall be held at the principal office of the corporation.

Section 2.Annual Meetings: The Board shall hold an Annual Meeting for the purpose of organization, selection of Officers, and transaction of other business. Annual meetings of the Board shall be held with call or notice on a day in January set by the Board.

Section 3. Regular Meetings: Meetings of the Board shall be held with call or notice on such dates and at such time as may be fixed by the Board.

Section 4. Special Meetings: Special meetings of the Board for any purpose may be called at any time by the Chairperson, Vice-Chairperson, Secretary, or any two Directors.

Section 5. Executive Sessions*:* The Board, on the affirmative vote of a majority of the Directors present at a meeting at which a quorum has been established, shall be entitled to adjourn at any time for the purpose of reconvening in executive session to discuss litigation in which the Council is or may become a part, personnel matters, or business of a similar nature. Prior to adjourning into an executive session, the topic(s) to be discussed in such session shall be announced, in general terms, to the Members in attendance at the meeting. Nothing herein shall be construed to obligate the Board to first call an open meeting before meeting in executive session with respect to the matters described above.

Section 6. Notice*:* Notice of regular meetings shall be given to the Members not less than 72 hours prior to the meeting. Notice of the time and place of meetings of the Board of Directors shall be given by one of the following methods: (A) by personal delivery of written notice; (B) by first class mail, postage prepaid; (C) by email; (D) telephone communication, either to the Director or to a person at the Director's home or office who would reasonably be expected to communicate such notice to the Director. All such notices shall be given or sent to the Director's address, email address or telephone number as shown on the records of the Council.

Section 7. Agendas: An agenda shall be prepared and given to the Members not less than 72 hours prior to the meeting. Non-agenda items may be considered at the meeting, with approval of a majority of the Board Members present, with the exception of the following matters: (A) appointment to fill a vacancy on the Board or a committee chairperson; (b) removal of a Director or committee chairperson; (C) adoption or revision of a budget, or authorization for the expenditure of non-budgeted funds in excess of $500.

Section 8 Quorum: A majority of the authorized number of Directors constitutes a quorum for the transaction of business, except to adjourn as provided in Section 9 of this Article. Every act or decision done or made by a majority of the Directors present at a meeting duly held at which a quorum is present shall be regarded as an act of the Board.

Section 9. Adjournment: A majority of the Directors present, whether or not a quorum is present, may adjourn a Director's meeting to another time and place. If the adjournment is for more than 24 hours, notice must be given to all Directors, present or not.

Section 10. Action Without a Meeting: Any action required or permitted to be taken by the Board may occur without a meeting. All Directors must consent to the action taken verbally, if not in writing. The action should then be ratified by the Board at its next regular or special meeting, and the action taken recorded in the minutes of that meeting.

Section 11. Robert's Rules of Order: All meetings of the Board of Directors and committees will be governed by Robert' Rules of Order, insofar as such rules are consistent with these bylaws, the Articles of Incorporation of this Council, or with any applicable provision of law.

Article V11. Committees

Section 1. Committees: The Board may appoint one or more committees, and delegate to such committee any of the authority of the Board, except with respect to:

a) Approval of any action which the California Nonprofit Benefit Corporation Law also requires approval of the Members, or approval of a majority of all Members;

b) Filling of vacancies on the Board or any committee chairperson;

c) Amendment or repeal of the bylaws, or adoption of the new bylaws;

d) Amendment or repeal of any resolution of the Board which by its expressed terms is not so amendable or repealable;

e) Appointment of other committees of the Board or the chairperson thereof;

f) Approval of any self-dealing transactions, as such transactions are defined in Section 5233(a) of the California Nonprofit Public Benefit Corporation Law.

Any such committees must be created by resolution adopted by a majority of the authorized number of Directors in office, provided a quorum is present. Unless the Board or such committee shall otherwise provide, the regular and special meetings and other actions of any such committee shall be governed by the provisions in these bylaws. Minutes shall be kept for each committee and presented at the next Board meeting.

ARTICLE V111. INDEMNIFICATION

Section 1. Right of Indemnification: To the fullest extent permitted by law, this corporation shall indemnify its Directors, officers and other persons described in Section 7237(a) of the California Corporations Code, including persons formerly occupying any such positions, against all expenses, judgments, fines, settlements and other amounts actually and reasonably incurred by them in connection with any proceeding as that term is used in that section, and including an action by or in the right of the corporation, by reason of the fact that the person is or was described in that section. Expenses, as used in these bylaws, shall have the same meaning as in Section 7237(a) of the California Corporation Code.

Section 2. Approval of Indemnity: On written request to the Board by any person seeking indemnification under Section 7237(a) or Section 7237(c) of the California Corporation Code, the Board shall promptly determine under Section 7237(e) of the California Corporation Code whether the applicable standard of conduct set forth in Section 7237(b) or Section 7237(c) has been met, and if so, the Board shall authorize indemnification. If the Board cannot authorize indemnification because the number of Directors who are parties to the proceeding with respect to which indemnification is sought prevents formation of a quorum of Directors who are not parties to that proceeding, the Board shall promptly call a meeting of Members. At that meeting, the Members shall determine under Section 7237(e) whether the applicable standard of conduct set forth in Section 7237(b) or Section 7237(c) has been met, and if so, the Members present at the meeting in person or by proxy shall authorize indemnification.

Section 3. Advancement of Expense: To the fullest extent permitted by law, and except as otherwise determined by the Board in a specific instance, expenses incurred by a person seeking indemnification under Sections 1 and 2 of this article, and of these bylaws, in defending any proceeding, covered by these sections, shall be advanced by the corporation before final disposition of the proceeding, on receipt by the corporation of an undertaking by or on behalf of that person that the advance will be repaid unless it is determined that the person is entitled to be indemnified by the corporation for those expenses.

ARTICLE 1X. INSURANCE

Section 1. Right to Purchase Insurance: The corporation shall have the right to purchase and maintain insurance to the full extent permitted by law on behalf of its officers, Directors, or agents in such capacity, or arising out of the officers', Directors', or agents' status as such.

ARTICLE X. OTHER PROVISIONS

Section 1. Amendments: These bylaws may be amended, or repealed and replaced, by two-thirds approval of the Board Members present and eligible to vote, provided that a quorum of the Board has been established.

Section 2. Construction and Definitions: Unless the context otherwise requires, the general provisions, rules, construction and definitions contained the General Provisions of the California Nonprofit Public Benefit Corporation Law shall govern the construction of these bylaws.

Section 3. Record of Revisions:

Rev No.	DESCRIPTION OF REVISION	AUTHORITY FOR REVISION	EFFECTIVE DATE
1.	Approval of Bylaws	Members	June 12, 2002
2	Amend Board Terms & Director vote method	Board	February 8, 2007
3.			
4.			

INTERNAL REVENUE SERVICE
P. O. BOX 2508
CINCINNATI, OH 45201

DEPARTMENT OF THE TREASURY

Date: MAY 0 2 2003

PLUMAS COUNTY FIRE SAFE COUNCIL INC
P. O. BOX 1225
QUINCY, CA 95971

Employer Identification Number:
74-3067126
DLN:
17053361026002
Contact Person:
THOMAS M KALLMAN ID# 31383
Contact Telephone Number:
(877) 829-5500
Accounting Period Ending:
August 31
Addendum Applies:
No

Dear Applicant:

Based on information you supplied, and assuming your operations will be as stated in your application for recognition of exemption, we have determined you are exempt from federal income tax under section 501(a) of the Internal Revenue Code as an organization described in section 501(c)(3). We also determined that you are a private foundation within the meaning of section 509(a) of the Code.

Based on the information you submitted with your application, we have determined that you are likely to qualify as a private operating foundation described in section 4942(j)(3) of the Code. Accordingly, you are treated as a private operating foundation for your first year. After that, you will be treated as a private operating foundation as long as you continue to meet the requirements of section 4942(j)(3).

This ruling satisfies the good faith determination requirement of section 53.4942(b)-3(b)(2) of the Excise Tax Regulations.

If you change your sources of support, your purposes, character, or method of operation, please let us know so we can consider the effect of the change on your exempt status and foundation status. If you amend your organizational document or bylaws, please send us a copy of the amended document or bylaws. Also, let us know any changes in your name or address.

As of January 1, 1984, you are liable for social security taxes under the Federal Insurance Contributions Act on amounts of $100 or more you pay to each of your employees during a calendar year. You are not liable for the tax imposed under the Federal Unemployment Tax Act (FUTA). However, since you are a private foundation, you are subject to excise taxes under Chapter 42 of the Code. You also may be subject to other Federal excise taxes. If you have any questions about excise, employment, or other Federal taxes, please let us know.

Donors may deduct contributions to you as provided in section 170 of the Code. Bequests, legacies, devises, transfers, or gifts to you or for your use are deductible for federal estate and gift tax purposes if they meet the applicable provisions of sections 2055, 2106, and 2522 of the Code.

PLUMAS COUNTY FIRE SAFE COUNCIL INC

Donors may deduct contributions only to the extent their contributions are gifts, with no consideration received. Ticket purchases and similar payments in conjunction with fundraising events may not necessarily qualify as deductible contributions, depending on the circumstances. See Publication 1391, which sets forth guidelines on when payments made by taxpayers for admission to, or other participation in fundraising activities for charity are deductible as charitable contributions.

You are required to file Form 990-PF, Return of Private Foundation or Section 4947(a)(1) Trust Treated as a Private Foundation. Form 990-PF must be filed by the 15th day of the fifth month after the end of your annual accounting period. A penalty of $20 a day is charged when a return is filed late, unless there is reasonable cause for the delay. However, the maximum penalty charged cannot exceed $10,000 or 5 percent of your gross receipts for the year, whichever is less. For organizations with gross receipts exceeding $1,000,000 in any year, the penalty is $100 per day per return unless there is reasonable cause for the delay. The maximum penalty for an organization with gross receipts exceeding $1,000,000 shall not exceed $50,000. This penalty may also be charged if a return is not complete, so please be sure your return is complete before you file it.

You are not required to file federal income tax returns unless you are subject to the tax on unrelated business income under section 511 of the Code. If you are subject to this tax, you must file an income tax return on Form 990-T, Exempt Organization Business Income Tax Return. In this letter we are not determining whether any of your present or proposed activities are unrelated trade or business as defined in section 513 of the Code.

You are required to make certain returns available for public inspection for three years after the later of the due date of the return or the date the return is filed. The returns required to be made available for public inspection are Form 990-PF, Return of Private Foundation or Section 4947(a)(1) Nonexempt Charitable Trust Treated as a Private Foundation, and Form 4720, Return of Certain Excise Taxes on Charities and Other Persons Under Chapters 41 and 42 of the Internal Revenue Code. You are also required to make available for public inspection your exemption application, any supporting documents, and your exemption letter. Copies of these documents must be provided to any individual upon written or in person request without charge other than reasonable fees for copying and postage. You may fulfill this requirement by placing these documents on the Internet. Penalties may be imposed for failure to comply with these requirements. Additional information is available in Publication 557, Tax-Exempt Status for Your Organization, or you may call our toll free number shown above.

You need an employer identification number even if you have no employees. If you did not enter an employer identification number on your application, we will assign a number to you and let you know. Please use that number on all returns you file and in all correspondence with the Internal Revenue Service.

If we have indicated in the heading of this letter that an addendum

PLUMAS COUNTY FIRE SAFE COUNCIL INC

applies, the addendum enclosed is an integral part of this letter.

Because this letter could help resolve any questions about your exempt status and private foundation status, you should keep it for your records.

If you have any questions, please contact the person whose name and telephone number are shown in the heading of this letter.

Sincerely yours,

Lois G. Lerner
Director, Exempt Organizations
Rulings and Agreements

Project Description

The Round Valley Project, Ingalls and Jenkins Projects (now known as the Wolf and Grizzly Creek Municipal Watershed Protection Project) were initially developed and planned under the Quincy Library Group (QLG) Pilot Project as part of the Herger-Feinstein Quincy Library Group (HFQLG) Act of Congress. Funding for HFQLG projects ended in 2012, leaving the Plumas National Forest looking for other solutions to continue their efforts to increase the pace and scale of landscape level forest treatments. The proposed projects have gone through the NEPA process with public scoping, input, and collaboration during HFQLG, but the implementation of these projects were left unfunded.

This proposal is the product of a forest collaborative effort that has been developed during the past year, this effort is a joint project of the Plumas County Fire Safe Council (PC FSC) and the Plumas National Forest. The name of this local group is the Feather River Stewardship Coalition and the Coalition is excited to identify and pursue opportunities for private and public landowners and land managers to improve forest health in the upper Feather River region.

This project spatially contributes to a large scale effort by the Plumas National Forest to create landscape level defensible fuel profile zones, areas of treated forest lands that have increased resiliency to high intensity wildfires. Several completed projects are in the nearby vicinity, the implementation of this project will create increased resilience of the treated areas to catastrophic wildfire.

The Wolf and Grizzly Creek Watershed Protection Project is consistent with Feather River Integrated Regional Watershed Management (IRWM) forest management strategies; is consistent with the Plumas County Community Wildfire Protection Plan (CWPP), 1988 Plumas National Forest Land and Resource Management Plan, USFS Watershed Condition Framework, and the CALFIRE Lassen-Modoc- Plumas unit fire plan. The proposed projects address elements identified in the action plans for both lower Wolf and Big Grizzly Creek priority watersheds

The municipal water source protection and enhancement project is located adjacent to two important water reservoirs on the Plumas National Forest, in Plumas County, a rural forested area of the Northern Sierra Nevada. These two watersheds have been identified as "Priority Watersheds" by the US Forest Service Watershed Condition Assessment Framework. The work identified within these watersheds are included on within the Forest Service's Action plan for these priority watersheds. Lake Davis, within the Grizzly Creek watershed, is the primary water source for the city of Portola. Also, water from Lake Davis is contributed the State Water Project, providing water throughout California. Reducing the risk of destructive wildfires surrounding these water reservoirs is essential to providing clean and abundant water to California and maintaining healthy watershed ecosystems.

The Wolf and Grizzly Creek Watershed Protection Project was designed to reduce fire hazard and restore forest health within municipal watersheds. These municipal water sources serve the disadvantaged communities of Greenville and Portola, the project area also provides wildlife habitat and extensive recreation opportunities for residents and visitors to the region. In addition, project activities will contribute to the local economy through the sale of forest products and creation of forest management jobs and opportunities for local businesses.

We are proposing the treatment of approximately 500 acres of fuels within these two watersheds. Fuel reduction and forest restoration treatments will include:

-131 acres of Mechanical Thinning of sawlogs and biomass, chipping and hauling of forest products on the Jenkins Stewardship project

-369 acres of hand thinning, hand or grapple piling, and burning in the Round Valley and Ingalls Projects.

The mechanical treatments within the 131 acres of the Jenkins project would include the removal of biomass to be chipped and hauled to a co-generation facility. Through the stewardship authority, the value from the sale of forest products would be used to leverage additional service work. Portola is currently listed as a non-attainment area by the US EPA and chipping and hauling biomass away from the region may be the most appropriate way to dispose of those materials.

Workplan and Schedule

EPA has been completed for all proposed work activities under the Freeman EIS and ROD, the Ingalls EIS and ROD, and the 2011 Keddie Project EIS and ROD. CEQA has not been completed for this project. CEQA compliance would be completed by the SN Conservancy as the lead agency, but the Plumas NF would provide necessary NEPA documentation to facilitate CEQA compliance.

• Review for CEQA would occur as early as fall 2015/winter 2016 with assistance from a partner such as SN Conservancy.

• Contracts would be prepared for solicitation and award in the Spring/Early summer of 2016.

• The contract for handthinning and piling would be solicited and awarded by spring 2016. Implementation would occur as early as summer/Fall of 2016. Hand piles would be burned by Forest Service crews between the Fall/Winter 2017/2018 pile burn seasons, as conditions permit.

• The mechanical thinning Stewardship contract would be solicited and awarded by Summer of 2016.

Implementation could occur as early as Summer/Fall of 2016, but would be designed to be a 1 year contract depending on the contractor's plan of operations.

The proposed project will take place in two municipal watershed in the upper Feather River Watershed. As such, there will be two project areas and two unique treatment plans.

For the Round Valley area we will work to treat the approximately 250 acres (see Round Valley map)

For the Lake Davis we will work to treat approximately 250 acres (see Jenkins and Ingalls maps) as follows:

Jenkins Project 131 acres

Ingalls Project 120 acres

Project Deliverable	Timeline
CEQA Review by SNC	Fall 2015
Contracts would be prepared for solicitation and award	Spring/Early summer of 2016
Six month Progress report developed and submitted	Spring 2016
Contract for mechanical thinning, hand thinning and piling	Summer 2016
Six month Progress report developed and submitted	Fall 2016
Mechanical thinning contract implemented	One year after contract has been awarded
Hand piles burned by Forest Service crews	Fall/Winter 2017/2018 pile burn seasons, as conditions permit
Six month Progress report developed and submitted	Spring 2017
Six month Progress report developed and submitted	Fall 2017
Six month Progress report developed and submitted	Spring 2018
Six month Progress report developed and submitted	Fall 2018

Restrictions, Technical and Environmental Documents, and Agreements

During the development of the Feather River Stewardship Coalition, the PC FSC and the Plumas National Forest developed an agreement (please see agreement 13-PA-11051100-021). The project proponents will supply the Sierra Nevada Conservancy with all of the NEPA documents that have been developed and will rely on the SNC to act as a lead agency in order to ensure that CEQA documents are developed and approved before project implementation occurs.

The Plumas NF would develop, solicit, and administer service contracts and an Integrated Resource Stewardship Contract (IRSC) to perform the mechanical and hand thinning contracts.

The Plumas County Fire Safe Council already has an agreement in place to collaboratively plan and develop hazardous fuel reduction projects within the wildland urban interface and priority watersheds in the Plumas NF. As part of this proposal, the Plumas County Fire Safe Council and the Plumas National Forest will develop a Partnership agreement which will allow for the partnership work to be completed by the two cooperating parties (PCFSC and the Plumas NF, respectively).

Once the hand thinning and mechanical thinning work is complete, the Plumas NF will prepare the burn and smoke management plan and acquire the necessary air quality/pollution permits to complete the burning of the piles. The Plumas NF has an active prescribed fire program and the burning of the piles would be absorbed into the Forest's annual burn program. All required permits and implementation of burning would be secured by the Plumas NF Fuels Management Program.

Organizational Capacity

The Plumas County Fire Safe Council (PC FSC) has been providing fuels reduction assistance to landowners in Plumas County for over 14 years. During that time we have administered 115 grants from private, county, state and federal sources totaling over $5 million (The PC FSC has successfully implemented grants from the SNC). These grants have allowed our organization to provide important fuels reduction to over 4,500 acres of private land in Plumas County. They have also been working with the Indian Valley Fire Department, the Indian Valley Community Services District and local residents to develop a greater awareness of the importance of fuels reduction work.

The PC FSC has successfully collaborated with the Plumas National Forest on numerous fuel reduction projects in the past. The Plumas NF has extensive experience partnering with contractors, CCC, and local tribal partners. In addition, the PNF has the requisite experience, infrastructure, staff and expertise to implement fuel treatment, contracting, administration and burning.

Cooperation and Community Support

These projects were initially developed and planned under the Quincy Library Group (QLG) Pilot Project as part of the Herger-Feinstein Quincy Library Group (HFQLG) Act of Congress. Funding for HFQLG projects ended in 2012, leaving the Plumas National Forest looking for other solutions to continue their efforts to increase the pace and scale of landscape level forest treatments. Both projects have gone through NEPA process with public scoping, input, and collaboration during HFQLG, but the implementation of these projects were left unfunded.

The Plumas County Fire Safe Council (PCFSC) has regularly collaborated with the US Forest Service to coordinate fuels reduction on Public and private lands and recognized the need for additional public collaboration when the HFQLG pilot project ended. As a result the PCFSC is facilitating the development of a new forest management collaborative, the Feather River Stewardship Coalition, with strong support from the Plumas NF.

The Feather River Stewardship Coalition (FRSC) is a diverse community of willing stakeholders working to improve the ecosystem health of private and public lands within the Feather River watershed. We work to identify solutions that facilitate productive balance among community, economy and environment.

Tribal Support Narrative

Tribal scoping has been completed through NEPA processes. The Plumas National Forest regularly engages local tribal groups such as the Maidu Summit consortium, Greenville Rancheria, Washoe, Mooretown, and Susanville Rancheria

In addition, proposed project work in the Round Valley area would complement treatments performed under the recently completed Maidu Stewardship contract. Tribal groups such as the Maidu Summit Consortium, the Greenville Indian Rancherias have been actively engaged with implementation of other aspects of Keddie Ridge project.

Contacts:

Danny Manning, Greenville Indian Rancheria, dannymanning@gmail.com

Greg Osborn, Mooretown Rancheria, gosborn@mooretown.org

Wade McMaster, Plumas NF Tribal Relations Manager, wmcmaster@fs.fed.us

Long Term Management and Sustainability

The proposed project is located entirely on Plumas National Forest System Land. As such, the proposed treatments will fully comply with the 1988 Plumas National Forest Land and Resource Management Plan as amended by the 2004 Sierra Nevada Framework Plan Amendment Record of Decision. These plans set forth acceptable activities, standards and guidelines, and necessary monitoring requirements to meet long term sustainability goals. In addition, project level design criteria and project level monitoring requirements for proposed treatments and compliance with the National Forest Management Act are set forth in the following NEPA Analyses:

- 2011 Keddie Project Final Environmental Impact Statement and Record of Decision
- 2006 Freeman Project Environmental Impact Statement and Record of Decision
- 2011 Ingalls Project Environmental Assessment and Decision Notice and Finding of No Significant Impact.

Design criteria, implementation, and monitoring requirements will be implemented under the proposed project to be compliant with the Plumas National Forest guiding direction to ensure long term sustainability. Additionally an agreement will be developed between the USFS PNF and the SNC in order to ensure that the SNC will be able to perform monitoring within the project area for the next 25 years.

Performance Measures

The following Performance Measures are required by SNC for monitoring project success:

- Number and type of jobs created.
- Number and value of new, improved or preserved economic activities.
- Number of people reached
- Resources leveraged for the Sierra Nevada

The following additional performance measure will be reported on:

- Acres of land improved or restored

Indian Valley Community Services District

"Providing services for our community health, well being, and prosperity."

P.O. Box 899, 127 Crescent St. Greenville CA. 95947
Phone (530) 284-7224, Fax (530) 284-0894
indianvalleycsd.com Email: ivcsd@frontiernet.net

August 27, 2015

Sierra Nevada Conservancy
Proposition 1 Watershed Improvement program

Letter of support for the Wolf and Grizzly Creeks Municipal Watershed Protection Project

Dear review committee:

Our organization is writing to strongly support the proposed Wolf and Grizzly Creeks Municipal Watershed Protection Project. We are excited to see the Plumas County Fire Safe Council partner with the Plumas National Forest to implement important fuel reduction projects within the watershed lands that serve our communities.

There is wide spread agreement that there needs to be more work done on reducing fuel for wildfires on forest lands throughout our region and this project will serve as a great example of what can be accomplished when our local organizations work together to identify ways to get the job done.
Please do not hesitate to contact me to discuss this further.

Sincerely,

Chris Gallagher
Interim General Manager

Tribal Support Narrative

Tribal scoping has been completed through NEPA processes. The Plumas National Forest regularly engages local tribal groups such as the Maidu Summit consortium, Greenville Rancheria, Washoe, Mooretown, and Susanville Rancheria

In addition, proposed project work in the Round Valley area would complement treatments performed under the recently completed Maidu Stewardship contract. Tribal groups such as the Maidu Summit Consortium, the Maidu Cultural Development Group and Greenville Indian Rancheria have been actively engaged with implementation of other aspects of Keddie Ridge project.

Contacts:

Danny Manning, Greenville Indian Rancheria, dannymanning@gmail.com

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SIERRA NEVADA CONSERVANCY
SNC Watershed Improvement Program - DETAILED BUDGET FORM

Project Name: Wolf and Grizzly Creek Municipal Watershed Protection

Applicant: Plumas County Fire Safe Council

SECTION ONE DIRECT COSTS	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**	**Total**
SN Conservancy CEQA compliance	$20,000					$20,000.00
Service Contract costs	$400,000					$400,000.00
Project Equipment, Building, Land purchases						$0.00
Project Materials & Supplies Purchased						$0.00
						$0.00
						$0.00
						$0.00
DIRECT COSTS SUBTOTAL:	$420,000.00	$0.00	$0.00	$0.00	$0.00	$420,000.00

SECTION TWO PARTIAL INDIRECT COSTS	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**	**Total**
Plumas County Fire Safe Council:						$0.00
Public Relations, Reporting	$1,500.00	$1,500.00				$3,000.00
Perf Measures, Invoice Billings	$1,000.00	$1,000.00				$2,000.00
						$0.00
INDIRECT COSTS SUBTOTAL:	$1,500.00	$1,500.00	$0.00	$0.00	$0.00	$5,000.00
PROJECT TOTAL:	$421,500.00	$1,500.00	$0.00	$0.00	$0.00	$425,000.00

SECTION THREE Administrative Costs (Costs may n*ot exceed 15% of the above listed Project costs*) :						**Total**
Plumas Corporation Indirect	$40,000.0	$35,000.0				$75,000.00
						$0.00
						$0.00
						$0.00
						$0.00
ADMINISTRATIVE TOTAL:	$40,000.00	$35,000.00	$0.00	$0.00	$0.00	$75,000.00
SNC TOTAL GRANT REQUEST:	$461,500.00	$36,500.00	$0.00	$0.00	$0.00	$500,000.00

SECTION FOUR OTHER PROJECT CONTRIBUTIONS	**Year One**	**Year Two**	**Year Three**	**Year Four**	**Year Five**	**Total**
Plumas NF administrative costs	$ 10,000	$ 5,000	$ 5,000			
Plumas NF Contract Prep (2 contracts)	$30,000					$30,000.00
Plumas NF Contract Admin (2 contracts)	$20,000	$15,000	$5,000			$40,000.00
Plumas NF Burning of Piles		$30,000	$30,000			$60,000.00
Plumas NF Forest Products	$3,500					$3,500.00
						$0.00
						$0.00
Total Other Contributions:	$53,500.00	$45,000.00	$35,000.00	$0.00	$0.00	$133,500.00

NOTE: The categories listed on this form are examples and may or may not be an expense related to the project. Rows may be added or deleted on the form as needed. Applicants should contact the SNC if questions arise.

CEQA STATUS

1. Describe how your project complies with the requirements for claiming a Categorical or Statutory Exemption per CEQA:

The Wolf and Grizzly Creek Watershed Protection Project is NEPA compliant since the project is exclusively on National Forest land. The Plumas County Fire Safe Council is requesting that SNC be the lead agency in developing CEQA for this project. **All NEPA documents can be found in the NEPA folder on the compact disk that accompanies this application. These documents were not printed due to the large number of pages contained within the files.**

2. If your organization is a state or local governmental agency, submit a signed, approved Notice of Exemption (NOE) documenting the use of the Categorical Exemption or Statutory Exemption, along with any permits, surveys, and/or reports that have been completed to support this CEQA status. The Notice of Exemption must bear a date stamp to show that it has been filed with the State Clearinghouse and/or County Clerk, as required by CEQA.

All NEPA documentation prepared for this project will be provided to SNC for development of CEQA.

3. If your organization is a nonprofit, there is no other California public agency having discretionary authority over your project, and you would like the SNC to prepare a NOE for your project, let us know that and list any permits, surveys, and/or reports that have been completed to support the CEQA status. All supplementary documentation must be provided to the SNC before the NOE can be prepared.

All NEPA documentation prepared for this project will be provided to SNC for development of CEQA. All NEPA documentation can be found in the NEPA folder on the compact disk that accompanies this application.

Negative Declaration OR
Mitigated Negative Declaration
If a project requires a Negative Declaration or Mitigated Negative Declaration, then applicants must work with a qualified public agency, i.e., one that has discretionary authority over project approval or permitting, to complete the CEQA process.
1. Describe how your project complies with the requirements for the use of a Negative Declaration or a Mitigated Negative Declaration per CEQA:

Not applicable at this time.

2. Submit the approved Initial Study and Negative Declaration/Mitigated Negative Declaration along with any Mitigation Monitoring or Reporting Plans, permits, surveys, and/or reports that have been completed to support this CEQA status. The IS/ND/MND must be accompanied by a

signed, approved Notice of Determination, which must bear a date stamp to show that it has been filed with the State Clearinghouse and/or County Clerk, as required by CEQA.

Not applicable at this time.

Environmental Impact Report

If a project requires an Environmental Impact Report, then applicants must work with a qualified public agency, i.e., one that has discretionary authority over project approval or permitting, to complete the CEQA process.

The Plumas County Fire Safe Council is requesting that the SNC acts as the lead agency for CEQA documentation for our proposed project.

1. Describe how your project complies with the requirements for the use of an Environmental Impact Report per CEQA:

Not applicable at this time.

2. Submit the Draft and Final Environmental Impact Report along with any Mitigation Monitoring or Reporting Plans, permits, surveys, and/or reports that have been completed to support this CEQA status. The EIR documentation must be accompanied by a signed, approved Notice of Determination, which must bear a date stamp to show that it has been filed with the State Clearinghouse and/or County Clerk, as required by CEQA.

Not applicable at this time.

Appendix A

Alternative Development by Unit, Stand Exam Data and Post Treatment Outputs by Unit, and Silvicultural and Noxious Weed Maps with Unit Numbers

Introduction

This appendix includes eight tables (Table 1 through Table 8) which display unit specific information for each action alternative. Tables 1, 3, 5, and 7 illustrate tabular data created after developing unit specific information for each alternative. These tables include: unit numbers for each silvicultural treatment unit; unit numbers for those noxious weed treatment units that occur outside of silvicultural unit boundaries; acres; an indicator for units within ("DFPZ") and outside of ("Non") DFPZs; prescription; treatment; logging system; purpose and need statement(s) that correspond to each unit; dominant land allocations; dominant California Wildlife Habitat Relationship (CWHR) system size and density classes; presence or absence of noxious weed treatments; visual quality objectives; inclusion of noxious weed treatments; wildlife land allocation(s); presence or absence of threatened, endangered, and Region 5 Forest Service sensitive (TES) plant species; and presence or absence of group selections. This information is then repeated for each unit for each action alternative. Colum headings are not applicable to specific units when the table cells are empty.

Tables 2, 4, 6, and 8 disclose stand exam data and post treatment outputs. These tables include: an indicator for units within ("DFPZ") and outside of ("Non") DFPZs; prescriptions; unit numbers, **existing** trees per acre, canopy cover, basal area per acre, quadratic mean diameter, relative density; **residual** quadratic mean diameter; **existing and residual** snags per acres (>15 inches DBH); **average** residual trees per acre, residual basal area per acre, and residual relative density; and **range in** residual trees per acre, residual canopy cover, residual basal area per acre, and relative density. This information is then repeated for each unit for each action alternative.

Figure 1, at the end of this appendix, includes silvicultural treatment units with unit numbers, and Figure 2 displays noxious weed units with unit numbers. These are the only figures that contain unit numbers.

Appendix B, the following appendix, includes alternative specific silvicultural and noxious weed treatment maps, and silvicultural and noxious weed prescription code tables. Appendices A and B should be used together to relate tabular (appendix A) and spatial data (appendix B) for each unit.

Specific Methodology

Plumas National Forest Geographic Information System (GIS) corporate data was used to create Tables 1, 3, 5, and 7 below. The Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) Interdisciplinary Team (IDT) worked synergistically to review the GIS data, scoping comments submitted by interested parties, and Forest Plan information, as amended, and created these unit specific tables.

Common stand exam data and Forest Vegetation Simulator (FVS) modeling were used to create Tables 2, 4, 6, and 8 below. Proposed treatments and corresponding prescriptions for each alternative were modeled to characterize existing conditions and average ranges in post-treatment stand conditions.

Table 1. Alternative A Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			Yes
3	109	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			Yes
4	19	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
5	15	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			Yes
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	No
7	64	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
10	135	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
14	96	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
17	113	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			Yes
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
22	33	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	General Forest		Yes	Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Noxious Weed Reduction	HRCA		Yes	Partial Retention	HRCA		No
25	91	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA			Modification and Partial Retention	HRCA		Yes
26	6	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
27	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
28	5	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
29	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
34	11	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		Yes
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No
42	195	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			Yes
43	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			Yes
44	13	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
45	40	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
46	4	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
49	84	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Rreduction	Defense Zone and Threat Zone		Yes	Partial Retention			Yes
50	14	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			Yes
51	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
52	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	Yes
53	15	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
54	19	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
55	55	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	Yes
56	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
59	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
62	20	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
63	28	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
66	71	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
67	24	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	Yes
68	179	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
69	93	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			Yes
71	89	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	Yes
72	47	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			Yes
74	45	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
75	34	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		Yes
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone. HRCA.		Yes	Modification and Partial Retention	HRCA		No
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Mt. Jura LSOG. HRCA.	5M	Yes	Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
93	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
94	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
95	25	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA.	5M/D		Partial Retention	50% HRCA		Yes
96	12	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Partial Retention	HRCA		Yes
97	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
98	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
99	94	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
99a	21	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
101	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		Yes
105	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		Yes
106	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		Yes
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No
NW 1						Noxious Weed Reduction			Yes	Modification			No
NW 5						Noxious Weed Reduction			Yes	Partial Retention			No
NW 11						Noxious Weed Reduction			Yes	Partial Retention			No
NW 16						Noxious Weed Reduction			Yes	Modification			No
NW 17						Noxious Weed Reduction			Yes	Modification			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
NW 19						Noxious Weed Reduction			Yes	Partial Retention			No
NW 20						Noxious Weed Reduction		5M	Yes	Modification and Partial Retention			No
NW 21						Noxious Weed Reduction		5M	Yes	Partial Retention	HRCA		No
NW 24						Noxious Weed Reduction		5M	Yes	Modification	PAC		No
NW 26						Noxious Weed Reduction			Yes	Modification	PAC/ HRCA		No
NW 27						Noxious Weed Reduction			Yes	Partial Retention			No
NW 28						Noxious Weed Reduction			Yes	Modification			No

Table 2. Alternative A Stand Exam Data and Post Treatment Outputs by Unit

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx2	93, 94, 95, 96, 97	583	60	1.6	225	13.7	74	149	112 - 191	30 - 50	127	82 - 172	17.6	37	25 - 48
			98, 99, 99a, 101	408	47	3.4	172	14.0	54	195	65 - 408	30 - 47	141	112 - 172	16.9	39	28 - 54
			92	414	55	4.5	215	15.5	62	71	35 - 113	30 - 50	145	101 - 187	20.4	32	21 - 42
			104, 105, 106	384	66	6.3	291	16.4	80	48	35 - 68	36 - 50	141	111 - 184	23.3	30	23 - 39
			68	482	63	2.8	250	14.5	78	79	55 - 112	33 - 50	144	108 - 184	20.9	37	28 - 47
			73	1136	73	5.1	276	11.5	85	150	144 - 162	43 - 50	102	89 - 129	15.6	26	23 - 31
			34	214	39	2.9	138	14.6	43	162	57 - 214	30 - 39	131	115 - 138	16.2	38	28 - 43
			2, 3, 4, 5	359	47	0.0	202	15.5	61	161	37 - 359	30 - 47	165	130 - 202	19.8	43	28 - 61
		Rx3	29	415	43	6.8	175	13.1	46	216	85 - 415	30 - 43	151	122 - 175	14.4	35	26 - 46
			28	559	61	0.3	238	11.8	66	107	57 - 167	31 - 50	146	105 - 187	16.4	34	25 - 44
			27	741	59	12.1	272	14.4	80	70	28 - 119	30 - 50	174	131 - 218	23.4	37	26 - 48
			26	231	35	4.1	154	20.6	39	168	42 - 231	30 - 35	147	133 - 154	21.7	35	25 - 39

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			7, 9	925	44	7.4	220	15.5	67	362	55 - 925	30 - 44	176	134 - 220	18.0	43	26 - 67
			81	1475	71	0.0	313	10.5	85	145	128 - 179	41 - 50	135	127 - 153	13.1	27	25 - 31
			71	244	59	10.8	266	18.1	74	68	43 - 99	30 - 50	164	117 - 211	24.9	41	29 - 54
			44	345	39	0.9	142	14.2	45	252	64 - 345	30 - 39	129	104 - 142	15.2	39	26 - 45
		Rx4	16, 17, 21	415	43	6.8	175	13.1	46	216	85 - 415	30 - 43	151	122 - 175	14.4	35	26 - 46
			22	559	61	0.3	238	11.8	66	107	57 - 167	31 - 50	146	105 - 187	16.4	34	25 - 44
			25	284	36	2.8	160	19.4	43	203	42 - 284	30 - 36	150	129 - 160	20.8	37	25 - 43
			69	571	46	0.7	165	12.9	56	343	207 - 571	30 - 46	131	97 - 165	15.0	44	34 - 56
			69	482	63	2.8	250	14.5	78	79	55 - 112	33 - 50	144	108 - 184	20.9	37	28 - 47
			66, 67	1097	41	1.3	191	10.9	67	478	129 - 1097	30 - 41	149	115 - 191	11.6	45	30 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	165	133 - 206	30 - 49	135	101 - 168	19.8	49	38 - 61
			36	417	48	1.6	201	14.1	60	192	47 - 417	30 - 48	158	118 - 201	17.2	42	26 - 60
			42, 43	345	39	0.9	142	14.2	45	252	64 - 345	30 - 39	129	104 - 142	15.2	39	26 - 45
		Rx5	65	327	45	0.6	191	15.3	52	210	93 - 327	40 - 45	175	160 - 191	16.5	44	36 - 52
		Rx8	10, 14	568	51	0.0	152	12.4	56	214	78 - 568	30 - 51	124	99 - 152	14.2	38	26 - 56
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx3	74	400	45	1.5	160	12.6	51	199	75 - 400	30 - 45	127	94 - 160	13.8	37	26 - 51
			75	264	55	5.1	258	19.3	75	128	33 - 264	40 - 55	219	168 - 258	24.0	57	40 - 75
			53, 55, 59, 62	560	65	3.4	255	12.2	75	94	61 - 137	35 - 50	159	139 - 184	18.2	38	31 - 46
			54, 56, 58	610	44	1.0	171	12.1	52	276	74 - 610	30 - 44	141	115 - 171	14.0	37	25 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	112	66 - 135	30 - 36	145	131 - 152	17.1	31	26 - 33

Table 3. Alternative C Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D	Partial Retention				No
2	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5D	Partial Retention				No
3	109	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5D	Modification and Partial Retention				No
4	19	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Modification and Partial Retention				No
5	15	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Modification				No
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5D	Modification and Partial Retention			Yes	No
7	64	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification				No
9	23	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
10	135	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	22 acres Threat Zone, General Forest		Modification and Partial Retention				No
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No
14	96	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone		Partial Retention				No
16	16	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
17	113	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5D	Modification and Partial Retention				No
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification				No
21	14	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
22	33	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Partial Retention				No
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest		Modification and Partial Retention				No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
25	91	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA		Modification and Partial Retention	HRCA			No
26	6	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
27	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification				No
28	5	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
29	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest		Partial Retention				No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Modification and Partial Retention	HRCA			No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Modification	HRCA			No
34	11	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Partial Retention				No
36	167	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Norther 1/4 unit = HRCA. General Forest	5M	Modification and Partial Retention	Northern 1/4 unit HRCA.			No
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.		Partial Retention	SOHA			No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone	5M	Partial Retention		Yes		No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No
42	195	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention		Yes		No
43	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
44	13	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
45	40	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
46	4	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Threat Zone		Partial Retention				No
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone		Partial Retention				No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
49	84	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
50	14	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Defense Zone		Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
51	14	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
52	14	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Modification			Yes	No
53	15	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
54	19	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification			Yes	No
55	55	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention			Yes	No
56	26	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Partial Retention				No
58	12	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Partial Retention				No
59	26	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Partial Retention				No
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Partial Retention				No
61	27	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
62	20	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
63	28	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
65	180	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA	5M	Modification and Partial Retention	HRCA			No
66	71	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention			Yes	No
67	24	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone		Partial Retention			Yes	No
68	179	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention			Yes	No
69	93	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone	5D	Partial Retention				No
71	89	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M	Partial Retention and Retention	HRCA		Yes	No
72	47	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation. HRCA.	5M	Retention	HRCA			No
73	221	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
74	45	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. Recreation.		Partial Retention and Retention				No
75	34	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No
78	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M/D	Partial Retention				No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M/D	Partial Retention			Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M/D	Partial Retention			Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D	Partial Retention and Modification	HRCA			No
81	19	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. HRCA.		Partial Retention	HRCA			No
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.		Modification and Partial Retention	HRCA			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M	Partial Retention	HRCA			No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M	Partial Retention	HRCA			No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention			Yes	No
92	42	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Partial Retention				No
93	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
94	19	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
95	25	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Threat Zone. 50% HRCA.	5M/D	Partial Retention	50% HRCA			No
96	12	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No
97	21	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
98	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification and Partial Retention				No
99	94	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
99a	21	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
101	3	DFPZ	Rx6	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
102	67	DFPZ	Rx1	Mastication	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
103	61	DFPZ	Rx8	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
104	52	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D	Modification and Partial Retention	HRCA			No
105	3	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone. Recreation. HRCA.		Partial Retention	HRCA			No
106	21	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation. HRCA.	5D	Partial Retention and Retention	HRCA			No
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.		Retention				No

Table 4. Alternative C Stand Exam Data and Post Treatment Outputs by Unit

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per Acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per Acre	Range in Residual Basal Area per Acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Residual Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 32	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx8	16, 17, 21, 29	415	43	6.8	175	13.1	46	219	85 - 415	30 - 43	151	121 - 175	14.4	35	26 - 46
			22, 28	564	61	0.2	239	11.8	66	205	93 - 564	36 - 61	172	133 - 239	14.9	42	31 - 66
			27	738	58	12.1	272	14.4	80	328	107 - 738	43 - 58	227	192 - 272	17.7	57	43 - 80
			26	231	35	4.1	154	20.6	39	170	44 - 231	30 - 35	148	136 - 154	21.7	35	25 - 39
			25	284	36	2.8	160	19.4	43	247	60 - 284	32 - 36	156	138 - 160	20.0	41	29 - 43
			7, 9	925	44	7.4	220	15.5	67	523	106 - 925	34 - 44	194	156 - 220	16.8	52	34 - 67
			93, 94, 95, 96, 97	579	60	1.6	225	13.8	73	278	98 - 579	42 - 60	186	161 - 225	16.6	53	39 - 73
			98, 99, 99a, 101	408	47	3.4	172	14.0	54	251	62 - 408	30 - 47	152	118 - 172	15.9	44	28 - 54

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per Acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per Acre	Range in Residual Basal Area per Acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Residual Relative Density
			92	414	55	4.5	215	15.5	62	210	96 - 414	45 - 55	192	173 - 215	17.5	48	38 - 62
			81	1475	71	0.0	313	10.5	85	173	128 - 248	41 - 50	138	126 - 161	13.2	29	26 - 35
			104, 105, 106	384	66	6.3	291	16.4	80	244	105 - 384	52 - 66	262	232 - 291	18.8	66	52 - 80
			71	244	59	10.8	266	18.1	74	178	111 - 244	55 - 59	253	240 - 266	19.2	66	59 - 74
			69	575	47	0.6	166	12.9	57	364	82 - 575	34 - 47	142	103 - 166	14.3	45	27 - 57
			68, 69	478	63	3.0	249	14.5	77	292	101 - 478	48 - 63	218	185 - 249	16.9	62	46 - 77
			66, 67	1099	41	1.3	191	10.9	67	494	129 - 1099	30 - 41	150	115 - 191	11.5	46	30 - 67
			65	327	45	0.6	191	15.3	52	209	75 - 327	34 - 45	173	146 - 191	16.9	43	31 - 52
			73	1136	73	5.1	276	11.5	85	637	125 - 1136	43 - 73	216	150 - 276	14.3	60	34 - 85
			45, 46, 49, 50	206	49	0.6	168	16.6	61	161	70 - 206	42 - 49	159	140 - 168	17.7	55	42 - 61
			36	422	48	1.5	202	14.0	60	261	72 - 422	34 - 48	176	137 - 202	15.9	48	31 - 60
			42, 43, 44	345	39	0.9	142	14.2	45	253	62 - 345	30 - 39	130	105 - 142	15.3	39	26 - 45
			34	214	39	2.9	138	14.6	43	163	57 - 214	30 - 39	130	114 - 138	16.2	38	28 - 43
			2, 3, 4, 5	359	47	0.0	202	15.5	61	221	65 - 359	35 - 47	181	153 - 202	17.8	49	35 - 61
			10, 14	568	51	0.0	152	12.4	56	214	78 - 568	30 - 51	124	99 - 152	14.2	38	26 - 56
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx8	74	400	45	1.5	160	12.6	51	201	67 - 400	30 - 45	129	97 - 160	14.2	37	25 - 51
			75	264	55	5.1	258	19.3	75	138	73 - 264	49 - 55	237	224 - 258	22.7	61	53 - 75
			53, 55, 59, 62	556	65	3.5	254	12.2	74	104	61 - 163	35 - 50	161	142 - 187	18.1	38	31 - 47
			54, 56, 58	610	44	1.0	171	12.1	52	284	74 - 610	30 - 44	141	114 - 171	14.0	37	25 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	112	64 - 135	30 - 36	145	130 - 152	17.2	31	26 - 33

Table 5. Alternative D Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			No
3	109	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			No
4	19	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			No
5	15	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			No
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	No
7	64	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			No
10	135	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
14	96	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
17	113	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			No
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
22	33	DFPZ	Rx10	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	General Forest		Yes	Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
25	91	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction /Forest Health /Noxious Weed Reduction	HRCA		Yes	Modification and Partial Retention	HRCA		No
26	6	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
27	9	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
28	5	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
29	9	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No
34	11	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		No
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
42	195	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			No
43	25	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			No
44	13	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			No
45	40	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
46	4	DFPZ	Rx9	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
49	84	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
50	14	DFPZ	Rx9	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			No
51	14	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
52	14	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	No
53	15	Non	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			No
54	19	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	No
55	55	Non	Rx1	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	No
56	26	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			No
59	26	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			No
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
62	20	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
63	28	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		No
66	71	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
67	24	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	No
68	179	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	No
69	93	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			No
71	89	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	No
72	47	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			No
74	45	Non	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			No
75	34	Non	Rx10	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		No
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone. HRCA.		Yes	Modification and Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Mt. Jura LSOG. HRCA.	5M	Yes	Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Partial Retention			No
93	25	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. OFE.	5M		Partial Retention			No
94	19	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. OFE.	5M		Partial Retention			No
95	25	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA. OFE.	5M/D		Partial Retention	50% HRCA		No
96	12	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA. OFE.	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
97	21	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
98	25	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE			Modification and Partial Retention			No
99	94	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
99a	21	DFPZ	Rx12	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
101	3	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE			Modification			No
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	OFE	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		No
105	3	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
106	21	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		No
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No
NW 1						Noxious Weed Reduction			Yes	Modification			
NW 5						Noxious Weed Reduction			Yes	Partial Retention			
NW 11						Noxious Weed Reduction			Yes	Partial Retention			
NW 16						Noxious Weed Reduction			Yes	Modification			
NW 17						Noxious Weed Reduction			Yes	Modification			
NW 19						Noxious Weed Reduction			Yes	Partial Retention			
NW 20						Noxious Weed Reduction		5M	Yes	Modification and Partial Retention			
NW 21						Noxious Weed Reduction		5M	Yes	Partial Retention	HRCA		
NW 24						Noxious Weed Reduction		5M	Yes	Modification	PAC		
NW 26						Noxious Weed Reduction			Yes	Modification	PAC/ HRCA		

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
NW 27						Noxious Weed Reduction			Yes	Partial Retention			
NW 28						Noxious Weed Reduction			Yes	Modification			

Table 6. Alternative D Stand Exam Data and Post Treatment Outputs

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx1	9	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			98, 101	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			105, 106	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			36	417	48	1.6	201	14.1	60	211	211 - 211	45 - 45	180	180 - 180	15.3	48	48 - 48
			42	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
		Rx10	21, 29	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			22, 28	559	61	0.3	238	11.8	66	260	167 - 353	50 - 61	209	187 - 230	13.1	51	44 - 59
			4, 5	359	47	0.0	202	15.5	61	271	183 - 359	47 - 47	194	186 - 202	15.5	55	50 - 61
		Rx11	17	415	43	6.8	175	13.1	46	352	224 - 415	43 - 43	172	166 - 175	13.1	44	39 - 46
			27	741	59	12.1	272	14.4	80	187	119 - 323	50 - 59	230	218 - 253	17.0	54	48 - 65
			26	231	35	4.1	154	20.6	39	187	98 - 231	35 - 35	153	151 - 154	20.6	37	33 - 39
			7	925	44	7.4	220	15.5	67	715	296 - 925	44 - 44	211	191 - 220	15.5	60	48 - 67
			93, 94, 95	583	60	1.6	225	13.7	74	233	176 - 330	50 - 60	184	171 - 209	15.6	53	47 - 62

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			104	384	66	6.3	291	16.4	80	227	68 - 384	50 - 66	252	184 - 291	18.3	63	39 - 80
			71	244	59	10.8	266	18.1	74	174	99 - 244	50 - 59	247	211 - 266	19.3	66	54 - 74
			73	1136	73	5.1	276	11.5	85	616	162 - 1136	50 - 73	217	129 - 276	13.2	61	31 - 85
			43, 44	345	39	0.9	142	14.2	45	284	162 - 345	39 - 39	138	130 - 142	14.2	42	37 - 45
			2, 3	359	47	0.0	202	15.5	61	301	183 - 359	47 - 47	196	186 - 202	15.5	57	50 - 61
		Rx12	25	284	36	2.8	160	19.4	43	200	115 - 284	36 - 36	156	153 - 160	19.4	39	35 - 43
			96, 97	583	60	1.6	225	13.7	74	253	176 - 330	50 - 60	190	171 - 209	15.4	55	47 - 62
			99, 99a	408	47	3.4	172	14.0	54	310	211 - 408	47 - 47	166	160 - 172	14.0	50	45 - 54
			92	414	55	4.5	215	15.5	62	159	113 - 206	50 - 55	196	187 - 205	16.5	47	42 - 51
			65	327	45	0.6	191	15.3	52	251	175 - 327	45 - 45	185	179 - 191	15.3	48	44 - 52
		Rx9	16	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			81	1475	71	0.0	313	10.5	85	400	179 - 622	50 - 71	207	153 - 261	11.5	47	31 - 62
			69	571	46	0.7	165	12.9	56	466	361 - 571	46 - 46	159	153 - 165	12.9	53	49 - 56
			68, 69	482	63	2.8	250	14.5	78	192	112 - 272	50 - 63	210	184 - 237	16.6	57	47 - 67
			66, 67	1097	41	1.3	191	10.9	67	746	396 - 1097	41 - 41	172	153 - 191	10.9	56	46 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	206	206 - 206	49 - 49	168	168 - 168	16.6	61	61 - 61
			34	214	39	2.9	138	14.6	43	174	135 - 214	39 - 39	137	135 - 138	14.6	41	39 - 43
			10, 14	568	51	0.0	152	12.4	56	250	212 - 288	50 - 51	139	137 - 141	12.5	44	42 - 46
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx1	53, 55	560	65	3.4	255	12.2	75	314	314 - 314	60 - 60	229	229 - 229	13.2	62	62 - 62
		Rx10	75	264	55	5.1	258	19.3	75	119	86 - 152	50 - 55	241	231 - 252	20.7	61	57 - 66
		Rx11	59, 62	560	65	3.4	255	12.2	75	210	137 - 355	50 - 65	205	184 - 247	14.5	53	46 - 67
			54, 56, 58	610	44	1.0	171	12.1	52	496	268 - 610	44 - 44	164	150 - 171	12.1	48	40 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	128	113 - 135	36 - 36	152	151 - 152	16.1	33	32 - 33
		Rx9	74	400	45	1.5	160	12.6	51	306	213 - 400	45 - 45	154	148 - 160	12.6	47	42 - 51

Table 7. Alternative E Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			Yes
3	109	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			Yes
4	19	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
5	15	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			Yes
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	Yes
7	64	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
10	135	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
14	96	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
17	113	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			Yes
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
22	33	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
25	91	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA			Modification and Partial Retention	HRCA		Yes
26	6	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
27	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
28	5	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
29	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
34	11	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		Yes
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No
42	195	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M	Yes	Partial Retention			Yes
43	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
44	13	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
45	40	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
46	4	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
49	84	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			Yes
50	14	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			Yes
51	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
52	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	Yes
53	15	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
54	19	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
55	55	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	Yes
56	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
59	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
62	20	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
63	28	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
66	71	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
67	24	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	Yes
68	179	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
69	93	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			Yes
71	89	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	Yes
72	47	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			Yes
74	45	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
75	34	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		Yes
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.			Modification and Partial Retention	HRCA		No
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
93	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
94	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
95	25	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA.	5M/D		Partial Retention	50% HRCA		Yes
96	12	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Partial Retention	HRCA		Yes
97	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
98	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
99	94	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
99a	21	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
101	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		Yes
105	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		Yes
106	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		Yes
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No

Table 8. Alternative E Stand Exam Data and Post Treatment Outputs

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx1	9	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			98, 101	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			105, 106	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			36	417	48	1.6	201	14.1	60	211	211 - 211	45 - 45	180	180 - 180	15.3	48	48 - 48
			42	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
		Rx10	21, 29	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			22, 28	559	61	0.3	238	11.8	66	260	167 - 353	50 - 61	209	187 - 230	13.1	51	44 - 59
			4, 5	359	47	0.0	202	15.5	61	271	183 - 359	47 - 47	194	186 - 202	15.5	55	50 - 61
		Rx11	17	415	43	6.8	175	13.1	46	352	224 - 415	43 - 43	172	166 - 175	13.1	44	39 - 46
			27	741	59	12.1	272	14.4	80	187	119 - 323	50 - 59	230	218 - 253	17.0	54	48 - 65
			26	231	35	4.1	154	20.6	39	187	98 - 231	35 - 35	153	151 - 154	20.6	37	33 - 39
			7	925	44	7.4	220	15.5	67	715	296 - 925	44 - 44	211	191 - 220	15.5	60	48 - 67
			93, 94, 95	583	60	1.6	225	13.7	74	233	176 - 330	50 - 60	184	171 - 209	15.6	53	47 - 62

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			104	384	66	6.3	291	16.4	80	227	68 - 384	50 - 66	252	184 - 291	18.3	63	39 - 80
			71	244	59	10.8	266	18.1	74	174	99 - 244	50 - 59	247	211 - 266	19.3	66	54 - 74
			73	1136	73	5.1	276	11.5	85	616	162 - 1136	50 - 73	217	129 - 276	13.2	61	31 - 85
			43, 44	345	39	0.9	142	14.2	45	284	162 - 345	39 - 39	138	130 - 142	14.2	42	37 - 45
			2, 3	359	47	0.0	202	15.5	61	301	183 - 359	47 - 47	196	186 - 202	15.5	57	50 - 61
		Rx12	25	284	36	2.8	160	19.4	43	200	115 - 284	36 - 36	156	153 - 160	19.4	39	35 - 43
			96, 97	583	60	1.6	225	13.7	74	253	176 - 330	50 - 60	190	171 - 209	15.4	55	47 - 62
			99, 99a	408	47	3.4	172	14.0	54	310	211 - 408	47 - 47	166	160 - 172	14.0	50	45 - 54
			92	414	55	4.5	215	15.5	62	159	113 - 206	50 - 55	196	187 - 205	16.5	47	42 - 51
			65	327	45	0.6	191	15.3	52	251	175 - 327	45 - 45	185	179 - 191	15.3	48	44 - 52
		Rx9	16	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			81	1475	71	0.0	313	10.5	85	400	179 - 622	50 - 71	207	153 - 261	11.5	47	31 - 62
			69	571	46	0.7	165	12.9	56	466	361 - 571	46 - 46	159	153 - 165	12.9	53	49 - 56
			68, 69	482	63	2.8	250	14.5	78	192	112 - 272	50 - 63	210	184 - 237	16.6	57	47 - 67
			66, 67	1097	41	1.3	191	10.9	67	746	396 - 1097	41 - 41	172	153 - 191	10.9	56	46 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	206	206 - 206	49 - 49	168	168 - 168	16.6	61	61 - 61
			34	214	39	2.9	138	14.6	43	174	135 - 214	39 - 39	137	135 - 138	14.6	41	39 - 43
			10, 14	568	51	0.0	152	12.4	56	250	212 - 288	50 - 51	139	137 - 141	12.5	44	42 - 46
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx1	53, 55	560	65	3.4	255	12.2	75	314	314 - 314	60 - 60	229	229 - 229	13.2	62	62 - 62
		Rx10	75	264	55	5.1	258	19.3	75	119	86 - 152	50 - 55	241	231 - 252	20.7	61	57 - 66
		Rx11	59, 62	560	65	3.4	255	12.2	75	210	137 - 355	50 - 65	205	184 - 247	14.5	53	46 - 67
			54, 56, 58	610	44	1.0	171	12.1	52	496	268 - 610	44 - 44	164	150 - 171	12.1	48	40 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	128	113 - 135	36 - 36	152	151 - 152	16.1	33	32 - 33
		Rx9	74	400	45	1.5	160	12.6	51	306	213 - 400	45 - 45	154	148 - 160	12.6	47	42 - 51

Figure 1 Silvicultural Treatment Units with Unit Numbers

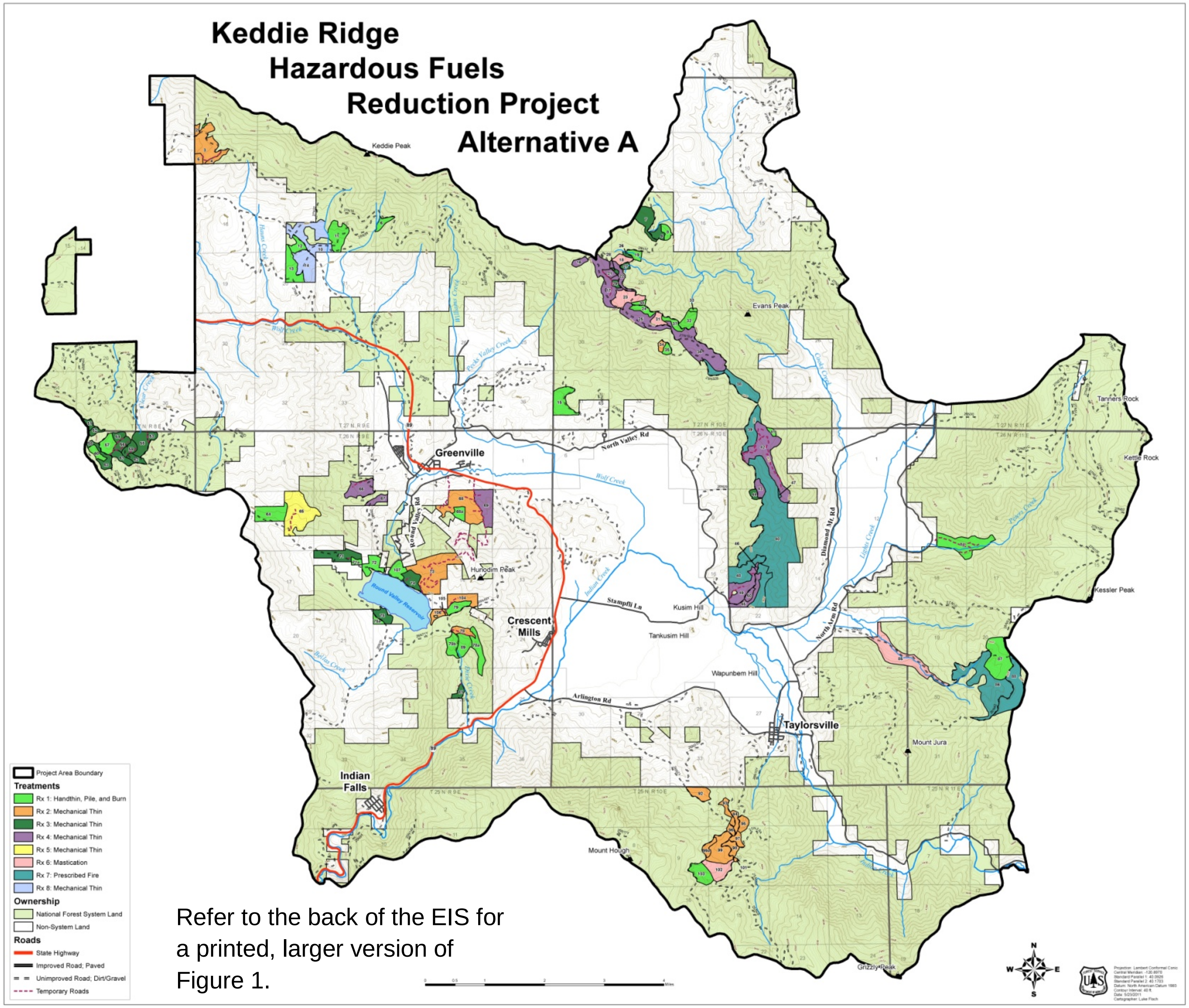
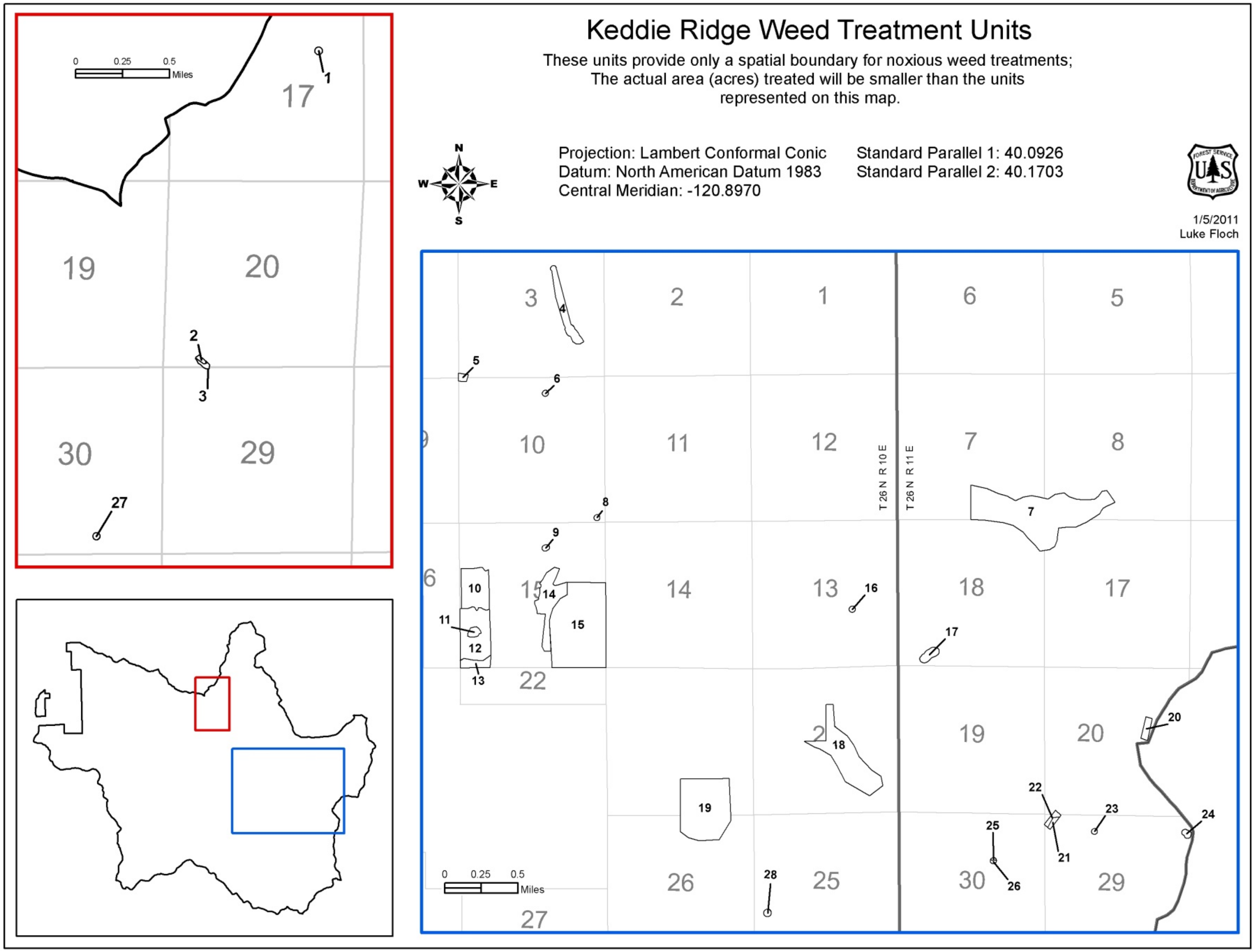


Figure 2 Noxious Weed Treatment Units with Unit Numbers



Appendix B

Alternative Maps

This appendix includes alternative specific treatment and noxious weed maps (Figure 1 through Figure 6). This appendix can be used in conjunction with appendix A to compare tabular data (appendix A) and spatial data (appendix B) for each unit within each alternative.

The first four maps (Figure 1 through Figure 4) are silvicultural treatment maps illustrating unit specific prescriptions for each alternative; township, range, and sections; ownership; and major roads, communities, bodies of water, and creeks. Some or all prescriptions change for each unit within each alternative; however, the footprint of the units does not change.

The last two maps (Figure 5 and Figure 6) focus on noxious weed treatment locations. These maps zoom into areas where there are noxious weed treatments. Most of the noxious weed treatments are less than one tenth of an acre and were difficult to see on the silvicultural maps. These weed treatment maps also include township, range, and sections; ownership; and major roads and creeks. Weed treatments are not proposed under alterative C (non-commercial funding alternative); however, implementing fuels treatments would directly benefit noxious weeds under this alternative.

Silvicultural and noxious weed prescription code tables are located at the end of all six maps (Table 1 and Table 2). The prescription code table clarifies which alternative the prescription applies to, the prescription code, and a general description explaining what the prescription is.

Figure 1 Alternative A Treatment Unit Map with Silvicultural Prescriptions

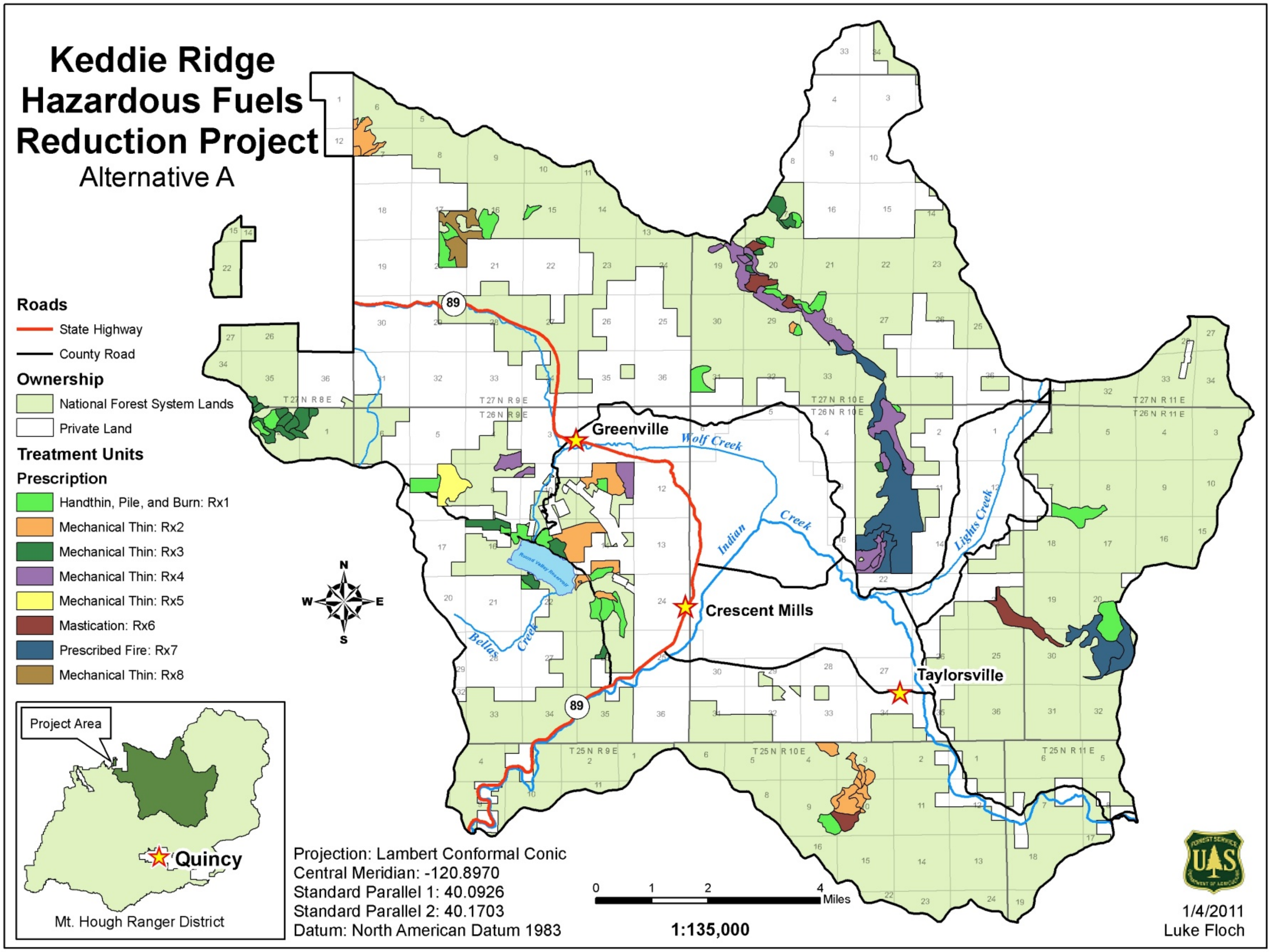


Figure 2 Alternative C Treatment Unit Map with Silvicultural Prescriptions

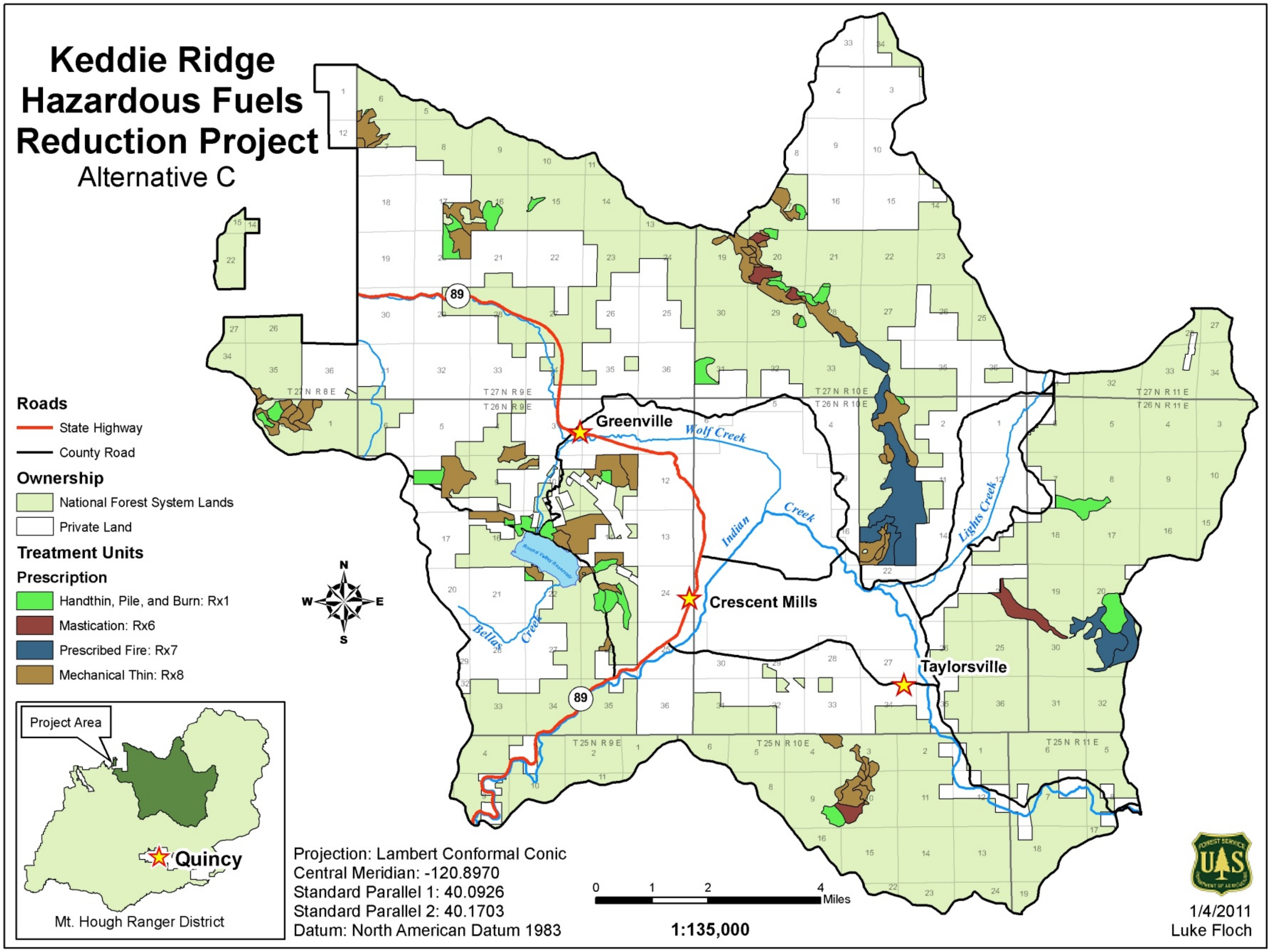


Figure 3 Alternative D Treatment Unit Map with Silvicultural Prescriptions

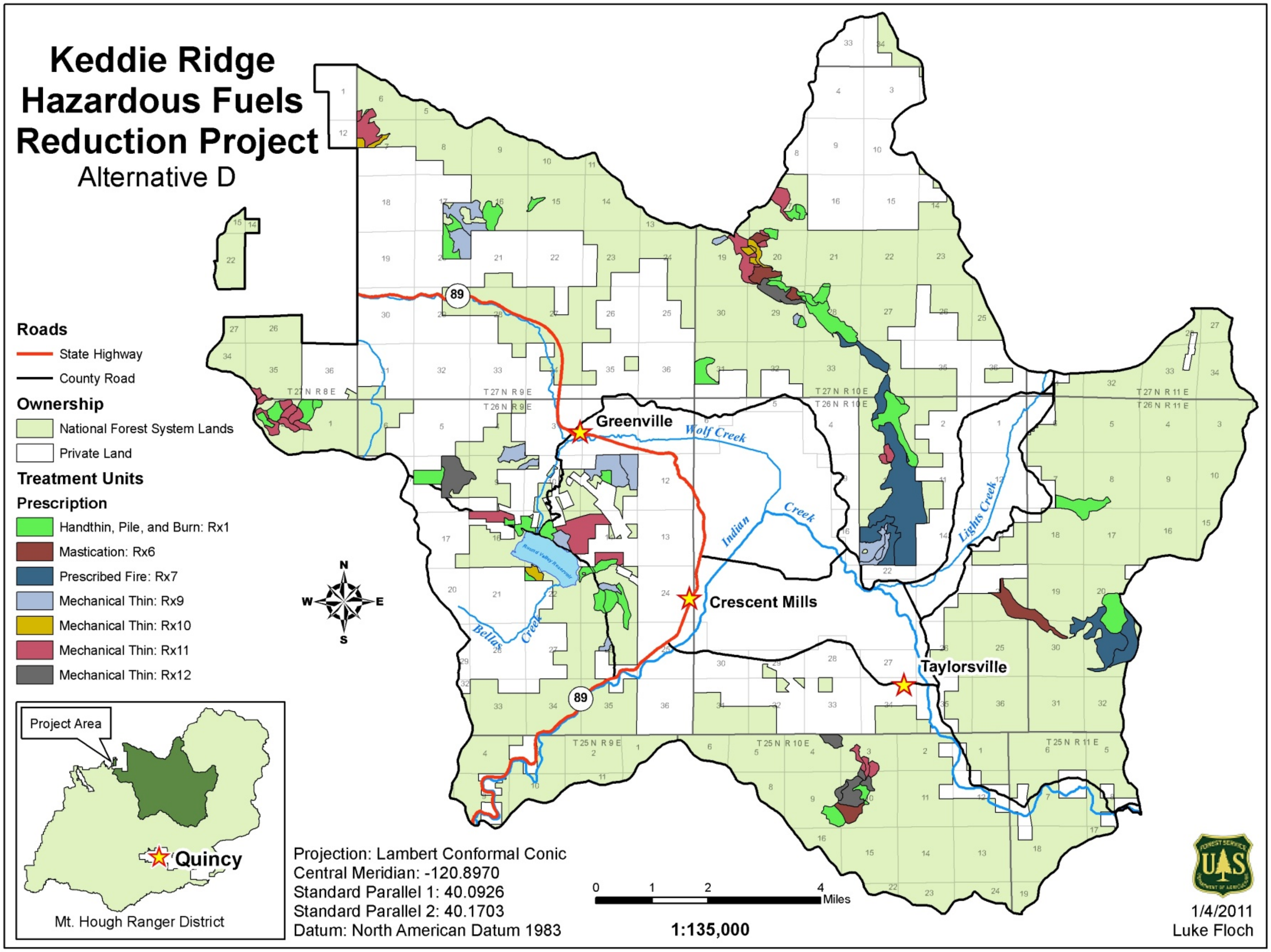


Figure 4 Alternative E Treatment Unit Map with Silvicultural Prescriptions

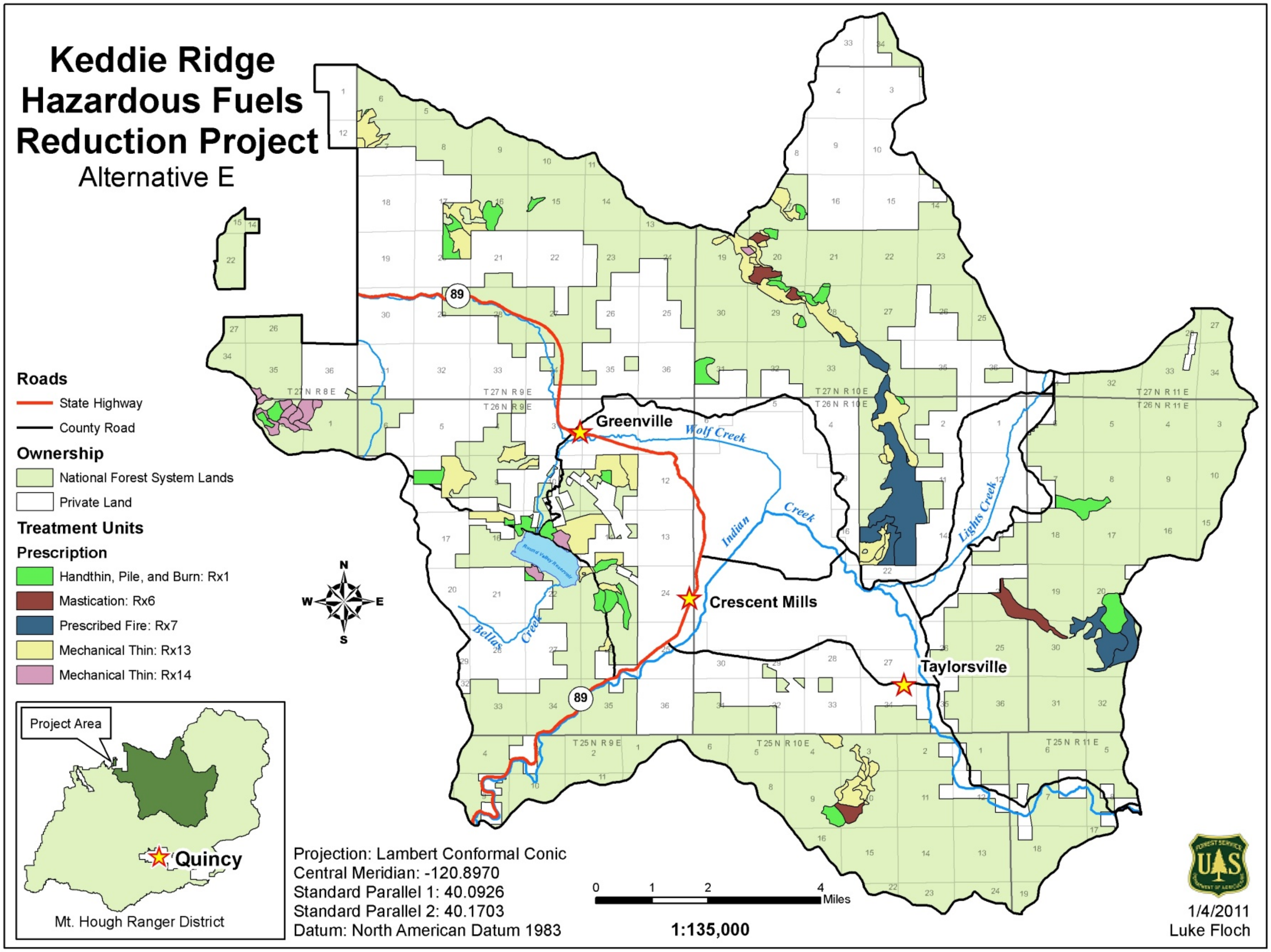


Figure 5 Alternatives A and D Treatment Unit Map with Noxious Weed Prescriptions

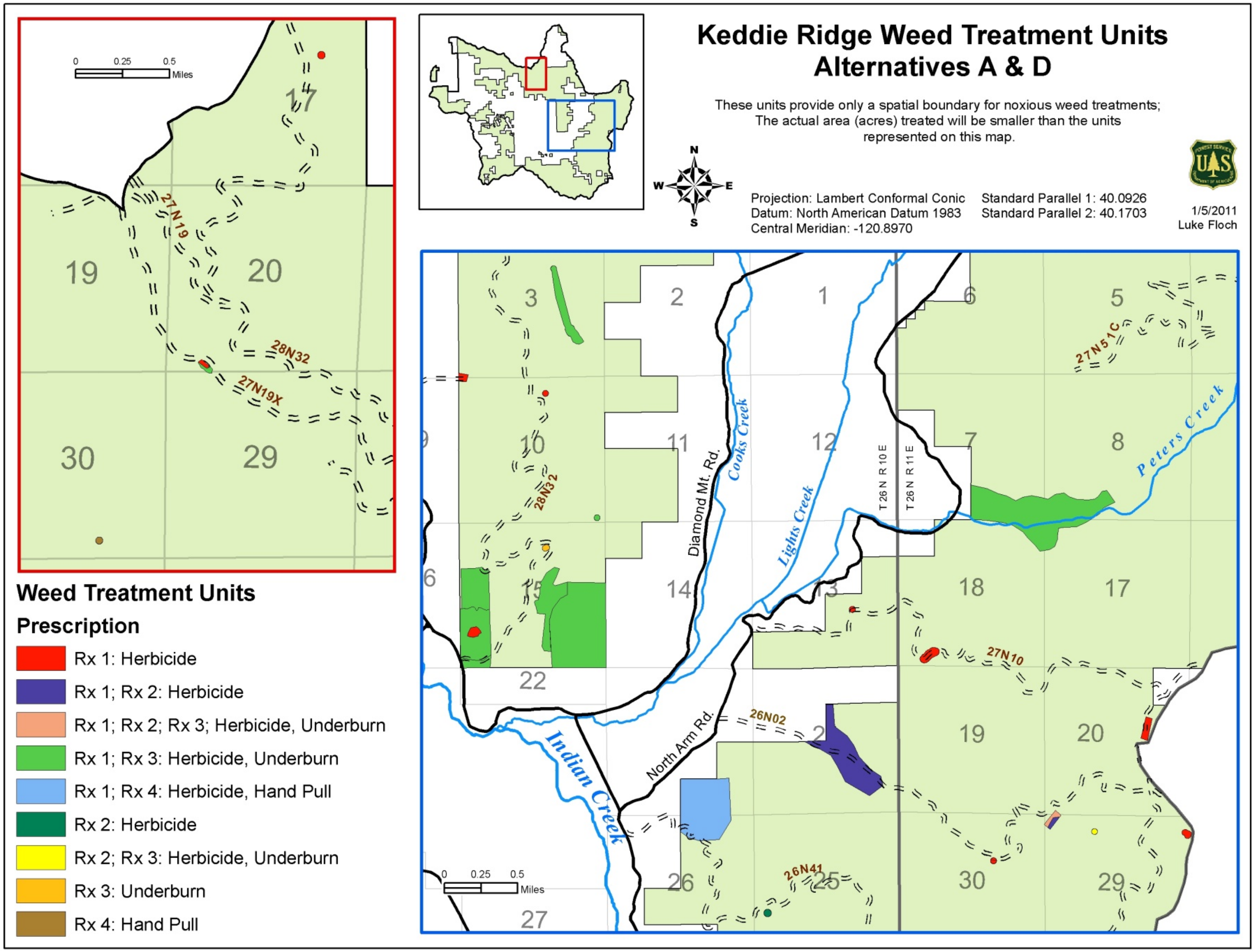


Figure 6 Alternatives C and E Treatment Unit Map with Noxious Weed Prescriptions

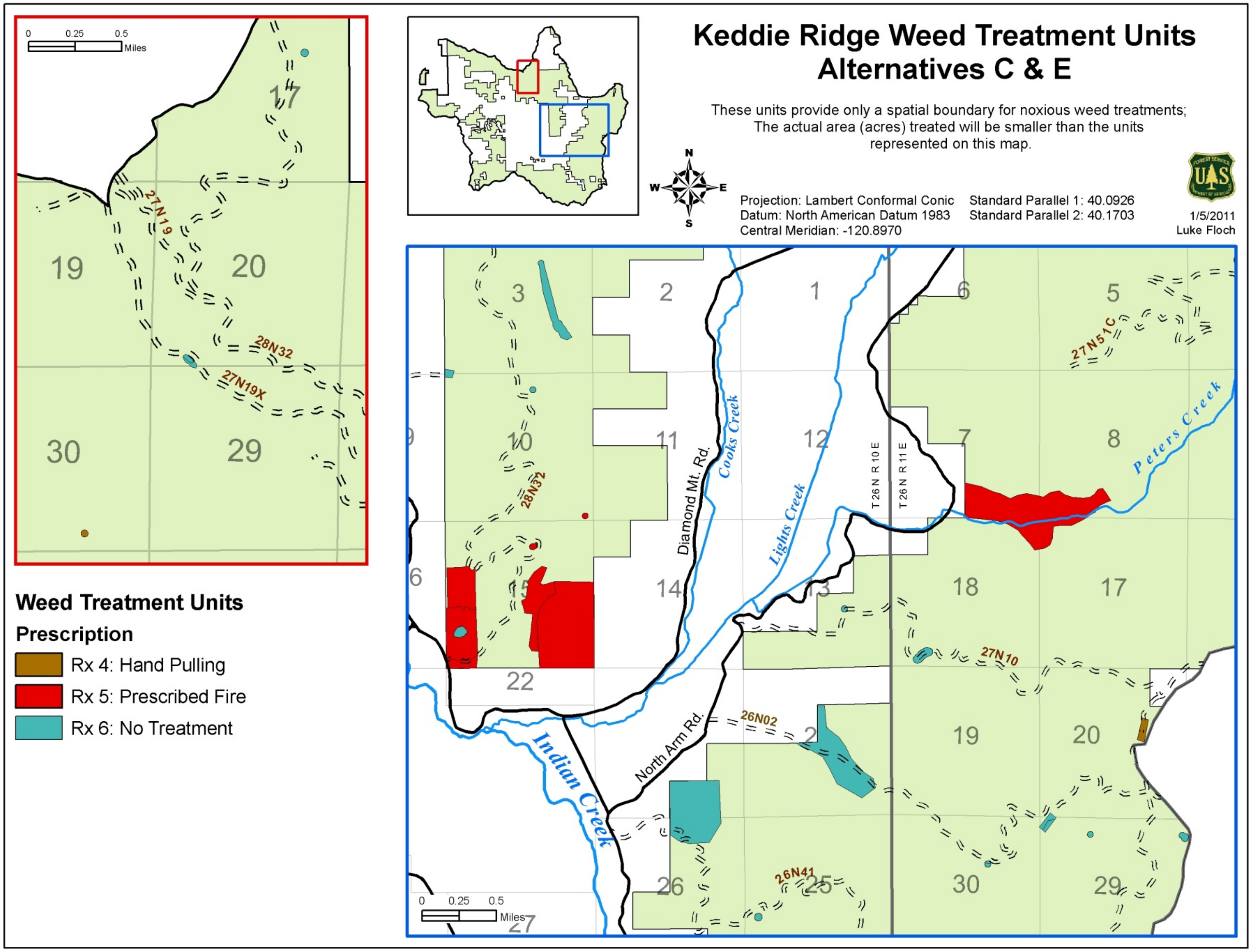


Table 1. Silvicultural Prescription Codes

Alternative	Prescription (Rx)	General Description
A, C, D, & E	**Rx 1**	Hand thin, pile, and burn trees less than 8 inches DBH and underburn.
A	**Rx 2**	Mechanical Thin to 30-40 percent canopy closure (CC), retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 3**	Mechanical Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 4**	Mechanical Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 5M/5D thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; in RHCAs thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 5**	Mechanical Thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches and underburn.
A, C, D, & E	**Rx 6**	Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.
A, C, D, & E	**Rx 7**	Low to moderate intensity prescribed underburn.
A	**Rx 8**	Mechanical Thin to 30-50 percent CC, generally retain live trees greater than or equal to 12 inches DBH, and underburn.
C	**Rx 8**	Mechanical Thin to 30-50 percent CC, retain live trees greater than or equal to 12 inches DBH, in RHCAs, thin to 50 percent CC retain live trees greater than or equal to 12 inches DBH; and underburn. Spring underburn in areas infested with noxious weeds.
D	**Rx 9**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 15 percent of the stand untreated; and underburn.
D	**Rx 10**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn.
D	**Rx 11**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D thin to 50 percent CC retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn.
D	**Rx 12**	Mechanical Thin to minimum 50 percent CC while only reducing the CC less than 10 percent, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn.
E	**Rx 13**	Mechanical Thin to 30-40 percent CC, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40 percent CC, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
E	**Rx 14**	Mechanical Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; except in RHCAs thin to 50 percent CC, generally live retain trees greater than or equal to 20 inches DBH; and underburn.

Table 2. Noxious Weed Prescription Codes

Alternative	Prescription (Rx)	General Description
A & D	**NW Rx 1**	Apply the herbicide aminopyralid to noxious weed infestations that are greater than 15 feet from the water's edge. Utilize a backpack sprayer for selective application and apply at rates between 0.05 and 0.11 acid equivalent (a.e.) pounds per acre (lbs/acre).
A & D	**NW Rx 2**	Apply the herbicide glyphosate to noxious weed infestations that are (a) between 0-15 feet from the water's edge or (b) within sites dominated by hoary cress. Utilize a wick applicator (in riparian areas) or a backpack sprayer for selective application and apply at rates between 1 and 3 acid equivalent (a.e.) pounds per acre (lbs/acre).
A, B, C, & D	**NW Rx 3**	Implement prescribed fire treatments in the spring and early summer. If necessary, utilze flaming with a propane torch to control weed infestations in areas that are a high risk for spread (i.e. on roads or landings).
A, B, C, & D	**NW Rx 4**	Implement manual control methods such as hand pulling, digging, cutting (i.e. with a weed whacker), or covering. Use manual methods to treat small infestations (i.e. less than 50 plants) and as a follow-up method to herbicide or prescribed fire treatments.

Appendix C

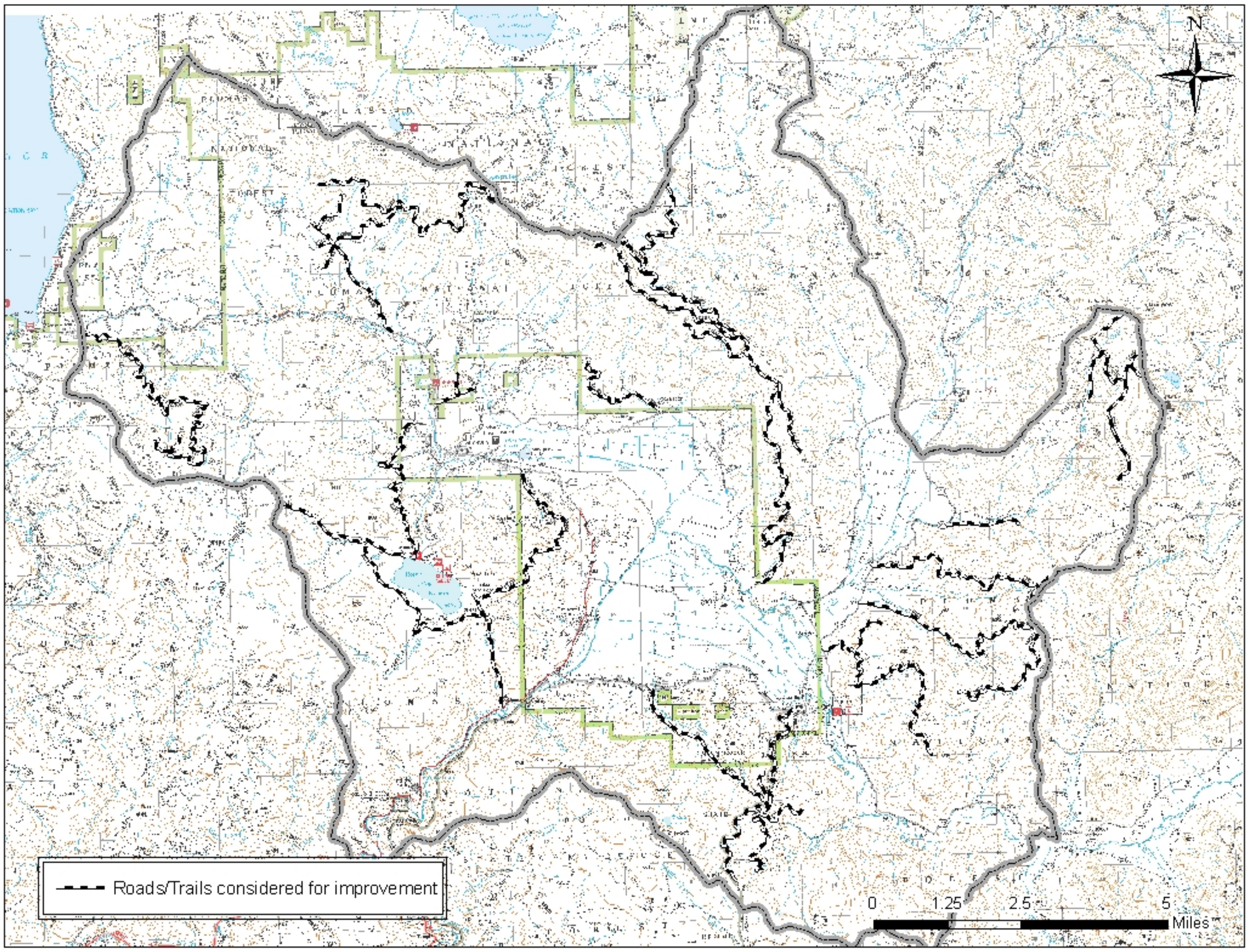
National Forest System Roads Proposed for Improvements

This appendix includes a list of National Forest System (NFS) roads and a few segments of Plumas County roads that are proposed for improvement activities under alternatives A, D, and E.

NFS roads that are to remain open but those that are improperly constructed or unmaintained will be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism will be considered for 100 miles of road within the watershed analysis area. Rolling dips, which will likely be the most commonly prescribed road improvement for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate will vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips will be determined by district watershed staff in order to sufficiently disconnect the road's drainage system from surrounding stream channels. Refer to Figure 1 for a visual display of National Forest System and Plumas County roads proposed for improvement activities.

25N29	27N16	27N92B3
25N29A	27N18	27N92B4
26N02	27N19	27N94
26N19	27N19X	28N32
26N21	27N19XA	28N32B
26N21D	27N22	28N38
26N41	27N24	PC201
26N42	27N38	PC204
26N49Y	27N43	PC208
26N55	27N43B	9M56
26N71Y	27N51A	9M56A
26N81	27N80	10M32
27N08	27N92	10M36
27N10	27N92B	

Figure 1 National Forest System and Plumas County roads proposed for improvement activities.



Appendix D

Economic Analysis

This appendix includes an economic analysis for each action alternative (A, C, D, and E). Each table breaks across two pages. This appendix relates to the information, data, effects, and conclusions presented in the Economic and Social Environment section of the Keddie Ridge Hazardous Fuels Reduction Project Environmental Impact Statement.

Table 1. Alternative A Economic Analysis

			ECONOMIC ANALYSIS					05/10/11
			Keddie Ridge Project Alternative A					15:25:07
NET VALUE			Total Acres =	2882	acres			
VALUE - Prescription			Total Acres =	1016				
PP/SP >24" sawtimber *	0.0%	125	mbf X	$255	/mbf			$31,875
WF >24" sawtimber *	0.0%	288	mbf X	$130	/mbf			$37,440
DF >24"sawtimber *	0.0%	109	mbf X	$215	/mbf			$23,435
IC >24" sawtimber *	0.0%	16	mbf X	$340	/mbf			$5,440
ALL 10"-23.9" sawtimber **	0.0%	2877	mbf X	$157	/mbf			$451,689
		3415		3.4				
VALUE - Low Volume			Total Acres =	1582	acres			
PP/SP >24" sawtimber *	0.0%	7	mbf X	$255	/mbf			$1,785
WF >24" sawtimber *	0.0%	554	mbf X	$130	/mbf			$72,020
DF >24"sawtimber *	0.0%	6	mbf X	$215	/mbf			$1,290
IC >24" sawtimber *	0.0%	1	mbf X	$340	/mbf			$292
ALL 10"-23.9" sawtimber **	0.0%	2413	mbf X	$157	/mbf			$378,841
		2981		1.9				
VALUE - GROUPS			Total Acres =	284	acres			
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	284	mbf X	$130	/mbf			$36,920
DF >24"sawtimber *	0.0%	483	mbf X	$215	/mbf			$103,802
IC >24" sawtimber *	0.0%	85	mbf X	$340	/mbf			$28,968
ALL 10"-23.9" sawtimber **	0.0%	3124	mbf X	$157	/mbf			$490,468
	0%	3976	mbf	14.0				
Sawlog Total Value		**10372**	**mbf**					**$1,664,265**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		6981	mbf X	$25	/mbf =			$174,525
Low volume Tractor cost		2653	mbf X	$50	/mbf =			$132,648
Skyline cost		410	mbf X	$70	/mbf			$28,686
		328	mbf X	$120	/mbf =			$39,347
# of sawtimber loads		10372	mbf /		4.5	mbf/truck =	2305	
Haul Cost		4	hours/trip X	$10	/hour X	2305	trips	$92,200
Surface Replacement-sawtimber		10372	mbf X			$15.00	/mbf =	$155,578
Subsoiling Costs		51	acres X	$230	/acre			$11,730
BD Costs		10372	mbf X	$0.30	/mbf			$3,112
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		10372	mbf X			$12.56	/mbf	$130,301
Yield Tax		$1,664,265	X	2.9%				$48,264
Scaling Sawtimber		2305	trips	$17	/trip			$39,185
Sawlog Total Cost								**$1,013,975**
Sawlog Net Value								**$650,290**
						PERCENT ABOVE VALUE		39%

Table 1 continues on page 3.

Biomass Value when Removed		2598	acres X	6.8	tons/acre X	$22.00	/ton =	$388,661
Biomass Value when Removed		284	acres X	12.0	tons/acre X	$22.00	/ton =	$74,976
Biomass Total Value								**$463,637**
	Acres		Total Biomass	21	1000 tons	7.3	AverageTons/Ac	
		Average Unit Size =		50	acres	$30	/acre	
		Contract Length =		5	years	($119)	/acre	
		Months Operation =		5	months	$30	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$298	/acre +	($60)	/acre)	$686,274
		2882	Biomass Acres					
# of biomass loads	2882	acres X	7.3	tons/acre	25	tons/truck =	843	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	843	trips	$429,930
Surface Replacement-biomass		2882	acres X	7.3	tons/acre X	2.14	/ton =	$45,159
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	7.3	tons/acre X	$0.20	/ton	$4,215
Scaling Biomass		843	trips	$8	/trip			$6,744
Biomass Total Cost								**$1,172,322**
Biomass Net Value								**($708,686)**
						PERCENT ABOVE VALUE		**-153%**
Combined (Sawlog & Biomass) Total Value								**$2,127,902**
Combined (Sawlog & Biomass) Total Cost								**$2,186,298**
Combined (Sawlog & Biomass) Net Value								**($58,396)**
						PERCENT ABOVE VALUE		**-3%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$5,555,070**
Harvest & Biomass (Employment)							159	
TOTAL FULL TIME JOBS								**189**
TOTAL EMPLOYEE-RELATED INCOME								**$6,799,620**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 2. Alternative C Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative C						15:41:33
Net Value			Total Acres =	2882	acres			
VALUE - Low Volume			Total Acres =	2882				
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	0	mbf X	$130	/mbf			$0
DF >24"sawtimber *	0.0%	0	mbf X	$215	/mbf			$0
IC >24" sawtimber *	0.0%	0	mbf X	$340	/mbf			$0
ALL 10"-23.9" sawtimber **	0.0%	231	mbf X	$157	/mbf			$36,267
		231		0.1				
Sawlog Total Value		**231**	**mbf**					**$36,267**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		0	mbf X	$0	/mbf =			$0
Low volume Tractor cost		210	mbf X	$50	/mbf =			$10,511
Skyline cost		21	mbf X	$120	/mbf =			$2,495
# of sawtimber loads		231	mbf /		4.5	mbf/truck =	51	
Haul Cost		4	hours/trip X	$10	/hour X	51	trips	$2,040
Surface Replacement-sawtimber		231	mbf X			$15.00	/mbf =	$3,465
Subsoiling Costs		38	acres X	$230	/acre			$8,740
BD Costs		231	mbf X	$0.30	/mbf			$69
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		231	mbf X			$12.00	/mbf	$2,772
Yield Tax		$36,267	X	2.9%				$1,052
Scaling Sawtimber		51	trips	$17	/trip			$867
Sawlog Total Cost								**$190,410**
Sawlog Net Value								**($154,143)**
						PERCENT ABOVE VALUE		**-425%**

Table 2 continues on page 5.

Biomass Value when Removed		2613	acres X	8.2	tons/acre X	$22.00	/ton =	$471,385
Biomass Value when Removed		269	acres X	8.2	tons/acre X	$22.00	/ton =	$48,528
Biomass Total Value								**$519,913**
	Acres		Total Biomass	24	1000 tons	8.2	AverageTons/Ac	
		Average Unit Size =		50	acres	$31	/acre	
		Contract Length =		5	years	($123)	/acre	
		Months Operation =		5	months	$31	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$307	/acre +	($61)	/acre)	$708,972
		2882	Biomass Acres					
# of biomass loads	2882	acres X	8.2	tons/acre	25	tons/truck =	945	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	945	trips	$481,950
Surface Replacement-biomass		2882	acres X	8.2	tons/acre X	2.14	/ton =	$50,641
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	8.2	tons/acre X	$0.20	/ton	$4,726
Scaling Biomass		945	trips	$8	/trip			$7,560
Biomass Total Cost								**$1,253,849**
Biomass Net Value								**($733,937)**
						PERCENT ABOVE VALUE		**-141%**
Combined (Sawlog & Biomass) Total Value								**$556,180**
Combined (Sawlog & Biomass) Total Cost								**$1,444,260**
Combined (Sawlog & Biomass) Net Value								**($888,080)**
						PERCENT ABOVE VALUE		**-160%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acres	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$6,384,754**
Harvest & Biomass (Employment)							31	
TOTAL FULL TIME JOBS								**60**
TOTAL EMPLOYEE-RELATED INCOME								**$2,161,134**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.
Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 3. Alternative D Economic Analysis

			ECONOMIC ANALYSIS					05/10/11
			Keddie Ridge Project Alternative D					15:41:33
NET VALUE			Total Acres =	2375	acres			
VALUE - Low Volume			Total Acres =	2375				
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	0	mbf X	$130	/mbf			$0
DF >24"sawtimber *	0.0%	0	mbf X	$215	/mbf			$0
IC >24" sawtimber *	0.0%	0	mbf X	$340	/mbf			$0
ALL 10"-23.9" sawtimber **	0.0%	1900	mbf X	$157	/mbf			$298,300
		1900		0.8				
Sawlog Total Value		**1900**	**mbf**					**$298,300**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		0	mbf X	$0	/mbf =			$0
Low volume Tractor cost		1729	mbf X	$50	/mbf =			$86,450
Skyline cost		171	mbf X	$120	/mbf =			$20,520
# of sawtimber loads		1900	mbf /		4.5	mbf/truck =	422	
Haul Cost		4	hours/trip X	$10	/hour X	422	trips	$16,880
Surface Replacement-sawtimber		1900	mbf X			$15.00	/mbf =	$28,500
Subsoiling Costs		38	acres X	$230	/acre			$8,740
BD Costs		1900	mbf X	$0.30	/mbf			$570
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		1900	mbf X			$12.00	/mbf	$22,800
Yield Tax		$298,300	X	2.9%				$8,651
Scaling Sawtimber		422	trips	$17	/trip			$7,174
Sawlog Total Cost								**$358,685**
Sawlog Net Value								**($60,385)**
						PERCENT ABOVE VALUE		**-20%**

Table 3 continues on page 7.

Biomass Value when Removed		2375	acres X	5.4	tons/acre X	$22.00	/ton =	$282,150
Biomass Total Value								**$282,150**
	Acres		Total Biomass	13	1000 tons	5.4	AverageTons/Ac	
		Average Unit Size =		50	acres	$28	/acre	
		Contract Length =		5	years	($112)	/acre	
		Months Operation =		5	months	$28	/acre	
Acres of 3-9" biomass-tractor		2375	acres X (	$279	/acre +	($56)	/acre)	$529,625
		2375	Biomass Acres					
# of biomass loads	2375	acres X	5.4	tons/acre	25	tons/truck =	513	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	513	trips	$261,630
Surface Replacement-biomass		2375	acres X	5.4	tons/acre X	2.14	/ton =	$27,482
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2375	acres X	5.4	tons/acre X	$0.20	/ton	$2,565
Scaling Biomass		513	trips	$8	/trip			$4,104
Biomass Total Cost								**$825,406**
Biomass Net Value								**($543,256)**
						PERCENT ABOVE VALUE		-193%
Combined (Sawlog & Biomass) Total Value								**$580,450**
Combined (Sawlog & Biomass) Total Cost								**$1,184,091**
Combined (Sawlog & Biomass) Net Value								**($603,641)**
						PERCENT ABOVE VALUE		-104%
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1765	acres X	$800	/acre	120	15	$1,412,000
Underburn with handline		1456	acres X	$350	/acre	400	8	$509,600
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,100,100
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,060,551
TOTAL NON-HARVEST COST								**$5,334,351**
TOTAL PROJECT VALUE								**-$5,937,991**
Harvest & Biomass (Employment)							40	
TOTAL FULL TIME JOBS								**66**
TOTAL EMPLOYEE-RELATED INCOME								**$2,374,303**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.
Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 4. Alternative E Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative E						15:44:51
NET VALUE			Total Acres =	2882	acres			
VALUE - Prescription			Total Acres =	1012				
PP/SP >24" sawtimber *	0.0%	205	mbf X	$255	/mbf			$52,275
WF >24" sawtimber *	0.0%	80	mbf X	$130	/mbf			$10,400
DF >24"sawtimber *	0.0%	158	40	$215	/mbf			$33,970
IC >24" sawtimber *	0.0%	39	mbf X	$340	/mbf			$13,260
ALL 10"-23.9" sawtimber **	0.0%	3386	mbf X	$157	/mbf			$531,602
		3868		3.8				
VALUE - Low Volume			Total Acres =	1545	acres			
PP/SP >24" sawtimber *	0.0%	267	mbf X	$255	/mbf			$68,085
WF >24" sawtimber *	0.0%	1023	mbf X	$130	/mbf			$132,990
DF >24"sawtimber *	0.0%	216	mbf X	$215	/mbf			$46,440
IC >24" sawtimber *	0.0%	56	mbf X	$340	/mbf			$19,040
ALL 10"-23.9" sawtimber **	0.0%	4805	mbf X	$157	/mbf			$754,385
		6367		4.1				
VALUE - GROUPS			Total Acres =	326	acres			
PP/SP >24" sawtimber *	0.0%	685	mbf X	$255	/mbf			$174,675
WF >24" sawtimber *	0.0%	326	mbf X	$130	/mbf			$42,380
DF >24"sawtimber *	0.0%	554	mbf X	$215	/mbf			$119,110
IC >24" sawtimber *	0.0%	98	mbf X	$340	/mbf			$33,320
ALL 10"-23.9" sawtimber **	0.0%	3586	mbf X	$157	/mbf			$563,002
	0%	5249	mbf	16.1				
Sawlog Total Value		**15484**	**mbf**					**$2,594,934**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		3513	mbf X	$25	/mbf =			$87,825
Low volume Tractor cost		5667	mbf X	$50	/mbf =			$283,350
Skyline cost		355	mbf X	$70	/mbf			$24,850
		700	mbf X	$120	/mbf =			$84,044
# of sawtimber loads		15484	mbf /		4.5	mbf/truck =	3441	
Haul Cost		4	hours/trip X	$10	/hour X	3441	trips	$137,640
Surface Replacement-sawtimber		15484	mbf X			$15.00	/mbf =	$232,260
Subsoiling Costs		51	acres X	$230	/acre			$11,730
BD Costs		15484	mbf X	$0.30	/mbf			$4,645
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		15484	mbf X			$13.08	/mbf	$202,488
Yield Tax		$2,594,934	X	2.9%				$75,253
Scaling Sawtimber		3441	trips	$17	/trip			$58,497
Sawlog Total Cost								**$1,360,983**
Sawlog Net Value								**$1,233,951**
						PERCENT ABOVE VALUE		**48%**

Table 4 continues on page 9.

Biomass Value when Removed		2598	acres X	5.8	tons/acre X	$22.00	/ton =	$331,505
Biomass Value when Removed		284	acres X	12.0	tons/acre X	$22.00	/ton =	$74,976
Biomass Total Value								**$406,481**
	Acres		Total Biomass	18	1000 tons	6.4	AverageTons/Ac	
		Average Unit Size =		50	acres	$29	/acre	
		Contract Length =		5	years	($116)	/acre	
		Months Operation =		5	months	$29	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$289	/acre +	($58)	/acre)	$666,058
		2882	Biomass Acres					
# of biomass loads	2882	acres X	6.4	tons/acre	25	tons/truck =	739	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	739	trips	$376,890
Surface Replacement-biomass		2882	acres X	6.4	tons/acre X	2.14	/ton =	$39,592
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	6.4	tons/acre X	$0.20	/ton	$3,695
Scaling Biomass		739	trips	$8	/trip			$5,912
Biomass Total Cost								**$1,092,148**
Biomass Net Value								**($685,667)**
						PERCENT ABOVE VALUE		**-169%**
Combined (Sawlog & Biomass) Total Value								**$3,001,415**
Combined (Sawlog & Biomass) Total Cost								**$2,453,130**
Combined (Sawlog & Biomass) Net Value								**$548,285**
						PERCENT ABOVE VALUE		**18%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$4,948,390**
Harvest & Biomass (Employment)							223	
TOTAL FULL TIME JOBS								**252**
TOTAL EMPLOYEE-RELATED INCOME								**$9,082,986**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Appendix E

Riparian Management Objectives

Riparian Management Objectives (RMOs)

Riparian and aquatic ecosystems on the PNF are managed to achieve specific riparian management objectives (RMOs) as presented in the Scientific Assessment Team (SAT) Guidelines (USDA 1999a, 1999b, appendix L). Each of the 10 RMOs is listed below followed by a discussion that includes current conditions, project design features, and standard management requirements that achieve those objectives. In general, the Herger-Feinstein Quincy Library Group Forest Recovery Act Environmental Impact Statement (HFQLG EIS) guidelines prohibit activities within the riparian habitat conservation areas (RHCAs) unless they are specifically designed to improve the structure and function of the RHCA and benefit fish habitat. The RMOs that specifically relate to hydrology and apply to the construction of the DFPZ and operations within RHCAs are presented below.

Under all action alternatives, treatments are proposed within RHCAs. In the discussion that follows, most references to treatment within RHCAs are specifically limited to those treatment areas. No RHCA treatment would occur under the no-action alternative.

The objective of the RHCA treatment within fuel reduction units is to reduce the potential for adverse impacts from high intensity wildfire. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). RHCA treatments would provide a safer and more effective fire suppression environment, improve forest health, and provide for a more sustainable vegetation condition consistent with protecting and maintaining riparian habitat values.

Field surveys were conducted to verify the existence and condition of the streams and sensitive areas within units that would be mechanically treated. All RHCA treatments are designed to minimize erosion from soil disturbance, and to protect and maintain the riparian vegetation that provides bank stabilization and habitat for wildlife, fish, and other aquatic species. The ten RMOs for the Keddie Ridge Project are discussed below.

1. **Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems. Water quality parameters that apply to these ecosystems include timing and character of temperature, sediment, and nutrients.**

In addition to reducing the risk of high-intensity fires, thinning RHCAs will allow the ecosystem within this corridor to return to a more productive historic condition. Competition between codominant and dominant trees will decrease and growth rates will increase while mortality rates decline. Over time, the crowns of larger more fire resistant trees will fill in, increasing the necessary shade for temperature regulation. Where available, canopy cover will be maintained at 50 percent on average, however this may range between 60 percent along fish bearing streams and 40 percent for non-fish bearing streams.

Proposed thinning, which will occur throughout most RHCAs within the Keddie Ridge Project area, would encourage forest growth and consequently hasten the development of larger trees and the subsequent recruitment of large woody debris to stream channels. Large woody debris is generally scarce throughout the RHCAs due to a shortage of old growth vegetation.

No change is expected in dissolved oxygen levels as they relate to treatments, since any newly created slash would be removed from stream courses within 48 hours after deposition. Thinning RHCAs adjacent to low velocity streams may actually improve oxygen levels by decreasing nutrient overloading from materials decaying in place. Most of the streams within the Keddie Ridge project are low to moderate velocity. In streams, the consumption of organic matter by bacteria requires oxygen. The amount of oxygen required for bacterial decomposition is the biochemical oxygen demand (BOD), a commonly used measure of water quality. When consumption by bacteria is high, oxygen levels in the water are reduced. Low oxygen levels can stress fish and other aquatic organisms.

Where RHCAs would be mechanically treated, ground based equipment would only be used on slopes less than or equal to 25 percent. RHCAs within sensitive areas (e.g., springs, seeps, and wetlands) could be entered with ground-based equipment 25 feet from the edge of the riparian area or wet perimeter of the soil, whichever is greatest. On slopes less than 15 percent, all mechanical equipment would be excluded from within 100 feet (horizontal) of fish bearing streams, 50 feet of perennial and intermittent streams, and 25 feet of ephemeral streams. On slopes between 15 and 25 percent, all mechanical equipment would be excluded from within 150 feet of fish bearing streams, 100 feet of perennial and intermittent streams, and 50 feet of ephemeral streams. In addition, skid trails will be located at angles to stream channels that minimize erosion into the channel, and skidders will only be allowed to back in to the outer RHCA on these skid trails. The mechanical exclusion zones would serve as effective filters and absorptive zones for potential sediment originating from upslope treatment areas. Removal of vegetation within these equipment exclusion zones would be allowed on a site-by-site basis to protect the sensitive attributes associated with the riparian area.

No ignition of prescribed fire would occur within 50 horizontal feet of all streams; however, backing fire would be allowed into these areas. Based on BMP evaluations completed on the Plumas National Forest over the last three years, short-term sediment delivery to streams after prescribed burning has not occurred (USDA 2007, 2008, 2009). Scorched conifers often drop needles following low or moderate severity fires. This needle cast provides ground cover that can help reduce rill and interrill erosion and sediment delivery (Pannkuk and Robichaud 2003). Additionally, the greater long-term benefit of treating these RHCAs is the potential protection from stand-replacing wildfire.

2. **Maintain or restore the stream channel integrity, channel processes, and sediment regime under which the riparian and aquatic ecosystems developed. Elements of the sediment regime include the timing, volume, and character of sediment input and transport.**

In addition to reducing the risk for high-intensity fires, thinning of the RHCA will allow the ecosystem within this corridor to return to a more stable historic condition. Historically, woody debris was a combination of large and intermediate logs. Debris jams; especially log-jams of small material will alter the natural sediment regime. Small material decays at a faster rate; entrainment of sediments is short term as decaying logs fail. During peak events small material cannot hold sediment in place. Released sediment will affect timing, volume and character of the input. End cutting and scouring within the channel caused by heavy loading of dead and downed material will influence the timing, volume, and character of sediment being transported through the system.

Equipment induced ground disturbances would be limited because only slopes less than or equal to 25 percent would be entered with ground-based equipment. Retention of large diameter snags within RHCAs would occur. The green-line characteristics would not be compromised in RHCAs and thus stream channel and sensitive area integrity would be maintained.

3. Maintain or restore instream flows to support desired riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.

Thinning of the RHCAs will reduce transpiration rates and interception. If transpiration rates are reduced, runoff and groundwater infiltration could increase. Interception of rain, snow and the subsequent evaporation also effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will initially reduce the interception of precipitation and possibly provide more water to meadows and wetlands. Runoff may increase in the short term. This additional water may increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

The main objective is to reduce the potential for stand-replacing wildfires and thus retain the RHCA's desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges. In-stream flows would be assessed during equipment operations, with respect to drafting requirements.

Within RHCAs, the green-line would be preserved and remain unaffected by harvest activities. Within the immediate riparian areas, physical effects derived from in-channel large woody debris (LWD) would be sustained, as no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers, and the snag retention standards for channel morphology, channel function, and bank stability. The effect of water diversion on future instream flow is beyond the scope of this project.

4. Maintain or restore the natural timing and variability of the water table in meadows and wetlands.

Transpiration is a function of the density, root mass, and size of existing vegetation. If transpiration is reduced, then runoff and groundwater infiltration could increase. Interception of rain, snow and the subsequent evaporation also effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will provide more water to sensitive areas. This additional water will increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

Activities proposed in the project area are not expected to negatively impact the timing and variability of water tables within sensitive areas. All RHCA sensitive riparian areas (springs, seeps, and wetlands) would be protected by a 25 foot buffer from the edge of the riparian area or wet perimeter of the soil, whichever is greatest and through the implementation of applicable best management practices (BMPs).

Wet areas and green-lines would not be entered. Ground based equipment would only be allowed on stable soils and slopes less than or equal to 25 percent within RHCAs.

5. Maintain or restore the diversity and productive nature of native and desired non-native plant communities in the riparian zone.

Riparian areas are often hotspots for plant diversity. Riparian vegetation plays a vital role in the ecological functioning of the riparian system, which includes: stabilization of stream banks; delivery of large woody debris to stream habitats; filtration of sediment; and maintenance of water quality. Thinning of conifers and retention of all hardwood species within RHCAs would reduce competition and improve diversity of existing riparian plant communities.

If left untreated, noxious weeds can pose a significant threat to riparian communities due to their ability to displace native species. Implementation of standard management requirements (appendix H) and the proposed noxious weed treatment measures would reduce the risk of noxious weed spread into riparian areas and protect the diversity and productivity of riparian plant communities.

6. Maintain or restore riparian vegetation to provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems.

Large woody material adds structure to stream channels and creates fish habitat. It also provides habitat for small burrowing mammals and acts as a reservoir, retaining moisture throughout the summer months. A host of organisms, including several nonvascular plants, are supported by this moisture. Another benefit of large woody material is that it provides nutrients to the ecosystem over the long term through the process of decomposition.

Thinning of the RHCAs will return the project area to a level of stocking and health that is more closely related to its historic condition. While volume of wood per acre may be near historic levels, it is in the boles of numerous small, less fire resistant trees. Removing the ladder fuels will encourage the stand to return to its natural state and greatly enhance it by reducing competition for nutrients, water, and sunlight.

Within treatment units, the objective is to reduce overstocked fuel concentrations. Thinning within RHCAs may release the residual conifers and deciduous trees thus stimulating growth. LWD retention standards would be implemented. Potential recruitment of LWD into the stream channel would be retained and enhanced. There would be a reduction in the potential for stand-replacing wildfire, and therefore a greater potential of LWD retention. Prescribed underburns would occur during times of elevated moisture, resulting in less LWD consumption.

7. Maintain or restore habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian plant communities.

Living plants provide shade; their root systems promote bank stability and create macro-pores that promote high infiltration rates. The decomposition of plant material contributes to soil matter and composition, provides nutrients, and water storage. During thinning of the RHCAs, measures will be applied to insure ground cover levels are maintained and vegetation providing stability to channel banks is not removed. Riparian zones (specifically the green-line) and wetted soil perimeters would be identified and protected from harvest activities. Impacts would further be reduced by the application of BMPs and standard management requirements.

Vertebrates that influence the viability of riparian plant communities include pocket gophers, moles, butterflies, bats, and ground squirrels. Thinning of RHCAs will have no detrimental effect on these species, thus their populations will continue to maintain the viability of riparian plant communities.

Invertebrates contribute to the viability of riparian plant communities in many ways. They act as decomposers, shredding dead plant materials and they burrow into woody debris. Invertebrates recycle nutrients and influence soil structure. They improve soil porosity and improve oxygen-penetrating capabilities. To maintain invertebrate populations, compaction and ground cover disturbance will be minimized through the use of low ground pressure equipment and the subsoiling of the final 200 foot approaches of skid trails to landings.

Noxious weed species have the potential to affect riparian plant species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard et al. 2000). Implementation of standard management requirements (appendix H) and the proposed noxious weed treatment measures would reduce the risk of noxious weed spread into riparian areas and protect the viability of riparian plant communities.

8. Maintain or restore riparian vegetation to provide adequate summer and winter thermal regulation within the riparian and aquatic zones.

Summer and winter thermal regulation within the riparian and aquatic zones would be maintained. Canopy cover within the RHCAs would be maintained at 50 percent on average, however this may range between 60 percent along fish bearing streams and 40 percent for non-fish bearing streams. Activities proposed in the project area are not expected to negatively impact riparian vegetation. Group selection harvest would only occur outside of RHCAs.

9. Maintain or restore riparian vegetation to help achieve rates of surface erosion, bank erosion, and channel migration characteristics of those under which the desired communities developed.

Riparian vegetation will be protected and maintained while coniferous ladder fuels are thinned. Except at designated crossings, stream banks will not be impacted by equipment and it is not expected that bank erosion will be accelerated either by equipment or by the implementation of the project. Thinning RHCAs will promote diversity and increase production of riparian communities. Burning of isolated burn piles outside of the RHCA will remove groundcover at point locations, but soil moving from these points will be trapped by ground cover immediately adjacent to the piles.

The maximum erosion hazard for soil types within the project area, ranging from moderate to very high, suggests that channel development has occurred under significant sediment loads. The riparian green-line of stream channels would not be impacted by the proposed management activities, and natural recovery processes within the streamside area would help moderate stream temperatures. Riparian vegetation may increase in vigor due to increased water yield and available sunlight. Within the immediate riparian areas, the physical effects derived from in-channel LWD would be retained, as no natural debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers.

10. Maintain and restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within that specific geo-climatic ecoregion.

Maintenance of the riparian habitat necessary to foster unique genetic fish stocks will be accomplished by prescribing treatments that will maintain bank stability, ground cover, and sufficient shade. In all the action alternatives, no mechanical treatment will occur in the first 100 feet of all fish bearing streams.

It is expected that all action alternatives would not substantially impact fish populations within or downstream of the Keddie Ridge Project area. The best opportunity to improve channel conditions and fish habitat along these streams is through the proposed road decommissioning and the improvement of road drainage systems that are adjacent to stream channels.

Appendix F

Past, Present, and Reasonably Forseeable Future Projects

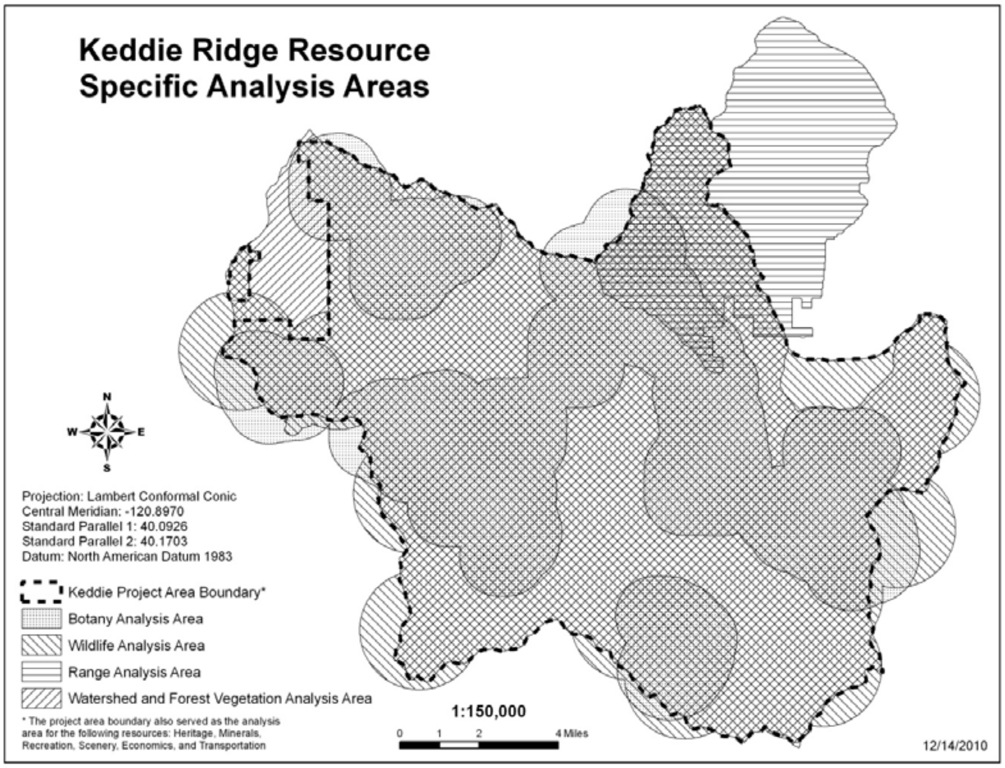
Introduction

The past, present, and reasonably foreseeable future activities described in this appendix are activities and natural events known to have already happened, are currently happening, or likely to happen within the analysis area boundaries for this project. This appendix lists projects and activities that are within one or more of the cumulative effects analysis areas for the following resources: vegetation, wildlife, botanical resources, watershed, cultural resources, range, recreation, and minerals. Analysis area boundaries are depicted in Figure 1.

This analysis relies on current environmental conditions as a proxy for the impacts of past actions—the reason is to understand the contribution of past actions to the cumulative effects of the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) proposed action and alternatives. The current conditions reflect the aggregate impact of prior human actions that have affected the environment and might contribute to cumulative effects.

This appendix is organized by past, present and ongoing, and future projects. The projects and activities associated with specific resources are listed under each category. The sections below exhibit past vegetation management projects on public and private lands; wildfires; watershed improvement projects; wildlife projects; herbicide treatments; and present, on-going, and reasonably foreseeable future projects. For each resource area, the scale and boundaries for the cumulative effects analysis vary—these are described in Chapter 3 of the Keddie Ridge Hazardous Fuels Reduction Project Environmental Impact Statement.

Figure 1 Resource Specific Analysis Areas for the Keddie Ridge Project



Past Projects

Past Forest Service Vegetation Management Projects

A total of 38,595 acres, were treated between 1980 and 2010. Table 1 lists the acres of past vegetation management actions on public lands, by activity.

Table 1. Forest Service Vegetation Management Activities Between 1980 and 2010 that Occurred in the Four Resource Analysis Areas (Combined) for the Keddie Ridge Project.

Activity	1980	1984	1989	1990	1991	1992	1993	1994	1995	1996	1997
Broadcast Burning - Covers a majority of the unit											
Burning of Piled Material	2				6						
Certification-Planted					78						
Clearcutting											
Commercial Thin				33							
Cull						60					
Mastication/Mowing											
Mechanical /Physical											
Natural Recovery											
Piling of Fuels, Hand or Machine											
Plant Trees				201	112						
Precommercial Thin				600	648						20
Sanitation (salvage)[1]				1526	6862	1612	2333	3		4390	5664
Sanitation Cut				640							
Site preparation for natural regeneration					17			51			
Site Preparation for Planting - Mechanical							16				
Site Preparation for Planting - Other					11						
Special Cut											
Stocking Survey		9		480		57	20	17			
Thinning for Hazardous Fuels Reduction											
Underburn - Low Intensity (Majority of Unit)											
Overstory Removal Cut (from advanced regeneration)			84	306	156	34	113				
Seed-tree Seed Cut (with and without leave trees)		3									
Single-tree Selection Cut			4	25	25	57	96	84	74		
Salvage Cut											
Stand Clearcut				10			6				
Total	2	13	89	3821	7914	1819	2583	154	74	4390	5683

[1] Note: Acres shown for sanitation (salvage) represent the extent of the sale area. Under sanitation harvests, dead and dying trees are removed; however trees are not harvested from every acre. In fact, the majority of acres within the sale area boundary were not subject to any harvesting.

Activity	1998	2000	2001	2003	2004	2005	2006	2007	2008	2010	Total
Broadcast Burning - Covers a majority of the unit							1072				1072
Burning of Piled Material				50							58
Certification-Planted											78
Clearcutting						4					4
Commercial Thin				1113	1729			274			3150
Cull											60
Mastication/Mowing					32	23					54
Mechanical /Physical								0	3		3
Natural Recovery										2559	2559
Piling of Fuels, Hand or Machine				540				18	25		583
Plant Trees											313
Precommercial Thin			1228	110							2606
Sanitation (salvage)[1]											22388
Sanitation Cut											640
Site preparation for natural regeneration											68
Site Preparation for Planting - Mechanical											16
Site Preparation for Planting - Other											11
Special Cut		1332									1332
Stocking Survey	276										859
Thinning for Hazardous Fuels Reduction								56			56
Underburn - Low Intensity (Majority of Unit)				64	585		610				1260
Overstory Removal Cut (from advanced regeneration)											693
Seed-tree Seed Cut (with and without leave trees)											3
Single-tree Selection Cut											366
Salvage Cut					347						347
Stand Clearcut											16
Total	276	1332	1228	1878	2694	26	1682	348	28	2559	38595

[1] Note: Acres shown for sanitation (salvage) represent the extent of the sale area for the given project. Under sanitation harvests, dead and dying trees are removed; however trees are not harvested from every acre. In fact the majority of acres within the sale area boundary were not subject to any harvesting.

Past Vegetation Management Projects on Private Lands

Timber Harvest Plans (THPs) were collected from California Department of Forestry and Fire Protection in April 2010. All THPs that overlap with the Keddie Ridge Project area and watershed analysis area were hand digitized into a Geographic Information System (GIS) shapefile with specific THP data attached in the attribute table. These THPs and attribute data (activity and year) are displayed in Table 2 below.

Table 2. Private Harvest Activities in Watershed Analysis Area.

	Acres of Activity by Treatment Year											
Activity	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2008**	**Grand Total**
All Product	110					51						161
Clearcut	119											119
Commercial Thin	85	149		150		191					558	1133
Fuel Break	37											37
Group Selection	188						13					201
Sanitation /Salvage	23					18					1614	1655
Shelterwood Removal cut	202	150		17	41			88	37			534
Shelterwood Step								15				15
Selection	243	4696	1467			4293	790	1821	1675	922		15908
Seed tree		316		10	18							344
Grand Total	1007	5310	1467	176	59	4555	803	1924	1712	922	2172	20108

Past Wildfires

Year	Acres	Cause
1979	3128	Miscellaneous
1981	17	Lightning
1986	30	Lightning
1987	17	Lightning
1990	29	Lightning
1996	1156	Equipment
2004	27	Equipment
2006	34	Lightning
2007	64960	----------------

Past Watershed Improvement Projects

Year	Project	Activity Description
1989-present	Wolf Creek (phase I, II, III, IV, Wolf Cr-Dunham, North	Bank stabilization and native revegetation.

	Canyon Creek (tributary to Wolf)) Restoration	

Past Recreation, Lands, and Minerals Projects

Year	Project	Activity Description
1977-1993	Calgom Mine	Exploratory drilling began in 1977. The first commercial scale Plan of Operations was approved in 1984. The mine operated continuously from November 1984 to November 1989. Active operations terminated in early 1990. Calgom Mining did some of the reclamation, but not all. The Forest Service secured their bond in 1992. The mine restoration plan was signed in May of 1993 and restoration work was completed in the summer of 1993.
2000	Ephesian Mine	Approved mining plan of operation for a lode mine.
1874-1999	Soda Rock Mine	Placer mining and removal of travertine for building stone took place in the area intermittently for over 100 years. In 1999, the Soda Rock Special Interest Area was withdrawn from mineral entry.
2005	Iron Dyke AML	Abandoned mine closure in Taylorsville area.

Past Wildlife Projects

Year	Project	Activity Description
1979-1995	Wildlife Guzzlers	Approximately 18 guzzlers installed in analysis area to improve water distribution/availability to wildlife.
1980-2007	Wood Duck Nest Boxes	Numerous wood duck boxes installed along shore of Round Valley Reservoir by USFS, boy scouts, California Waterfowl Association.
1984	Will Fire Road Closure	Closed 6 acres of road within the Will Fire burn.
1985	Keddie Ridge Road Closure	Closed 2.3 miles (5.5 acres) of road on Keddie Ridge.
1986	Beardsley Grade Broadcast Burn	Broadcast burned 110 acres of brush/oak using helitorch to improve deer winter range.
1988	Road Seeding	Seeded 1 acre of closed skid trail on Beardsley Grade for deer winter range improvement.
1989	Jura Burn	Broadcast burned 125 acres of brush/oak using helitorch to improve deer winter range.
2008	Genesee Oak	12 acres of black oak was thinned and over-mature silktassel brush was cut to improve deer winter range.

Past Herbicide Treatments

The California Department of Pesticide Regulation (DPR) requires farmers and other users of agricultural pesticides to submit site-specific documentation of all pesticide applications; these include applications to parks, golf courses, cemeteries, rangelands, forest lands, pastures, and along roadsides and railroad rights-of-way. The primary exceptions to these reporting requirements are home-and-garden use and most industrial and institutional uses (California DPR 2009). The total amount of reported glyphosate use within Keddie Ridge Project analysis areas is listed in Table 3 and Table 4 below. There was no reported use of aminopyralid or borax within any of the analysis areas.

Table 3. Total Pounds of Glyphosate (Isopropylamine Salt) Recorded within the Four Keddie Analysis Areas Between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Sub-watershed	Reported Use				
	2004	2005	2006	2007	2008
Crescent Mills			42		
Mountain Meadows					135
Upper Cooks Creek					1202
Upper Wolf Creek	34				
Total	34	0	42	0	1336

Table 4. Total Acres Treated with Glyphosate (Isopropylamine Salt) within the Four Keddie Analysis Areas between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Sub-watershed	Reported Use				
	2004	2005	2006	2007	2008
Crescent Mills			22		
Mountain Meadows					11
Upper Cooks Creek					245
Upper Wolf Creek	78				
Total	78		22		256

Present and Ongoing Projects

Present and Ongoing Vegetation Management Projects within the Keddie Ridge Project Analysis Area

Maidu Stewardship Project

Project treatments include approximately 550 acres of commercial and non-commercial thinning to improve oak habitat; 405 acres of commercial and non-commercial thinning to reduce hazardous fuels, approximately 325 acres of habitat enhancement for culturally important plants. Treatments were initiated in 2006 and are expected to continue through 2016.

Canyon Dam Fuel Reduction and Forest Health Project

Approximately 147 acres of hand thinning, piling, and burning was initiated in fall of 2010 and will be completed over 3-5 years. In addition, 488 acres of mechanical thinning will be initiated in 2011 and completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.

Empire Vegetation Management Project

Project treatments include approximately 121 acres of group selection timber harvest; 430 acres of defensible fuel profile

	zones (DFPZs) mechanical thinning; 133 acres of individual tree selection mechanical thinning; and 144 acres of mastication. These treatments will be initiated in fall 2010 and would be completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.
Moonlight Fire Recovery and Restoration Project	Project treatments include approximately 330 acres of post-fire roadside hazard tree removal and 70 acres of post-fire salvage harvest. These treatments are ongoing and anticipated to be complete by the end of 2011.
Plumas Fire Safe Council Projects	These projects are located on private lands surrounding homes and are currently being implemented by the Plumas Fire Safe Council. Project treatments include approximately 294 acres of a combination of handthinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.
Natural Resource Conservations Service (NRCS) Projects	These projects are located on private lands and are currently being implemented by the Natural Resource Conservation Service (NRCS). Project treatments include approximately 1,960 acres of a combination of handthinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Present and Ongoing Recreation, Lands, and Minerals Projects

Recreation activities	Recreation activities include camping, hiking, horseback riding, mountain biking, road biking, off-highway vehicle riding, boating, swimming, fishing, snowmobiling, cross country skiing, hunting and rock hounding, picnicking, and driving for pleasure.
Recreation site maintenance	There are 2 developed recreation sites within the project area, Greenville Campground and Round Valley Picnic Area. There are also 2 dispersed recreation sites, Indian Falls and Sandy Beach, which are commonly used for swimming. Greenville Campground is operated under a special use permit with Indian Valley Community Services District. Developed and dispersed recreation site maintenance requires hazard tree removal, graffiti removal, pile burning, replacing signs, fire rings, tables and older

	buildings.
Trail maintenance	There are approximately 7 miles of non-motorized system trails within the Keddie Ridge Project area. These trails include Peters Creek Trail, Round Valley Interpretive Trail, and Indian Falls Interpretive Trail. Annual trail maintenance work consists of clearing hazard trees, maintaining water bars or other erosion control devices, and maintaining or replacing signs. Work is typically accomplished by force account crews and volunteers.
Personal use woodcutting permits	Woodcutting for personal use is permitted throughout the Plumas National Forest. The following is a list of the number of personal use permits sold on the Mt. Hough Ranger District for the past nine years. It is estimated that 20 percent of the District's permit sales are within the Keddie Ridge Project area. 2001 – 2,577 permits for an estimated 5,154 cords 2002 – 2,461 permits for an estimated 4,922cords 2003 – 2,154 permits for an estimated 4,308 cords 2004 – 1,940 permits for an estimated 3,880 cords 2005 – 2,475 permits for an estimated 4,950 cords 2006 – 2,651 permits for an estimated 5,302 cords 2007 – 2,499 permits for an estimated 4,988 cords 2008 – 3,096 permits for an estimated 6,192 cords 2009 - 2,871 permits for an estimated 5,742 cords
Commercial use woodcutting permits	The following is a list of the number of commercial permits sold on the Mt. Hough Ranger District for the past 9 years. It is estimated that 20 percent of the District's commercial permit sales are within the Keddie Ridge Project area. 2001 – 160 permits for an estimated 2,400 cords 2002 – 135 permits for an estimated 2,025 cords 2003 – 92 permits for an estimated 1,380 cords 2004 – 83 permits for an estimated 1,245 cords 2005 – 255 permits for an estimated 3,825 cords 2006 – 329 permits for an estimated 4,935 cords 2007 – 372 permits for an estimated 5,580 cords 2008 – 774 permits for an estimated 9,000 cords 2009 – 1,609 permits for an estimated 16,000 cords
Christmas tree permits	The following is a list of the number of Christmas tree permits sold on the Mt. Hough Ranger District for the past 9 years. It is estimated that 25

percent of the Mt. Hough Ranger District's permit sales are within the Keddie Ridge Project area.

2001 – 2,062 permits
2002 – 2,348 permits
2003 – 2,499 permits
2004 – 2,282 permits
2005 – 2,320 permits
2006 – 2,047 permits
2007 – 2,364 permits
2008 – 2,136 permits
2009 – 1,736 permits

Abandoned mines

Two identified abandoned mineshafts exist within the project area. Open shafts may pose a direct hazard to forest users, Forest Service personnel, and Forest Service contractors.

Active mining claims

There are approximately 168 active mining claims in the project area. The Mt. Hough Ranger district currently administers 3 active plans of operation and 4 notices of intent for those active claims.

Special uses

There are 39 special uses that occur in the project area. These permitted uses include 3 road easements, 4 power lines, 1 railroad right-of-way, 11 waterlines, 1 telephone line, 1 barn, 1 private residence, 2 irrigation ditch permits, 1 transfer station permit, 2 livestock areas, 1 natural resource monitoring permit, 1 weather station, 1 weather modification device, 1 storage yard, 2 industrial microwaves, 1 reservoir, 1 stream gauge station, 1 private mobile radio service, 1 commercial radio service, 1 campground concession permit, 1 group use permit, and 2 recreation events. These forest uses require maintenance of the permitted area by permitees which may include activities such as hazard tree removal, brush removal, road maintenance, and replacement of improvements.

Present and Ongoing Grazing Activities

Allotment	Number of Acres	Acres within Analysis Area	Status		
			Status/Kind	Number	Season
Lights Creek	29,929	611	Active	24 Pair 'On' 16 pair 'Off'	6/1-9/1
Taylor Lake	26,920	235	Vacant		

Present and Ongoing Botany Projects

Webber's Milkvetch (*Astragalus webberi*) Habitat Improvement Project	This project is located approximately 0.3 miles south of Taylorsville and is adjacent to National Forest System (NFS) road 23N59. It includes treatment of 7.5 acres of NFS land using a combination of hand thinning, piling, pile burning, and prescribed fire to enhance habitat for Webber's milkvetch, a Region 5 Sensitive plant species.
Noxious Weed Mechanical Treatment Project	As a part of this project, 10 yellow starthistle infestations, covering approximately 1.8 acres, are treated on an ongoing basis within the Keddie Ridge Project analysis area. Treatments consist of hand pulling and cutting with a string trimmer (i.e. weed whacker).

Present and Ongoing Herbicide Treatments

No herbicide treatments are currently being conducted on NFS lands within the Keddie Ridge Project area. For an estimate of use on private lands, refer to Table 3 and Table 4, which describe past pesticide application within the Keddie Ridge Project analysis areas.

Future Projects

Future Fuels and Vegetation Management Projects within the Keddie Ridge Analysis Area

Year	Project	Activity Description
2013	Belden HFQLG Project	Project Treatments include: Approximately 605 acres of DFPZ treatments, 105 acres of area thinning treatments, and potentially 81 acres of group selection.
2011	Keddie Ridge Roadside and Deck Salvage Sale	This project proposes to remove three decks on NFS roads 27N19 and 27N19X created during the Moonlight Fire of 2007. Additionally, this project would remove roadside hazards along nine miles of NFS roads 28N32, 27N19, and 27N19X.

Fuel Treatment Maintenance within the Keddie Ridge Project Area

Defensible fuel profile zone (DFPZ) maintenance would be a reasonable and foreseeable future activity occurring within the Keddie Ridge Project area. These activities would be designed to maintain low surface fuel loadings, low fire intensities, and low rates of spread. This discussion incorporates, by reference, the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement and Final Supplemental EIS (HFQLG FSEIS) (USDA 2003a). Surface fuel reduction activities would include, but not be limited to, prescribed fire, mastication, and piling and burning of residual slash.

The Forest Service would assess the need for DFPZ maintenance treatments approximately five to ten years after the completion of the initial mechanical and fire activities proposed in the Keddie Ridge Project. It is expected that maintenance activities would take place as described in the HFQLG FSEIS, and further refined by on-site information available at the time that maintenance would be proposed. Specific decisions about maintenance for a particular DFPZ (timing of entry and treatment method) would be made at the time DFPZ maintenance is deemed necessary (HFQLG FSEIS, page 3).

Future Watershed Treatments

Year	Future Activities	Activity Description
2010	Wolf Creek Restoration	Bank stabilization and native revegetation.

Future Grazing Activities

A Plumas National Forest Range NEPA (National Environmental Policy Act) Strategy and Implementation Plan was signed by the Forest Supervisor on December 16, 2005. Through plan implementation, the Forest will analyze and document range NEPA projects on all active allotments. The Lights Creek Allotment is currently scheduled for analysis in 2016. No range improvements are anticipated in the meantime. End of season use monitoring (meadow use, riparian shrub use, and stream bank alteration) is done each year.

Future Recreation, Lands, and Minerals Projects

Year	Future Activities	Activity Description
2010	OHV Route Designation	The Plumas National Forest Motorized Travel Management Project Final Environmental Impact Statement and Record of Decision was completed and signed in fall of 2010. This decision added 234 miles of trails to the existing National Forest Transportation System, creating a total of 4,482 total miles of road and trail access on the Forest. Of that total, 4,118 are available for passenger car use; 4,383 are available for 4-Wheel Drive use; 3,802 are available for unlicensed All Terrain Vehicles (ATV) use; 3,855 are available for unlicensed motorcycle use; and, 4,482 are available for licensed motorcycle use. A subset (165 miles) of the 234 miles will be available immediately while the remainder will need maintenance before they can be used. Implementation of the Plumas National Forest Motorized Travel Management Project will occur when appeals have been resolved and a Motor Vehicle Use Map (MVUM) is published. The MVUM will show which routes are available for use by what types of vehicles and any seasonal restrictions that may apply. Pending any appeal resolution, the MVUM is expected in the spring of 2011. Until then, the current Forest Order regulating use remains in place.
2011	Recreation	The Mt. Hough Ranger District has plans to complete a Cycle 10 Resource Advisory Committee (RAC) Project in Greenville Campground by replacing a restroom with a sweet smelling vault toilet.
2011	Lands	The Plumas National Forest is seeking a permittee to operate and maintain the Greenville shooting range under a special use permit. The forest has started verbal negotiations with a potential permittee.
2011	Abandoned mine land reclamation	The Plumas National Forest will likely be reclaiming the two know abandoned mine sites within the project area during 2011.

2010	Mining Plans of Operation	There are six potential future mining operations that would be approved through a mining plan of operation.

Appendix G

Public Comments, Response to Public Comments, and Issue Identification

Introduction

The following appendix displays Forest Service responses to public comments on the Keddie Ridge Hazardous Fuels Reduction Project released January 2011. This appendix includes (1) a table listing the name and location of the commenter, the organization or entity each commenter represents, and the date of the comment; and (2) a narrative of comment statements and Forest Service responses organized by resource as presented in chapter 3. The comment statement is taken from the comment letters. A complete copy of each letter received is available at the Mt. Hough Ranger District, Quincy, CA, and are hereby incorporated by reference.

Summary of Public Comments Received

The Responsible Official received verbal or written comments from three agencies and seven organizations. The Council on Environmental Quality (CEQ) regulation 40 CFR 1503.4 states that an agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses are to:

1. **Modify alternatives including the proposed action,**
2. **Develop and evaluate alternatives not previously given serious consideration by the agency,**
3. **Supplement, improve, or modify its analyses,**
4. **Make factual corrections,**
5. **Explain why comments do not warrant further agency response.**

Table 1. Commenters on the Keddie Ridge Hazardous Fuels Reduction Project Draft Environmental Impact Statement.

Comment ID Code	Commenter	Entity	Location	Date of Comment
Agencies				
EPA	Kathleen Goforth	U.S. Environmental Protection Agency	San Francisco, CA	3/18/2011
DOI	Patricia Sanderson Port	U.S. Department of the Interior	Oakland, CA	3/21/2011
Stewart	Frank Stewart	QLG Counties' Forester	Chico, CA	3/16/2011
Organizations				
SPI	Tom Downing	Sierra Pacific Industries	Quincy, CA	3/21/2011
AFRC	Bill Wickman	American Forest Resource Council	Quincy, CA	3/8/2011
SFL	Karina Silvas-Bellanca and Craig Thomas (Thomas and Silvas-Bellanca)	Sierra Forest Legacy	Sacramento, CA	3/3/2011
FL	Craig Thomas, Karina Silvas-Bellanca, Darca Morgan, and Pat Gallagher (Thomas et al.)	Forest Legacy	Sacramento, CA	3/21/2011
JMP	Chad Hanson	John Muir Project	Cedar Ridge, CA	3/21/2011
PCERC	Bill Wickman et al.	Plumas County Economic Recovery Committee	Quincy, CA	3/18/2011
PC	John Sheehan	Plumas Corporation	Quincy, CA	3/21/2011

Responses to Public Comments

Below are comments and responses on the Keddie Ridge Hazardous Fuels Reduction Project Draft Environmental Impact Statement released in January 2011. These comments are sorted by comment number in order of appearance under chapter 3 "Affected Environmental and Environmental Consequences (FVFFAQ – Forest Vegetation, Fuels, Fire, and Air Quality; WL – Wildlife: Terrestrial and Aquatic; WT – Watershed (Soils and Hydrology); B – Botanical Resources; E – Economic and Social Environment; AD/S – Alternative Development/Selection).

Forest Vegetation, Fuels, Fire, and Air Quality (FVFFAQ)

For additional information regarding responses to comments raised during the scoping period, during the DEIS comment period, and after the DEIS comment period, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendices F, G, and H, respectively.

1. **"The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #1 Breakdown of trees removed by diameter class and by species for each unit."** (Thomas and Silvas-Bellanca, SFL, pg. 1)

Response: Please refer to the Final Environmental Impact Statement (FEIS), Chapter 1, Purpose and Need for desired conditions for fuels reduction and forest health. Please refer to the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators and Environmental Consequences section including comparison of alternatives for a discussion on the measurement indicators used to analyze alternatives effects and effectiveness in meeting desired conditions in terms of forest structure and composition, landscape heterogeneity, and fuels and fire behavior. In addition please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendices A and C for existing pre-treatment and residual post-treatment conditions. Breakdown of trees and species removed are a poor indicator of whether desired conditions or concepts within the GTR are met because this focuses on what is being removed, not what conditions are left after the treatment. Post-treatment stand conditions are far more applicable to how well desired conditions are met. The FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences section provides a discussion of post-treatment stand conditions with regards to the measurement indicators. The FEIS, Appendix A, Tables 2, 4, 6, and 8 also display more unit specific post treatment stand conditions and ranges in conditions after treatment for each alternative. In addition, during the comment period, FVS outputs for each stand and prescription were provided showing number of trees per acre by diameter class both before and after treatments. Lastly the FEIS, Appendix D, Economic Analysis section provides a relative estimate of volume of harvested trees by species both greater than 24 inches in diameter and less than 24 inches in diameter by alternative.

2. **"The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #2 Breakdown of slope positions for each prescription and how that corresponds to retention on a per acre basis."** (Thomas and Silvas-Bellanca, SFL, pg. 1)

Response: Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Implementation of Within-stand Level Heterogeneity section. The tree selection guidelines describe how treatment intensity and corresponding reduction in stand density should vary with, among other variables, aspect. This section includes two tables; the first describes the varying amount of aspect for each unit that would receive a mechanical thinning treatment; the second table displays both average and a range in stand level conditions that correspond with maximum and minimum canopy cover retention guidelines in the silvicultural prescription for each unit.

3. **“The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #3 We’d like a more specific description of the snag retention levels in each unit. The discussion of 4-6 snags/acre is contrary to natural (variable) snag production levels in nature that the GTR is striving to replicate. In Scott Stephen’s work in the Sierra Martir, the average snag levels only occurred on 12 percent of the acres in his research acre. Presenting field markers with an average/ac marking requirement creates a homogenous landscape, not a restored, diverse outcome. We are looking for something that supports the notion of heterogeneity in the unit designs.”** (Thomas and Silvas-Bellanca, SFL, pp. 1-2)

Response: Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail, Design Criteria common to all action Alternatives, for snag retention design criteria; the FEIS, Chapter Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Effects common to all action alternatives, Direct and Indirect effects section of timber harvest for effects to snags, and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Implementation of Within-Stand Level Heterogeneity, Tree Selection Guidelines, Item #7 (Snags) section for tree designation guidelines for snags. Proposed treatments would not designate snags for removal unless those snags pose a hazard to infrastructure or treatment operations. The treatments proposed under the Keddie Ridge Project would retain four to six snags per acre (greater than 15 inches in diameter and 20 feet in height) in accordance with the 2004 SNFPA ROD (Table 2, page 69) (USDA 2004b). Incidental removal of snags may occur for operability and safety; however guidelines set forth in the Pacific Southwest and Plumas National Forest Product Theft Detection and Investigation Plan would be used to ensure that operability, safety, and minimum snag densities would be met. Snags designated as hazards would meet guidance provided in the Plumas National Forest Hazard Tree Abatement Plan, OSHA regulations governing logging operations (29 CFR 1910.266), and the Forest Service Manual 2450 (Timber Sale Contract Administration) policy.

4. **“Basal area retention levels appear to take the approach that has 150 sq ft BA average across most of the project. Most of the early stand density literature is focused on young, fast growing even-aged stands and does not support a more ecological GTR-220 approach of variable clumping with gaps. Averaging BA and presenting “averaging” in the marking instructions will lead to simplification of stand structure and increased homogeneity…the thing we are trying to avoid. Clumped retention and variable BA retention, particularly around large tree groups (see attached photo) is one of the primary objective in the GTR Dinkey Creek project planning documents we presented to you during scoping. We need to better understand how (and if) these concepts are reflected in the Keddie project. A more specific breakdown of the levels of**

retention that will be provided in groups, pg. 43 of the Forest Vegetation, Fuels, Fire, and Air Quality report elude to various levels of retention in CWHR 4 stands and CWHR 5 stands, but no values are given of these various retention levels." (Thomas and Silvas-Bellanca, SFL, pg. 3: #4)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Effects Analysis Methodology, Measurement Indicators. Basal area is used as a measurement indicator of how well alternatives would or would not meet desired conditions associated with improving forest health. The threshold of 150 square feet per acre provides context and scale to this measurement indicator and is not a design element or design criteria of proposed treatments. The FEIS, Chapter 2 Alternatives, describes alternatives, proposed treatments, silvicultural prescriptions, and design criteria.

The threshold of 150 square feet of basal area per acre, above which density second-growth ponderosa pine stands are considered susceptible to bark beetle-induced mortality, was first suggested by Sartwell (1971) and his subsequent research (Sartwell and Steven 1975, Sartwell and Dolph 1976). Oliver (1995) found that Sartwell's threshold of 150 square feet of basal area per acre "above which density stands are susceptible to attack by bark beetles appears to be a reasonable average value for California."

Landram (2004) used basal area as a metric to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (Where the Keddie Ridge Project is primarily located) the insect risk thinning guides also suggest thinning to 150 square feet of basal area per acre. It is also worth noting that this threshold appears in line with a majority of the reference conditions described for the project area (Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Estimates of forest structure for pine dominated and mixed conifer forests in California and northern Mexico adapted to an active-fire disturbance regime.) Consequently, this metric is used in the analysis to quantify and compare the relative effectiveness of the alternatives and corresponding treatments in meeting desired conditions for forest health.

Using stand level average metrics as a threshold to compare alternatives would not result in "simplification of stand structure and increased homogeneity." As shown in the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Implementing Within-Stand Variability, Tree selection guidelines would be used to enhance heterogeneity and "key off" micro site and wildlife habitat structures. Item # 4c describes basal area guidelines and how basal area retention would vary depending on clump, gap, and matrix locations. In addition, the FEIS Appendix A, tables 2, 4, 6, and 8 display the stand level range of basal areas corresponding to the canopy cover ranges for each prescription by alternative. All proposed treatments would meet basal area retention standards as directed by the SNFPA 2004 ROD, table 2.

5. **The Appendix D-2 suggests 132 mbf of >24" PP and SP are going to be harvested in the project. How is this consistent with ecological restoration that should be targeting the retention of these tree species and sizes?** (Thomas and Silvas-Bellanca, SFL, pg. 3: #5)

Response: Please refer to the FEIS, Appendix D, Economic Analysis, Tables 1through 4. Table 1 estimates that treatments under alternative A could produce 132 mbf of sawlog volume in ponderosa pine and sugar pine trees greater than 24 inches in diameter. Table 4 estimates that treatments under alternative E could produce 1,157 mbf of sawlog volume in ponderosa pine and sugar pine trees greater than 24 inches in diameter. Tables 2 and 3 estimate that no sawlog volume in ponderosa pine and sugar pine trees would be harvested. These volume estimates are based on FVS modeling using simulated prescriptions and due to the uncertainty in modeling estimates, these results are best interpreted in a relative rather than an absolute sense. These tables indicate opportunities to harvest ponderosa pine and/or sugar pine greater than 24 inches do exist within stands in the project area under these prescriptions; however, 1) these opportunities would be much more limited under alternative A than alternative E, and 2) these opportunities would generally be discouraged given the preference to retain these trees to best meet desired conditions.

Under alternative A, these trees could account for approximately 1.3 percent of the total volume to be harvested and could equate to approximately 1 tree every 7 to 181 acres, depending on the stand, whereas under alternative E removal of these trees would increase by nearly 9 times more than alternative A. Under alternative E, these trees could account for approximately 7.5 percent of the total volume to be harvested and could equate to approximately 1 tree every 3 to 5 acres.

In addition, retention of ponderosa and sugar pine greater than 24 inches is preferred to meet desired conditions. While the FVS modeling and economic analysis indicates that given stand conditions, some opportunities to remove these trees exist, the on the ground rationale for designating these trees would follow those few instances described by North et al. (2009), Addendum, page vii.

6. **"In the analysis of Forest Vegetation, Fire, Fuels, and Air Quality our main concern is that the concepts of the GTR-220 are not fully captured by the averaging metrics used to compare Alternatives. Further, the target stand condition although weighted by species reduces BA to 150 ft2/ac on 70 percent of stands treated mechanically (p. 77 DEIS) and does not support the intentions of proposed action to use the concepts of the GTR-220. Comments from Malcolm North on the Keddie project point out that averaging is unlikely to capture heterogeneity. "However much of what historic forests were like and the conditions suggested by GTR 220 are for a high variability in density that SDI averages are unlikely to capture." Averaging SDI also seems to suggest spacing of larger trees, realigning the proposed alternative with the HFQLG alternative. SFL could better understand the intentions of the DEIS if general criteria were presented in the document on how and when larger trees will be thinned with more developed discussion of how this will enhance and improve habitat values and increase fire resiliency. Given the shortage of larger tree-dependent high quality it is hard to understand the emphasis on even spacing, particularly of larger trees."** (Thomas et al., FL, pg. 10)

Response: Please refer to response to comment FVFFAQ #4. The threshold of 150 square feet of basal area is used as a measurement indicator threshold, above which stands may be more susceptible to bark beetle induced mortality. This measurement indicator is used to compare the relative differences of the alternatives in meeting the purpose and need for forest health, it is not used as a design criteria. Desired conditions include heterogeneity and diverse forest structures at multiple scales: at the micro site or within stand variability, at the stand level, and at the landscape level. Such heterogeneity, particularly at the within stand level, may be represented by large ranges within stand conditions; however, there is considerable utility in forest management in describing and comparing average conditions, just as the mean is used in statistics to give context to ranges in variance and determine levels of significance.

Under alternative A, 70 percent of the mechanically treated stands would have average conditions which would be below the threshold of 150 square feet per acre. This indicates that these stands would meet desired conditions for forest health in terms of improving forest resiliency to insect mortality. While forest structure within these stands would be variable with large ranges in canopy cover and basal area, on average, at the stand level, these stands would have densities reduced such that susceptibility to insect mortality would be reduced.

These stand level thresholds do not "suggest spacing of larger trees, realigning the proposed alternative with the HFQLG alternative" or imply homogeneity. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Implementation of within-stand level heterogeneity section. For example, the figure from Terry and Chilingar (1955) under Appendix C, Tree Selection Guidelines, Item #2, displays how a certain canopy cover guideline or threshold may vary by a clumped or even distribution. Likewise with basal area, a quantified average guideline or threshold does not implicitly lead to homogeneity. Distributions depend on implementation of such threshold or guideline, and such conditions may be met while mutually emphasizing concepts of heterogeneity. The Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Implementation of within-stand level heterogeneity section provides direction on how such desired conditions may meet canopy cover and basal area guidelines while enhancing heterogeneity. Tree selection guidelines are provided as general criteria on "how and when larger trees will be thinned with more developed discussion of how this will enhance and improve habitat values and increase fire resiliency."

In addition, please refer to the response to comment FVFFAQ #7.

7. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: We remain concerned about information presented regarding desired stand density and basal area in Chapter 3 (p. 46-47) because while heterogeneity and diversity are mentioned in the treatments there is also a consistent message of retaining very low densities throughout the project area (also noted in comments from Brandon Collins, Appendix B, p. 109). Both these ideas seem to be in conflict throughout the analysis.** (Thomas et al., FL, pg. 10)

Response: Please refer to the response to comment FVFFAQ #6. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions. In the section on reference conditions, two important concepts are highlighted by studies on reference conditions: 1) the heterogeneity of forest structure, and 2) the low stand densities of forest structure. Clearly, the concept of low densities is not mutually exclusive from the concept of heterogeneity. While reference conditions indicate a large ranges in both trees per acre and basal area per acre, these studies also indicate that average stand level densities were low. Collins et al. (2011) serves as a good example of this; while recognizing considerable variation in forest structure, the authors also emphasize the need for creating low density structures. Collins et al. (2011), Figure 3 shows that over 60 percent of the historical lots had derived canopy covers less than 30 percent canopy cover and 96 percent of lots had canopy covers less than 40 percent canopy cover.

Large ranges in forest structure indicates a high degree of heterogeneity that may be characterized by a wide range of dense conditions and open conditions, but low average stand densities indicate that this forest structure – which is thought to be more resilient - had relatively higher proportions of open forest conditions than dense forest conditions. Therein lies the utility and necessity to analyze both the average and the ranges with regards to forest structure and heterogeneity; while the range indicates the wide ranges in conditions, the average puts the relative proportions of these conditions into context.

Particularly in terms of climate change, studies such as Hurteau and North (2009), Stephens et al. (2009), and Battles et al. (2008) all suggest that, for the Sierra Nevada mountains, maintaining lower density stands, on average, dominated by large fire-resistant trees may be better resilient to climate induced trends described for forests with active-fire disturbance regimes.

8. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: While the discussion on stand density and basal area effectively summarizes key research, the DEIS seems that it focuses entirely on stocking levels for ponderosa pine type. We believe that applying a threshold of 150 ft2/acre basal area or assigning an SDI of 270 (60 percent of maximum of 450) is inappropriate for mixed conifer stands. We also note that this approach is not consistent with that taken on other national forests. The values reported in yield tables for mixed-conifer stands are significantly greater than the numbers associated with pine stands. It is inappropriate to consider a stocking threshold of 60 percent as a level to never exceed when the Keddie project and the 2010 HFQLG Status Report monitoring show very low levels of snags and large woody material. Levels so low that the Plumas National Forest is failing to met standards and guidelines for the retention of these important resources. Mortality is a critical part of forest dynamics. It is important to a vast array of wildlife species and plays a critical role in overall forest health. Also, as pointed out in Collins comments, "…the period encompassed by these studies (referring to Appendix A of the Forest Vegetation, Fire, Fuels, and Air Quality specialist report pg. 100-101) corresponds with a fairly narrowly focused view of forest management that did not recognize the role or importance of natural disturbance in maintaining healthy forests." This is a key issue in the development of reference conditions, and it identifies the key question of how valid are these conditions without recognizing the importance of disturbance in the landscape.** (Thomas et al., FL, pg. 10)

Response: Please refer to the response to comments FVFFAQ #6 and #7. Also, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand Density. An SDI of "270 (60 percent of maximum of 450)" was not assigned to mixed conifer stands. The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, discloses that: "The combination of Long and Shaw's work, with first-hand familiarity of the forests within the project area, suggest a fairly conservative maximum SDI of 450, which is the value used for ponderosa pine in this analysis. This is based on the latest research by Long and Shaw (In review) for the pine dominated mixed conifer forests of the Sierra Nevada (Long, personal communication, Shaw, personal communication), and considers the desired low density conditions, and the relatively lower site of the project."

The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, further describes that "For the Keddie Ridge Project, a site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002) as described by Hann and Wang (1990). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. While a maximum stand density index of 450 is used for ponderosa pine in this analysis, the individual stand maximum stand densities are higher – this is driven by the presence of shade tolerant species such as Douglas fir and white fir which have higher maximum stand density indices. This approach is well accepted as a component of the Forest Vegetation Simulator (Dixon 2002) and is consistent with approaches described by the latest silviculture and ecology texts (Tappeneir et al. 2007) and the scientific literature (Hann and Wang 1990, Shaw 2006)."

Using basal area threshold (150 square feet per acre) and stand density threshold (60 percent of maximum SDI) are entirely consistent with Region 5 direction for designing thinning for fuel reduction and forest health objectives (Landram 2004, Blackwell 2004). Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Effects Analysis Methodology, Measurement indicators for Forest Vegetation section. The insect risk thinning guidelines developed specifically for the Plumas NF, Transition Zone (where the Keddie Ridge Project is primarily located) suggest thinning to 150 square feet per acre.

In addition, direction provided by the Regional Forester Jack Blackwell on Conifer Density Management for Multiple Objectives (2004) is to design thinnings to "ensure that that density does not exceed an upper limit (for example: 60 percent of maximum stand density index)" and to "ensure that this level will not be reached again for at least 20 years after thinning."

Furthermore, use of stand density concepts for forest and fuels management, particularly for Sierra Nevada Forests, is widely discussed in scientific literature. Sherlock's 2007 General Technical Report (PSW GTR-203) titled "Integrating Stand Density Management with Fuel Reduction" specifically discusses how stand density management concepts are directly applicable to fuel and forest health treatments for the Sierra Nevada forests and how this is congruent with the 2004 SNFPA ROD and FEIS (USDA 2004a, 2004b). Oliver et al. (1996) in the Sierra Nevada Ecosystem Project devotes an entire chapter to "Density Management of Sierra Forests" which describes "objectives for regulating stand density in the Sierra Nevada forests are ecological as well as managerial." The linkages between silviculture and ecology are widely discussed by Long et al. (2004) for a wide range of forest ecosystems. In addition, threshold relationships between stand density and insect mortality are also widely discussed in the scientific literature for western forests including Fettig et al. (2007), Ferrell (1996), Oliver (1995), Negron and Popp (2004), and Negron et al. (2009).

For a discussion on yield tables, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Reference Conditions section. Dr. Collins' comments points out that the yield tables, which tend to describe denser forest structure were focused on stand normality and "well-stocked stands." These yield tables did not include low density stands because, as Dr. Collin's comments point out, that "the period encompassed by these studies (referring to Appendix A of the Forest Vegetation, Fire, Fuels, and Air Quality specialist report pg. 100-101) corresponds with a fairly narrowly focused view of forest management that did not recognize the role or importance of natural disturbance in maintaining healthy forests." Consequently, his comments highlight that yield tables were biased toward denser stands, yet reference conditions indicate that many stands were, on average, of much lower density under a natural active-fire disturbance regime contrary to the commenter's assertion that yield tables indicate that stands were much denser.

The commenter discusses the concepts of managing for 60 percent of maximum stand density index, and recruitment of large woody debris. With regards to managing for 60 percent of maximum stand density index and large woody debris recruitment. The Keddie Ridge Project does not propose that a "stocking threshold of 60 percent as a level to never exceed". Please see response to comment FVFFAQ #8 and Blackwell (2004). In addition, please see the response to comment FVFFAQ #3 and please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Tree Selection Guidelines Item #7 section. Under the Keddie Ridge Project snags would not be designated for removal unless it is a hazard tree, and where large down woody desired conditions are not met, snags would be left for wildlife habitat.

Lastly, with regards to snags and snag recruitment, there are two concepts which are applicable to the project. The first is that managing stands below 60 percent of maximum stand density does not equate to zero tree mortality. Natural background levels of mortality would still be expected to occur. This is evident from reference conditions that indicate that while stands may have low average stand densities, a wide range in conditions – or heterogeneity – in combination with natural disturbance regime events such as fire, provide for natural background levels of mortality.

The second concept involves scale and intensity. The Keddie Ridge Project proposes to treat approximately 11 percent of the National Forest System (NFS) lands within the FVFFAQ analysis area. Of this, nearly half of the treatments involve hand thinning, piling, and burning or prescribed fire treatments which would not notably effect recruitment of larger snags (greater than 15 inches dbh and greater than 20 feet tall). In fact, the proposed 1,456 acres of low to moderate prescribed fire treatments would likely create new snags directly through fire-induced mortality and indirectly through delayed mortality as a result of fire-injury and predisposal to insect attack.

The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment, Figure 2 indicates that a large portion of NFS lands within the analysis area are dominated by closed canopy mid to late seral stands (represented by CWHR 4M, 4D, 5M, and 5D), which are characterized by relatively higher stand densities and higher potential for mortality and snag and large down woody debris recruitment. Furthermore, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Comparison of Cumulative Effects, Table 49 indicates that these CWHR types and corresponding conditions would be reduced by 7 to 12 percent dependent on alternative. Considering 1) the context, scale, and dispersion of treatments that reduce stand densities, 2) the expected continued background levels of mortality within these units, 3) snag creating effects of proposed prescribed fire treatments, 4) the persistence of high stand density conditions and expected and continued mortality outside of treatment areas, and 5) treatment design criteria to retain levels of snags and large down woody debris, including tree selection guidelines that address retaining green decadent trees with wildlife structures, measures have been incorporated into the project design to minimize reductions in, maintain retention, and promote recruitment of snag densities and large down woody debris.

9. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: Further complicating this issue, Long and Shaw (2005), which is cited numerous times to suggest that SDI of 450 was appropriate for ponderosa pine across western states (Appendix A of Forest Vegetation, Fire, Fuels, and Air Quality report pg. 96); however this same study also identifies that this approach should be used with caution (See page 214). We are particularly concerned because the Long and Shaw 2005 paper had very limited sampling of Ponderosa pine plots in California (See Table 1, p. 206) used to inform the paper. Relying on this paper to support the low BA outcomes in the Keddie project skews desired conditions in a direction inappropriate for mixed conifer stands in the project area. Relying on Oliver (2005) pine mortality data for the Keddie project is also inappropriate since that information is derived from even-aged Ponderosa pine stands in California. Please explain in detail why thresholds for even-aged pine stands are used as desired conditions and to drive management for mixed-conifer stands.** (Thomas et al., FL, pg. 11)

Response: Please refer to response to comment FVFFAQ #8. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators, Forest Vegetation, Relative Density; and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A. Recent research by Long and Shaw (2005) using data across the western states for ponderosa pine and the latest research by Long and Shaw (In review) for the Sierra Nevada Mixed conifer forests (Long, personal communication, Shaw, personal communication) suggest 450 as a maximum SDI for ponderosa pine and ponderosa pine dominated mixed conifer systems. Long and Shaw (In review) developed a density management diagram for even-aged mixed-conifer stands in the Sierra Nevada using 224 FIA plots in California. “The research is intended for use in even-aged stands, but may also be used for uneven-aged management where a large group selection system is used” (Long and Shaw In review). This research is directly applicable to the Keddie Ridge Project considering first-hand familiarity of the forests within the project area, the desired species composition, the desired low density conditions, and the relatively lower site of the project. This approach leans slightly toward maintaining higher stand densities than those using a maximum stand density index of 365 for ponderosa pine as described by DeMars and Barrett (1987) and Oliver (1995).

The stand-specific calculation of maximum stand density index for a mixed species stand is largely dependent on the relative abundance of species present. For mixed-species stands like those that occur within the Keddie Ridge Project, Tappenier et al. (2007) describes "several approaches have been recommended for establishing a maximum stand density. Cochran et al. (1994) recommend selecting the SDI of the species with the lowest maximum value, but Hann and Wang (1990) calculate a weighted average SDI in which the weights are the basal area of the respective species." These approaches are also described in Shaw (2006).

For the Keddie Ridge Project, a site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002) as described by Hann and Wang (1990). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. While a maximum stand density index of 450 is used for ponderosa pine in this analysis, the individual stand maximum stand densities are higher – this is driven by the presence of shade tolerant species such as Douglas fir and white fir in these stands which have higher maximum stand density indices, This approach is well accepted as a component of the Forest Vegetation Simulator (Dixon 2002) and is consistent with 1) approaches described by the latest silviculture and ecology texts (Tappeneir et al. 2007), 2) the scientific literature (Hann and Wang 1990, Shaw 2006, Long and Shaw 2005, Long and Shaw In review)and 3) in collaboration with experts in the field of stand density (Long, personal communication, Shaw, personal communication).

10. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: "There's no discussion, however, of what kind of heterogeneity from reference conditions might be desired or how it might be silviculturally implemented" (North comments on Keddie). We would like to see more specific treatments that outline how and where the prescriptions for the proposed action to meet desired conditions. Currently, it is difficult to interpret from the documents how heterogeneity will be implemented silviculturally both within stand (or micro-site) and on the landscape level. A particular area to focus some additional descriptions would be in the group selections. The DEIS (p. 73) states for group selections, "Harvest trees less than 30 inches DBH. Consider retaining healthy vigorous undamaged tress of desired shade intolerant species greater than 20 inches DBH…" and in the Forest Vegetation, Fire, Fuels, and Air Quality specialist report (pg. 110, g. i., ii., and iii). Neither document illustrates to reader the criteria that will be used for creating "clumps", "gaps", or low densities of larger trees. This was also mentioned during our phone conversation with Ryan Tompkins and Michael Donald on March 10th, and we were not satisfied with the conclusion that this would be more evident in the marking guidelines, which were not provided for review.** (Thomas et al., FL, pg. 11)

Response: Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Alternative A, Diversity within the Prescription Design, Implementation of Landscape level heterogeneity, and Implementation of Within-stand level heterogeneity section. Tree selection guidelines and group selection guidelines discuss how heterogeneity would be implemented at the stand and landscape scales, including criteria that would be used for creating clumps, gaps, low densities of larger trees (the matrix), and identification, location, and design of group selections. Appendix C also includes a thorough discussion of how the design of alternative A implements the conceptual framework of the PSW GTR-200 (North et al. 2009). These guidelines were developed with input and review from Dr. North, lead author of the PSW GTR-220 (North et al. 2009).

11. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: On page 3 of the DEIS under Purpose 1: Reduce Hazardous Fuel Accumulations and Purpose 2: Improve Forest Health, the desired condition states, "… is uneven-aged management, multistoried, fire resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of fire." There are areas where reduction in canopy bulk density may be appropriate, in forests adjacent to homes or in areas for key strategic fire suppression activities to reduce fire severity under all weather scenarios, however, separating crowns outside of these key areas may be limited in its effectiveness to prevent crown fire spread (Agee et al. 2000, Stephens and Moghaddas 2005 in North et al. 2009 p. 3). Stephens and Moghaddas found using modeling tools Fuels Management Analysis (FMA) and Fire Family Plus software (with data supplied by specific inventories of trees size, shape, height and crown ratio) that, " [A]ll four outputs can be controlled by changing surface and ladder fuels, giving managers an opportunity to interactively develop target fuel conditions for a desired fire behavior. Fuels can be reduced until the crowning and torching indices are higher than conditions that are likely to occur even under extreme weather conditions." (In North et al. 2009 p. 3)** (Thomas et al., FL, pg. 12)

Response: Please refer to the FEIS, Chapter 1, Purpose 1: Reduce Hazardous fuel accumulations. The desired condition is an "uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire." Also, please refer to the FEIS, Chapter 1, Purpose 2: Improve forest health. In addition to the fuels desired conditions, forest health desired conditions state that "stand densities would generally be low, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrences."

The desired condition for forest health includes the desired condition for Purpose 1, Reducing Hazardous Fuel Accumulations, but in addition, includes promoting low stand densities, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence. In addition, low density, open canopy forest conditions would promote the regeneration, growth, and development of fire-resistant shade intolerant species such as ponderosa pine and black oak, and would contribute to landscape, stand, and within stand level heterogeneity. Removal of a portion of intermediate sized trees would contribute to creating low density, open canopy stands, accelerate the development of large diameter trees, reduce inter tree competition, enhance the growth and development of shade intolerant species, and contribute to heterogeneity.

Lastly for discussion regarding the need for fuel reduction, the basic components of fuel reduction, scale and intensity of fuel reduction, and the interaction of fuels reduction and forest health objectives and goals, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B, Fuel Reduction section.

In addition, please see the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Effects Analysis Methodology section. Fire modeling software including Fire Family Plus, and the Fire and Fuels Extension of the Forest Vegetation Simulator with stand level tree field inventories were used in the analysis of effects by alternative.

12. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: There is substantial evidence indicating that it is not necessary to reduce canopy cover to 40 percent or to remove trees up to 30" dbh, as proposed in the Keddie project, to reduce the risk of uncharacteristic wildfire. Much of this evidence is cited in Legacy's appeal of the 2004 ROD, which was incorporated in our scoping comments on the Keddie project (SNFPC et al. 2004, pp. 62-71). It is generally recognized by fire scientists that fire resiliency largely is achieved by removing surface fuels and smaller diameter material and increasing crown to base height. "Most of the trees that need to be removed to reduce accumulated fuels are small in diameter and have little or no commercial value." (U.S. General Accounting Office 1999, p. 44). "When thinning is used for restoration purposes in dry forest types, removal of small diameter material is most likely to have a net remedial effect. Brush, small trees, along with fine dead fuels lying on top of the forest floor, constitutes the most rapidly ignited component of dry forest." (Christensen et al. 2002, p. 2). Thus, "surface fuels are the means by which crown fires are sustained....Without heavy surface fuels, crown fires are almost always absent, regardless of canopy cover, size class distribution, or the height to live crown." (Rice 2005, p. 2).** (Thomas et al., FL, pg. 12)

Response: Please refer to the response to comments FVFFAQ #11. In addition, please refer to the FEIS, Chapter 2, Alternatives section. The Keddie Ridge Project FEIS analyzes in detail four action alternatives which treat fuels to varying degrees. Alternative C, the non commercial funding alternative, is designed with the singular purpose of meeting the purpose and need for fuels reduction. This alternative would implement a substantially lower upper diameter limit of 12 inches dbh. Alternative D, the 2001 consistent alternative would implement lower upper diameter limits of 12 to 20 inches, would maintain higher amounts of canopy cover (50 percent), and would maintain 15 to 25 percent of the treatment area left untreated. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels Reduction section. While these alternative would meet or partially meet immediate fuels reduction goals, it would not fully meet the forest health goals which include creating open forest stands that are generally low in stand density, characteristic of an active-fire regime stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought fire, and insect and disease occurrences.

13. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: Studies of the effects of fuel treatments on fire behavior support the conclusion that fuel reduction that focuses on surface and ladder fuels and small diameter material is effective in reducing uncharacteristic fire. Stephens (1998) examined a number of fuel treatments and used the model FARSITE to evaluate their efficacy. In all cases, the most successful fuel treatments included prescribed fire. Further, prescribed fire alone was as effective in reducing fire risk as treatments with logging and prescribed fire combined. "These treatments resulted in fuel structures that will not produce extreme fire behavior at 95th percentile conditions." (Ibid. p. 32). Further, the vegetative conditions in the watershed where the fire effects were modeled included canopy cover conditions of up to 100 percent cover. The prescribed burning treatments did not reduce in any way the canopy cover of the dominant and co-dominant trees, yet these treatments were as effective as the thinning/biomass/prescribed burn treatments in which canopy cover was reduced to 50 percent in some areas of the watershed. Thus, no change in canopy cover of the dominant and co-dominant trees was necessary to meet the fuel objective under extreme weather conditions. Furthermore, reducing canopy in some areas to 50 percent did not result in any additional benefit. Similar results were reported by van Wagtendonk (1996), which again emphasized that removal of the surface and ladder fuels is effective in changing fire behavior. These studies demonstrate that it is not necessary to remove medium to large diameter trees or alter canopy cover in order to prevent crown fire and other extreme fire behaviors.** (Thomas et al., FL, pg. 12-13)

Response: Please refer to the response to comments FVFFAQ #11, #12, and #14. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels Reduction for a discussion on Scale and Intensity of fuels treatments. Research indicates that the effectiveness of fuels treatments is determined, in part, by the site specific existing stand conditions relative to the treatment prescribed. Research such as Moghaddas et al. (2010), Collins et al. (2010), Peterson et al. (2005) and Agee and Skinner (2005) all recognize prescribed fire, mechanical thinning, and mechanical thinning with prescribed fire as variable options for treating accumulations of hazardous fuels. Moghaddas et al. (2010) emphasize that "there is no one fuel treatment strategy…rather a combination of strategies is needed, especially when dealing with complex landscapes and management objectives (Stephens et al. 2010)." This is particularly important with regards to the multiple management objectives as described in the FEIS, Chapter 1, Purpose and Needs section. Treatments that may meet fuels reduction objectives, may not meet other project objectives such as forest health.

14. **Restoring fire as an ecological process need to be developed more within the specialist report: The DEIS and the Forest Vegetation, Fire, Fuels, and Air Quality specialist report both failed to identify the ecological restoration role that fire plays in this system, which furthers the underlying idea that thinning is always preferred.**

We understand that past management activities have lead to higher densities and species composition change, which is well summarized, "but the emphasis is on trying to restore ecological processes (including wildlife habitat) and those processes seem to thrive with greater structural

heterogeneity" (North comments on Keddie). The role that fire will play in the Keddie project in the now and into the future is unclear, and if the concepts from the GTR-220 are to be fully embraced we would like to see more discussion the tremendous ecological restoration value of fire (i.e., preparing the seedbed for germination, cycling nutrients and replenishing minerals, modifying conditions promoting wildlife habitat and forage, creating structural heterogeneity, minimizing disease and pathogens, and reducing or increasing fire hazard (Kilgore 1979).

"To completely restore fire as an ecological process, there is no substitute for fire. In the words of Sue Husari, fire management officer for the Pacific West Region of the National Park Service and one of the true pioneers in fire management: "You can't restore fire without fire."Sugihara et al. 2006. (Thomas et al., FL, pg. 13)

Response: Please refer to the response to comment FVFFAQ #11, #12, and #13. In addition, please refer to the FEIS, Chapter 2, Alternatives section . The Keddie Ridge Project recognizes the ecological role of fire in the project area, and consequently proposes thousands of acres of follow-up prescribed fire underburn treatments and prescribed burn only treatments,

All action alternatives include the use of prescribed fire to reduce surface fuels in the proposed treatments, including in all hand thinning and mechanical thinning treatments. In addition, all action alternatives include 1,456 acres of low to moderate intensity prescribed burn only treatments.

The commenters' "would like to see more discussion the tremendous ecological restoration value of fire (i.e., preparing the seedbed for germination, cycling nutrients and replenishing minerals, modifying conditions promoting wildlife habitat and forage, creating structural heterogeneity, minimizing disease and pathogens, and reducing or increasing fire hazard" (Kilgore 1979).

The reintroduction of fire as a process and the tremendous ecological value of fire is a fundamental component of the proposed treatments within all action alternatives as it is within guiding Forest Plan direction as amended by the 1999 HFQLG FEIS and ROD (USDA 1999) and the 2004 Sierra Nevada Forest Plan Amendment FEIS and ROD (USDA 2004a, USDA 2004b). This concept is the greatest similarity between all action alternatives, and consequently, the differences within the action alternatives lie in the amount and intensity of mechanical thinning and group selection treatments which would occur prior to the application of prescribed fire treatments. As North et al. (2009) highlights in the PSW GTR-220:

"Mechanical treatments can be effective tools to modify stand structure and influence subsequent fire severity and extent (Agee et al. 200, Agee and Skinner 2005) and are often a required treatment in forests containing excessive fuel loads. Prescribed fire is generally implemented very carefully, killing only the smaller size class trees (Kobziar et al. 2006). In some cases, it is ineffective for restoring resilience, at least in the first pass (Ritchie and Skinner 2007). For example, prescribed fire may not kill many of the larger ladder-fuel or co-dominant true fir trees that have grown in with fire suppression (Knapp and Keeley 2006, North et al. 2007). In many stands, mechanical thinning followed by prescribed fire may be necessary to achieve forest resilience much faster than with prescribed fire alone (Schwilk et al. 2009, Stephens et al. 2009)."

Consequently, the analysis in the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section focuses on how the relative differences in alternatives and how each alternative would or would not meet the desired conditions as described by the Purposes and Needs in the FEIS Chapter 1. In addition, the Forest Vegetation, Fuels, Fire, and Air Quality Report appendices include background information pertinent to the analysis. Appendix B includes a discussion on Fuel Reduction treatments including the need for fuels treatments, basic components of fuels treatments, scale and intensity of treatments, and the interaction of fuels reduction and forest health objectives and goals. Appendix C includes a thorough discussion on how alternatives would implement heterogeneity concepts as discussed in the PSW GTR-220 (North et al. 2009).

15. **Restoring fire as an ecological process need to be developed more within the specialist report: We also understand the complicated nature of air quality management, and if this were truly to be the collaborative approach alternative, then it would be very important to have the local air pollution control district at the table when discussing the Regions intentions to increase the pace and scale of ecologically based treatments (Ecological Leadership Intent) because the resilience and ecological integrity of the Sierran forests cannot be enhanced or maintained without managing fire within them.** (Thomas et al., FL, pg. 13)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section for a discussion on effects to air quality. In addition, please see the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B discussion on limitations to the use of prescribed fire. Implementation of prescribed fire treatments would occur over a range of years dependent on weather and fuels conditions being “within” prescription, air quality regulations, and available resources. Modifications to air quality regulations do not fall within the purview of the Keddie Ridge Project Collaboration with local air quality districts on air quality issues is addressed at the forest and regional level.

16. **To fully be able to call out a project that is using the GTR-220 concepts we would like to see the following revised in the DEIS and Forest Vegetation, Fire, Fuels, and Air Quality report. The following questions are for concepts that we do not see as being fully developed within the DEIS or within the specialist reports. A more fully developed section on stands and landscape level heterogeneity (see attach micro-site marking reference). How will the alternative A treatments and current prescriptions be varied across topographical and aspects differences within the stands. What criteria will you use to thin larger trees within CWHR 4 size classes, and how does this follow the concept in the GTR-220 of keying off existing structures? And how will this accelerate these stands into CWHR 4 is the larger trees are being removed? More detailed criteria on how the leave tree groups or clumps (both high and low density) and the creation of gaps will be established? The identification of these areas will help us understand more fully that the concepts of the GTR were in fact developed fully, and that this project falls in line with the Regions Ecological Restoration Intent. Furthermore, we would like to see more discussion on how fire will be returned to this project and be allowed to play it vital role in the ecosystem, both for reducing fuel loading and creating diversity.**

The above was also requested in our April, 2010 scoping letter, we requested that the district ensure stand heterogeneity be provided for in the project area in the following ways:

- **Varying stand density targets throughout the stand;**
- **Creating clumps composed of larger trees with higher density and canopy cover;**
- **Increasing stand density and canopy cover in canyons and north and northeast aspects;**
- **Retaining untreated areas (“diversity islands”); and**
- **Retaining patches of understory shrubs and advanced tree regeneration.**
- **Include specific wildlife tree microhabitat marking in the project design (Michel and Winter 2009) and procedures for identifying other micro-habitat features to be retained in project design.**

(SFL scoping letter for the Keddie Project, April 15, 2010, p. 2). The Keddie DEIS embraces a few concepts in the GTR such as heterogeneity, but only partially. The Forest Service should revise the DEIS to align the purpose and need, implementing the GTR, to include wildlife recommendations. (Thomas et al., FL, pg. 13, VI: Conclusion)

Response: Please refer to the FEIS, Chapter 2, Alternatives section, for the design of each alternative. Alternative A includes the greatest range in silvicultural prescriptions including the greatest ranges in canopy cover retention and stand density. This includes areas with higher densities, canopy cover, and retention of trees greater than 20 inches. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C for further discussion on implementing both landscape level, stand level, and within-stand level heterogeneity and how the design of Alternative A is congruent with the conceptual framework presented in the PSW GTR-220 (North et al. 2009). In addition, the Keddie Ridge Project ID team has worked with the lead author of the PSW GTR-220, Dr. Malcolm North, to incorporate the report’s conceptual framework into the Keddie Ridge Project as appropriate.

17. **No rational connection between the facts found and the proposed action: The DEIS claims that the Proposed Action is necessary in order to prevent high levels of tree mortality from various causes, including fire and insects. However, the facts found in the Forest Service’s own Forest Vegetation Simulator (FVS) data, pertaining to the Project area, present irreconcilable contradictions. First, there is no information in the record indicating that stands will not continue to increase in live tree basal area over the coming decades, even when beetle mortality is taken into account. Also, about 25 percent basal area mortality levels identified in the DEIS and Keddie Forest Vegetation, Fuels, Fire, and Air Quality Report (Vegetation Report) would be from the logging itself—i.e., the direct killing and removal of trees with chainsaws, with an additional 13 percent basal area mortality projected from fire under the most extreme fire weather—a total of 38 percent basal area mortality. HOWEVER, under the non-commercial thin (thinning of trees up to 12 inches in diameter removed) the combined live basal area reduction from thinning and fire (under “extreme” fire conditions) is much smaller than**

combined mortality under the Proposed Action—i.e., basal area mortality of only 15 percent from thinning and basal area mortality of only 13 percent from fire under extreme fire weather (a total of only 28 percent mortality). Thus, there is a fundamental disconnect in the DEIS between the facts found and the proposed decision, especially in light of the data discussed in the section below about the low levels of beetle mortality generally associated with high levels of basal area and stand density index. (Chad Hanson, JMP, pg. 1)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence.

Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Analysis Methodology, Measurement indicators for Forest Vegetation, Fuels, and Potential Fire Behavior and Effects section. These measurement indicators focus on residual, post-treatment attributes of forest vegetation structure, density, species composition, and landscape diversity and heterogeneity as residual post-treatment conditions are the best indicator of how well desired conditions as described in Chapter 1 would be met for the project purposes and needs. Simply put, measures that display what remains after treatment best describe whether desired conditions are met; the measure of how much basal area is removed offers little context with regards to desired conditions.

Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Comparison of Effects by Alternatives, Direct and Indirect Effects: Mechanical Thinning Treatments & Cumulative Effects section for a discussion comparing how well each alternative meets the purposes and needs of the project. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A for a discussion on the low density and open canopy nature of desired conditions, and Appendix B for discussion on scale and intensity of fuel treatments and the interaction between fuel treatments and forest health objectives. In general, proposed mechanical treatments under alternatives A and E would remove more trees, canopy cover, and basal area than alternatives C and D, and would better enhance landscape, stand level, and within-stand heterogeneity. While the commenter recognizes that alternative A would mechanically remove more trees relative to alternative C, the comment fails to account that prescribed fire treatments would create more residual mortality in the form of leaving more dead standing trees which would then contribute to future hazardous fuel loads. This effect and the subsequent management considerations are discussed in the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B, Scale and Intensity of Treatment, and Interaction of Fuels and Forest Health Objectives sections.

In addition, the commenter is inappropriately using percent basal area mortality as a measurement indicator. Predicted percent (basal area) mortality is the potential tree mortality as measured by the percent of basal area that would be killed in a fire event occurring under 90th percentile weather conditions as predicted by FFE (Reinhardt and Crookston 2003, Rebain et al. 2010); this is not the percent basal area mortality that would occur as the result of the proposed treatments.

Lastly, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality , Environmental Consequences, Alternative B section, acknowledges that stand growth would continue under the no-action alternative. In these forested systems, net stand growth would likely outpace mortality; however, this does not mean that there isn't an increased potential and susceptibility of these forests to unacceptable levels of mortality. It is well documented in the scientific literature, and the Keddie Ridge Project Forest Health Evaluation that as stand density increases the risk and susceptibility of these forests to unacceptable levels of mortality due to drought, insects, and disease, also increases. Consequently, indicator measures of stand density are used to characterize forest health risks and how this corresponds with the proposed treatments for each alternative. The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Affected Environment and Environmental Consequences, Alternative B and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand density, existing condition of Forest health, and climate change sections all discuss the negative environmental consequences associated with high density stands which has been well documented in the scientific literature.

18. **No rational connection between the facts found and the proposed action: Moreover, the Keddie Forest Vegetation, Fuels, Fire, and Air Quality Report (pp. 49-50) claims that the non-commercial alternative, Alt. C, would leave basal area and stand density index levels that would "NOT" be "within desired conditions" (emphasis in original). Yet, the desired conditions described in the Purpose and Need section of the DEIS make no mention of specific thresholds for basal area or stand density index that must be met; nor does the DEIS explain in any meaningful way the supposed negative consequences that are sought to be avoided by reducing stand density and basal area to the levels in the Proposed Action. Instead, the DEIS merely makes vague references to the potential for some amount of beetle mortality—i.e., future snag recruitment above zero—but does not quantify this expected mortality relative to the mortality that would result from the logging itself.** (Chad Hanson, JMP, pp. 1-2)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. As FVFFAQ #21 and #24 discusses, these measurement indicators are used to display how well alternatives would meet forest health conditions. These measurement indicators and corresponding thresholds have been widely used in scientific literature to display susceptibility of stands to mortality from the combination of drought and bark beetles, and effectively characterizes the risk in these conditions post-treatment for each alternative.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health. The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Environmental Consequences, Alternative B for the negative consequences “that are sought to be avoided by reducing stand density and basal area to the levels in the proposed action.”

19. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): First, the DEIS states that stands would be thinned such that their SDI (stand density index) would be no more than 60 percent of limiting or maximum SDI even 20 years after thinning, BUT fails to identify the scientific source or rationale for reducing stand density so severely that stands would still be less than 60 percent of LIMITING SDI at 20 years post-thinning, or provide any rationale or methodology to explain the levels of tree mortality that would likely occur, based upon the scientific data, if stands exceed 60 percent of the chosen SDI threshold/target, relative to the level of tree mortality expected due to cutting and removal of trees with chainsaws under the Project.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency.

Relative density as described in the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, is used as a measurement indicator to compare how well proposed treatments and corresponding silvicultural treatments for all action alternatives would meet desired conditions for forest health, including how well these proposed treatments meet guidance for thinning treatments developed by Region 5 (Blackwell 2004, Landram 2004). The calculation of relative density is based on the maximum stand density index and is described in the FEIS and the Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A. This is consistent with current research definition and application of stand density index (Shaw and Long 2010).

The Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A provides discussion on reference conditions and appropriate stand density levels for stands characteristic of an active-fire stand structure. In addition, Blackwell (2004) provides guidance advising forest managers to develop thinning prescriptions to ensure that stand densities do not exceed an upper limit, for example 60 percent of maximum stand density index, for at least 20 years after thinning. Blackwell (2004) based this recommendation on the increasing incidence of both tree mortality and large fire occurrence in California National Forests which have been subsequently been documented in scientific literature (Miller et al. 2009). The intent was to avoid situations where projects only treat surface and ladder fuels to meet short term fuels objectives while not addressing long term forest health risks. These recommendations are consistent with the latest research on fuels reduction and ecosystem restoration for forested systems of the Sierra Nevada mixed conifer forests (Collins et al. 2011) which suggest that treatment prescriptions that maintain higher densities, maintain high canopy covers, and implement lower diameter limits “may be too conservative with respect to residual stand structure” and “are on the upper end of or entirely exceed the values we report in distributions based on the 1911 data (Fig 3.)”(Collins et al. 2011).

Lastly, please refer to the FEIS, Chapter 2, Alternatives. Under the proposed action, proposed treatments and corresponding silvicultural prescriptions are designed and developed using canopy cover, CWHR type, and upper diameter limits to fully meet the desired conditions as described in the FEIS Chapter 1. All proposed treatments would meet standards and guidelines as directed in the 2004 SNFPA ROD, table 2 (USDA 2004b).

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #21, and #24.

20. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Second, the Vegetation Report (p. 10) cites Oliver (1995), vaguely asserts that beetle mortality occurs above a basal area of 150. However, in the ponderosa pine plots in California within natural forest stands (i.e., not plantations), the densest plots increased to basal areas well over 200 square feet per acre with almost no beetle mortality (i.e., mortality of trees from beetles) after the stands reached about 85 years of age (Oliver 2005, Fig. 1). The stands in the Project area are natural forests over 85 years of age. Oliver (2005) noted that mortality levels have “declined over the years” in the eastside ponderosa pine forests as these forests have grown older and denser. Oliver (2005 [Fig. 1]) found that basal area mortality was minor in ponderosa pine stands above 150 square feet per acre—about 5-15 percent basal area mortality every 10-30 years, while stands gently increased in live tree basal over time.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health.

Oliver (1995) concludes that “Sartwell’s threshold of 34 m^2 per ha (150 ft^2 per acre) of basal area above which density stands are susceptible to attack by bark beetles appears to be a reasonable average value for California.” In addition, basal area per acre has also been used by Landram (2004) to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (where the Keddie Ridge Project is located), the insect risk thinning guidelines suggest thinning to 150 square feet per acre. These recommendations are consistent with Oliver (2005) who concludes that a primary example of a satellite study of the west wide levels of Growth study in ponderosa pine has demonstrated "the efficacy of low reserve densities in maintaining stand health…Because, most tree mortality whether it is caused by biotic or abiotic factors, is episodic, evaluations of forest health are meaningful only if reserve densities are maintained over a long period of time."

Oliver (2005, Figure 1) does not show as the commenter asserts that "the densest plots increased to basal areas well over 200 square feet per acre with almost no beetle mortality (i.e., mortality of trees from beetles) after the stands reached about 85 years of age" nor does it show that Oliver "found that basal area mortality was minor in ponderosa pine stands above 150 square feet per acre." Contrary to these assertions, Oliver (2005) acknowledges that mortality occurred primarily in plots that had higher reserve densities (p. 75).

The theme of low stand densities in maintaining forest health and improving forest resiliency to disturbances such as drought, insect and disease, and fire, is common among literature describing reference conditions of active-fire stand structure, forest health management, and climate change recommendations. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion.

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, and #19.

21. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Third, the Vegetation Report (p. 5) acknowledges that the Project area is comprised of mixed-conifer and true fir, not pure ponderosa pine stands, and states that the maximum stand density index (SDI-Max) for mixed-conifer forests is 750 (Vegetation Report, p. 11). The Vegetation Report (pp. 10-11) implies that significant beetle mortality occurs at stand density index (SDI) levels above 55-60 percent of the maximum SDI. However, the Vegetation Report utterly fails to describe the actual level of basal area mortality that can be expected above 60 percent of SDI-Max, and the cited studies on pp. 10-11 of the Vegetation Report do not indicate that basal area mortality from insects when stands exceed 60 percent of the SDI-Max of 750 (i.e., when they exceed an SDI of 450) will exceed the mortality levels from logging itself projected under the Proposed Action.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of stand density use, relevant thresholds, and desired conditions. The FEIS states that "Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California." However, goes on to explain that the calculation of this maximum stand density is largely dependent on the mix of species. The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density further explains that for mixed-species stands like those that occur within the Keddie Ridge Project, Tappenier et al. (2007) describes "several approaches have been recommended for establishing a maximum stand density. Cochran et al. (1994) recommend selecting the SDI of the species with the lowest maximum value, but Hann and Wang (1990) calculate a weighted average SDI in which the weights are the basal area of the respective species." These approaches are also described in Shaw (2006).

A more site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS) which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For, the purpose of this analysis, relative density based on the maximum stand density index as calculated by FVS is used for each individual stand.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, risk for beetle induced mortality, and scientific literature on basal area and stand density and their relation to improving forest health. "Actual levels of basal area mortality that can be expected above 60%" relative density is difficult to quantify due to the limitations of forest growth and yield model (FVS) in simulating insect outbreaks and predicting periods of drought. However, FVS does provide meaningful estimates of stand density and basal area, measures which have been widely used in forest management and scientific literature as indicators of or thresholds of elevated risk for these forest health issues (Powell 1999, Ferrell 1993, Sartwell 1971, Sartwell and Stevens 1975, Oliver 1995, Oliver et al. 1996, Landram 2004, Negron and Popp 2004, Negron et al. 2009). Consequently, the FEIS displays how well each alternative meets these indicators or thresholds which describe elevated risk of bark beetle mortality and display how susceptible forested stands may be to these forest health concerns.

Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Under the proposed action, proposed treatments and corresponding silvicultural prescriptions are designed and developed using canopy cover, CWHR type, and upper diameter limits to fully meet the desired conditions as described in the FEIS Chapter 1. Relative density as described in the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, is used as a measurement indicator to compare how well proposed treatments and corresponding silvicultural treatments for all action alternatives would meet desired conditions for forest health, including how well these proposed treatments meet guidance developed by Region 5 (Blackwell 2004, Landram 2004).

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, and #24.

22. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Fourth, the Vegetation Report (p. 11) states that the maximum SDI—i.e., the SDI level used to determine the target SDI percentages—is 750 for mixed-conifer forests like those in the Project Area, as discussed above. However, the FVS outputs for the Keddie Project show that the Forest Service is actually using a much lower SDI-Max value that is has neither**

disclosed nor supported with any scientific data. For example, under Prescription 1 in the FVS Outputs, 40 percent of maximum SDI is listed as 231 in one case, and 39 percent of maximum is listed as 251 in another. In other cases, 46 percent of maximum is listed as 264 and 44 percent of maximum is listed as 297. Whatever methodology was used to derive the maximum and the percentages of maximum, they were not adequately discussed, divulged, or supported with evidence in the DEIS or Vegetation Report. Moreover, as discussed above, the Vegetation Report (p. 11) makes false statements, implying that, because SDI-Max is 750, far higher SDI levels (i.e., far more trees) would be retained than would actually result under the Proposed Action. (Chad Hanson, JMP, pg. 3)

Response: Please refer to response to comment #21. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for a discussion of background information, scientific literature, methodology for calculating site-specific maximum stand density.

A site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS) which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding detailed background information, methodology and consistency with scientific literature, and management guidelines on stand density and its relation to reference conditions, climate change, existing conditions, and improving forest health.

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, and #21.

23. **Scientific Accuracy and Integrity, Generally: The DEIS implies that stands in the Project Area exceed some desired percentage of the maximum stand density index for ponderosa pine-dominated stands. The DEIS fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the DEIS's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future.** (Chad Hanson, JMP, pg. 3)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health. For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, #21, and #22.

For responses related to stand density and its relation to snags and large down woody debris retention and recruitment, please refer to response to comments #3 and #8. Please refer to the FEIS, Chapter 2, Alternatives, Tables 5, 6, and 7 for design criteria for snag retention and residual surface fuels (including large down woody debris). In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Implementation of heterogeneity and Tree Selection guidelines items #5 "Damaged, "Defect" and Wildlife Retention Trees, and #7 Snag Retention guidelines. These guidelines provide further direction on 1) retaining trees that serve as suitable wildlife habitat structures, 2) snag retention and recruitment, and 3) large down woody debris retention and recruitment.

24. **Scientific Accuracy and Integrity, Generally: The DEIS fails to provide information about the number, or basal area, of trees that would be removed through mechanical thinning relative to the number/basal-area that would be expected to die due to competition mortality as SDI increases, e.g., as predicted by Oliver (1995); and the DEIS fails to explain why mortality of trees through chainsaws and removal to timber mills is "restoration" and "forest health" enhancement, while natural mortality of a similar (or lower) number of trees through competition, and resulting creation/recruitment of ecologically-important snags for cavity-nesting wildlife, would somehow be ecologically harmful.** (Chad Hanson, JMP, pg. 3)

Response: Please refer to the FEIS, Appendix A, tables 2, 4, 6, and 8 for number of trees, basal area, and canopy cover before and after treatments. In addition, during the comment period, FVS outputs for each stand and prescription were provided showing number of trees per acre by diameter class and basal area per acre, both before and after treatments. Lastly the FEIS, Appendix D, Economic Analysis provides a relative estimate of volume of harvested trees by species both greater than 24 inches in diameter and less than 24 inches in diameter by alternative. These data display the existing condition and stand attributes and post-treatment condition and stand attributes and also show, by default, umber and basal area of trees to be harvested and removed. However, breakdown of number of trees or basal area of trees removed are a poor indicator of whether a) desired conditions, b) concepts within the GTR are met, or c) environmental effects to forest vegetation, fuels, and fire behavior, because this focuses on what is being *removed*, not what conditions *remain* after the treatment. Comparisons of Pre-treatment and Post-treatment stand conditions are far more applicable to how well desired conditions are met.

Please refer to the FEIS, Chapter 1, Purpose and Need for desired conditions for fuels reduction and forest health. This section describes the need for action to reduce hazardous fuel accumulations, improve forest health, protect and enhance habitat for Region 5 Forest Service sensitive plant and wildlife species, improve watershed health, and reduce noxious weed infestations. Under the Proposed Action, proposed treatments were designed to fully meet these purpose and needs. Please refer to the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators and Environmental Consequences including comparison of alternatives for a discussion on the measurement indicators used to analyze alternatives effects and effectiveness in meeting desired conditions in terms of forest structure and composition, landscape heterogeneity, and fuels and fire behavior. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendices A and C for existing pre-treatment and residual post-treatment conditions with regards to the measurement indicators. The FEIS Appendix A, tables 2, 4, 6, and 8 also displays more unit specific post treatment stand conditions and ranges in conditions after treatment for each alternative.

The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment and Environmental Consequences, Alternative B discusses the environmental effects of allowing " natural mortality through competition". Furthermore, this The FEIS discusses that by maintaining high stand densities and allowing natural mortality through competition, stands are at higher risk to large scale mortality from insect and disease outbreaks which may be exacerbated by periods of drought. This is well documented in past the scientific literature (Guarin and Taylor 2005, Macomber and Woodcock 1994, Fettig et al. 2007, Ferrell 1993,Ferrell 1996, Powell 1999, Egan et al 2010). In addition, the Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A further discusses how these trends have the potential to intensify with climate change and affect valuable landscape attributes such as large diameter trees (Battles 2008, Lutz et al. 2009). The Keddie Ridge Project specific Forest Health evaluation (Cluck and Woodruff 2010) recognizes that stands within the project "are at a high risk to bark beetle caused tree mortality due to overstocked conditions and could experience unacceptable levels of tree mortality in the future." Once these beetle and/or disease outbreaks begin, management options to control such outbreaks are limited, especially when exacerbated by periods of drought. It is also well documented in the scientific literature (Ferrell 1996, Fettig et al 2007, Egan et al. 2010) that the most effective methods to reduce risk of unacceptable levels of tree mortality is through preventative silvicultural techniques, particularly thinning to reduce stand density.

Consequently allowing natural mortality through competition would not meet the project purposes and needs for action and would leave the landscape susceptible to mortality caused by drought, insects, disease, and fire.

In addition, please refer to response to comments FVFFAQ #3, #8, and #24 for additional discussion on snag and large down woody debris retention and recruitment.

25. Effect of stand density reduction on future large snag levels and Wildlife, B. Effects and cumulative effects of targeting dense mature stands: Further, the HFGLG Final EIS (QLG FEIS) states on page 3-58 that the eastside forests of the QLG project area are seriously deficient in dense, mature and old growth forest habitat, and have too many openings relative to historic times. As such, the QLG FEIS states for eastside forests:

"Due to the existing condition, it is probable that stands having mid-seral size class and density attributes (seral stages…H-3B/C, H-4A) would be adversely impacted by group selection because

these areas would be targeted for treatment and not protected by interim direction for California spotted owl. In addition to changes to the tree size class attribute of mid-seral to late-seral stands is the effect of openings. In contrast to the west slope of the planning areas, mid-seral and uneven-aged eastside mixed conifer and pine stands have far more and larger anthropogenic openings (wildfire burns, regeneration cuts, roads, skid trails, landings) today than those cause by adaphic [sic] and stochastic factors (rock outcrops, insect patches, patch burns, windthrow) in the past. As eastside fir and mixed conifer mid-seral stands increase their late-seral values the creation of more openings and removal of the larger trees would increase earlier seral attributes creating a further imbalance in the quantity of land now occupied by the various seral stages. As for eastside pine, thinning would promote later seral values, but group selection would reverse the trend for mid-seral stands."

Seral stage H-3B/C is defined as having trees 12-23.9 inches in diameter and canopy cover of more than 40 percent (with H-3C being the highest canopy cover). Plumas Forest Plan, Appendix E, pp. 1-2. Seral stage H-3B/C is equivalent to CWHR 4M and 4D. In other words, there are now more openings and more open forests on the eastside of the northern Sierra Nevada than there were historically, and fewer dense, old forests. This is a special concern, given the fact that the Project appears to target dense, old stands. These dense, mature forest areas are the areas that are capable of producing (recruiting) large snags through competition between trees. If such habitat areas are already in deficit on the eastside, as the QLG FEIS states, then the Project would have significant adverse cumulative effects—i.e., cumulative effects on native wildlife species dependent upon high densities of large snags within green forests. (Chad Hanson, JMP, , pg. 4)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Introduction. The Keddie Ridge Project is not located in the "eastside forests of the QLG project area". The Keddie Ridge Project is located primarily in the transition zone – an ecological zone used to describe the transition between the wet productive westside forests of the Sierra Nevada and the relatively dry, less productive eastside forests of the Sierra Nevada as described by the HFQLG FEIS (USDA 1999).

Furthermore, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Affected Environment displays that the majority of NFS lands within the analysis area for Forest Vegetation, Fuels, Fire, and Air Quality are mid-seral closed canopy stands characterized by CWHR 4M and 4D. The affected environment described the high density and homogenous nature of these stands. Because such stand structure has increased vulnerability to high-severity fires, insect outbreak, and landscape level drought-induced mortality, a homogenous occurrence of this seral stage across the landscape is unstable (McKelvey and Johnston 1992, Millar et al. 2007). A more diverse distribution of seral stages, characterized by heterogeneous stand structures, may be more resilient to disturbance events such as fire, drought, and insect and disease infestations and more characteristic of desired conditions (Stephens and Fule 2005, Millar et al. 2007, Collins and Stephens 2010).

Please refer to the FEIS, Chapter 3, Environmental Consequences, Cumulative Effects and Comparison of Alternatives, for a discussion on how proposed alternatives and corresponding treatments may affect landscape level heterogeneity with regards to seral stages as represented by CWHR size class and density. Proposed treatments under alternatives A and E would convert mid-seral canopy stands (CWHR 4M and 4D) stands into open canopy stands (CWHR 4P) and create conditions that reduce inter tree competition and accelerate the growth and development of large diameter trees. This would enhance heterogeneity at the landscape and stand levels and promote the development of later seral open canopy stands as described in the desired conditions for forest health.

In addition, please refer to response to comments FVFFAQ #3, #8, and #24 for additional discussion on snag and large down woody debris retention and recruitment.

26. **Misrepresentation of fire effects and failure to discuss the ecological importance of mixed-intensity fire: The DEIS fails to adequately discuss the fact that, historically, there was always some mix in fire intensities in the forests of the northern Sierra Nevada and eastside Cascades, and high-intensity fire patches were both common and natural (Beaty and Taylor 2001, Bekker and Taylor 2001, Hessburg et al. 2007, Bekker and Taylor 2010). Bekker and Taylor (2010) found that, in an unmanaged area of the Lassen National Forest within mixed-conifer forests, the fires burned mostly at high-intensity historically, with some high-intensity fire patches being thousands of acres in size. Bekker and Taylor (2010) concluded that "high-severity fire was important in shaping stand structure" historically. Further, the Project documents fail to discuss the fact that patches of high-intensity fire support very high levels of native biodiversity and many wildlife species depend upon such habitat (Hutto 1995, Hutto 2006, Noss et al. 2006, Hanson 2010, Swanson et al. 2010). The DEIS describes fire intensities other than low intensity as being wholly negative for the forest ecosystem and the wildlife species that inhabit it, and this is inaccurate.** (Chad Hanson, JMP, pp. 4-5)

Response: Please refer to the FEIS, Chapter 1, Purpose and Need, Purpose 1 Reducing Hazardous Fuel Accumulation. The objective is to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources. The FEIS, Chapter 1, Purpose and Need, Background provides a recent and local example of how high severity wildfire has impacted biological resources, and the Purpose and Need 1 discuss the need for action. The desired condition is an uneven-aged multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire.

In addition please refer to the FEIS, Chapter 2, Alternatives considered but eliminated from detailed study, Alternative F. The 2004 SNFPA ROD does not include the incorporation of high severity effects within prescribed fire treatments.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix B, Fuels Reduction, Need for Fuels Reduction. Many studies such as Bekker and Taylor (2001), Beaty and Taylor (2001), and Hessburg et al. (2007), Miller et al. (2009), and Collins and Stephens (2010) have discussed the occurrence of moderate, high, and mixed severity occurrences within dry mixed conifer forests of the Cascades and Sierra Nevada ranges. However, Fire Regime data for the Keddie Ridge Project area indicates that over 96 percent of stands proposed for treatment within the Keddie Ridge Project fall within Fire Regime I, a fire regime characterized by frequent primarily low to mixed severity fire.

Concerning high severity patch sizes, recent large wildfires are very different from presettlement fires with respect to the average sizes of patches of high severity fire within the fire perimeter. High severity patches more than a few acres in size were unusual in fires in the Sierra Nevada before Euroamerican settlement (Show and Kotok 1924, Kilgore 1973, Stephenson et al 1991, Weatherspoon et al. 1992, Skinner 1995, Skinner and Chang 1996, Weatherspoon and Skinner 1996, Safford 2007, Safford pers. comm. 2008a, Safford 2008b). Miller et al. (2008) have also shown trends indicating that the average size of high severity patches in Sierra Nevada wildfires has increased (by about 100 percent) over the last 25 years (Safford pers. comm.. 2008a, Safford 2008b).

While the occurrence of fire (including low, moderate, and high severity fire) on the landscape is a natural disturbance that is essential to ecosystem function, the large scale of these fires, particularly the vast proportion that burned under high severity, are well outside the natural range of variability in fire size and severity experienced on the Plumas National Forest in the past and are uncharacteristic of the “natural” fire regimes typically described for the dry Sierra Nevada forests (Peterson et al 2009, Miller 2008, Safford 2007, Safford et al. 2007, Safford 2008b, Stephens et al 2007, Beaty and Taylor 2007, Moody and Stephens 2002, , Gruell 2001, McKelvey et al. 1996, Weatherspoon 1996, Weatherspoon and Skinner 1996, Skinner and Chang 1996, McKelvey and Johnston 1992, Leiberg 1902,).

As stated above, for the purposes of the Keddie Ridge Project, fuels treatments are designed to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources and to create open forest conditions where fire severity is reduced. The FEIS, Chapter 3 Forest Vegetation, Fuels, Fire, and Air Quality Section, Affected Environment shows that within the Keddie Ridge Project, forested stands are highly vulnerable to the effects of uncharacteristically severe wildfire – over 70 percent of NFS lands within the analysis area have a high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components.

27. **The DEIS fails to explain why, for fire and fuels purposes, it proposes to remove many mature fire-resistant trees up to 20 or 30 inches in diameter. Contrary to the implication of the DEIS, removal of intermediate-sized trees is unnecessary where the purpose is to effectively reduce the potential for severe fire. Recent scientific studies have found that precommercial thinning of sapling and pole-sized trees only (up to 8-10 inches in diameter) effectively reduces fire severity. See, for example:**

    a. **Omi, P.N., and E.J. Martinson. 2002. Effects of fuels treatment on wildfire severity. Final report. Joint Fire Science Program Governing Board, Western Forest Fire Research Center, Colorado State University, Fort Collins, CO. Available from http://www.cnr.colostate.edu/frws/research/westfire/finalreport.pdf (found that precommercial thinning of trees under 8 to 10 inches in diameter reduced potential for severe fire (email communication with the authors confirmed that trees removed were of this small size class)). More specifically, the Omi and Martinson (2002) study, found that**

precommercial thinning reduced stand damage (a measure of fire severity generally related to stand mortality) in both of the two thinned study sites, Cerro Grande and Hi Meadow (the authors reported that the Hi Meadow site was marginally significant, p<.1, perhaps due to small sample size), each with several plots.

b. **Martinson, E.J., and P.N. Omi. 2003. Performance of fuel treatments subjected to wildfires. USDA Forest Service Proceedings RMRS-P-29 (found that non-commercial thinning of submerchantable-sized trees, generally followed by slash burning or removal, in several areas across the western U.S. greatly reduced fire severity, and that this result held true regardless of post-thinning basal area density).**

c. **Strom, B.A., and P.Z. Fule. 2007. Pre-wildfire fuel treatments affect long-term ponderosa pine forest dynamics. International Journal of Wildland Fire 16: 128-138 (non-commercial thinning of very small trees under 20 cm dbh (8 inches dbh) in seven different sites dramatically reduced fire severity, resulting in post-fire basal area mortality of only about 28 percent (low severity) in non-commercially thinned areas versus post-fire basal area mortality of about 86 percent in untreated areas).** (Chad Hanson, JMP, , pp. 6-7, Thinning and Fire Severity)

Response: Please refer to the response to comments FVFFAQ #11 and #12. In addition, please refer to the FEIS, Chapter 2, Alternatives. The Keddie Ridge Project FEIS analyzes in detail four action alternatives which treat fuels to varying degrees. Alternative C, the non commercial funding alternative, is designed with the singular purpose of meeting the purpose and need for fuels reduction. This alternative would implement a substantially lower upper diameter limit of 12 inches dbh and consequently would implement treatments similar to those described by literature and cited by the commenter. Alternative D, the 2001 compliant alternative, would implement lower upper diameter limits of 12 to 20 inches, would maintain higher amounts of canopy cover (50 percent), and would maintain 15 to 25 percent of the treatment area left untreated. In addition, nearly half of the acres proposed for treatment in all action alternatives include prescribed fire only or hand thinning treatments described by literature and cited by the commenter; However, alternatives A and E also propose a wider range and diversity of treatment intensities.

Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels reduction. While these alternatives would meet or partially meet immediate fuels reduction goals, alternatives C and D would only and uniformly implement low intensity thinning treatments that would not fully meet the forest health goals. Forest health desired conditions include creating open forest stands that are generally low in stand density, characteristic of an active-fire regime stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought fire, and insect and disease occurrences. Please refer to the FEIS, Chapter 2, Comparison of alternatives, and the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Environmental Consequences, Comparison of Alternatives. The lower intensity treatments proposed under alternatives C and D do not meet desired conditions described for forest health.

Moghaddas et al. (2010) emphasize that "there is no one fuel treatment strategy…rather a combination of strategies is needed, especially when dealing with complex landscapes and management objectives (Stephens et al. 2010)." This is particularly important with regards to the multiple management objectives as described in the FEIS, Chapter 1, Purpose and Needs. Treatments that may meet fuels reduction objectives, may not meet other project objectives such as forest health.

28. **The proposed action for alternatives A and E do not have the appropriate number of acres of group selection as directed by the HFQLG Act. Group Selection units are to be located primarily in CWHR 4M Stands. The NFS lands within the project area contain approximately 16,230 acres of CWHR 4M Stands. The total acres of CWHR stands proposed for treatment in both alternative A and E is 3,998. Using the total acres proposed for treatment multiplying the yearly harvest level percentage of 0.57 and on a 20-year re-entry cycle results in 456 acres. Alternative A and E have identified 284 and 326 acres of group selection respectively. As of 2009, the HFQLG Pilot Project has accomplished 7,600 acres of group selection, which represents 18 percent of the total 43,000 acres originally identified in the HFQLG ROD. We have experienced this shortfall on a project level throughout the HFQLG Pilot Project Area. The agency, by not meeting this target has failed to promote stand restructuring and has severely impaired the economic viability of these projects. We request that both alternatives have the maximum number of acres allowed under the act be placed on the landscape within the project area.** (Tom Downing, Sierra Pacific Industries, pg. 1)

Response: Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail. Alternatives A and E proposed 2,882 acres of mechanical thinning or group selection treatments in DFPZ and Area Thinning units where commercial forest products would be harvested. Alternative E proposes 326 acres of group selection which is 11.3 percent of the area to be treated. The 11.3 percent based on a 20 year re-entry cycle is approximately equivalent to 5.7 percent based on a 10 year re-entry cycle as specified by the HFQLG FEIS and ROD. Under Alternative A, proposed acreage of group selection treatments was reduced to based on resource concerns raised during scoping, existing conditions and desired conditions, and the conceptual framework discussed in the PSW-GTR-220 (North et al. 2009). Alternative A proposes 284 acres of group selection treatments which is 9.9 percent of the area to be treated based on a 20 year re-entry cycle. For additional information regarding alternative development and design, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternatives A and E.

29. **Unit 84 in 2006 was to be mechanically thinned. In 2011, the treatment is hand pile and burn trees less than 8 inches DBH and underburn. Mechanically treating this unit as a DFPZ or area thin is being consistent with the purpose and heed of the project. Treating this unit by hand thinning will not result in significant fuels reduction, improve stand health, or contribute to the protection or enhancement of habitat for sensitive species.** (Tom Downing, Sierra Pacific Industries, pg. 2).

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence. Between 2006 and the proposed action, concerns regarding occurrences of noxious weeds within proximity of the unit were identified. Please refer to the FEIS, Appendix A table 2. The Forest Vegetation ,Fuels, Fire, and Air Quality analysis indicates that for this unit, hand thinning treatments would create an open canopy stand (approximately 37 percent canopy cover) of low density (approximately 31 percent relative density) and would effectively reduce ladder fuels and potential fire behavior and effects. Therefore, the proposed treatment would still meet desired conditions as described in the FEIS, Chapter 1, Purpose and Need for Reducing hazardous fuel accumulations and Improving forest health.

30. **EPA acknowledges the importance of the project's goals to improve forest and watershed health, reduce fuel loading, and protect and enhance habitat for sensitive plant and wildlife species. The preferred alternative (Alternative A) proposes to construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs) and to decommission on mile of roads. We recognize the long term benefits of decreasing wildfire risk, and we support the inclusion of the resource protection measures and best management practices described in the DEIS. We have rated the DEIS as Lack of Objections.** (Kathleen Goforth, Environmental Protection Agency, pg. 1).

Response: Noted.

31. **We recommend the FEIS include a more detailed description of climate change and the implications for successful reforestation. The DEIS notes climate change trends, such as summer drought, may increase the frequency and severity of wildfires (p. 229). We encourage the Forest Service to elaborate on aspects of the project's monitoring related to climate change, including temperature and precipitation, and how they can be incorporated into the goals of successful fuel management and watershed restoration. For example, describe and evaluate projected climate change impacts on the severity and frequency of insect outbreaks, droughts, and fire seasons in the Plumas National Forest and how these anticipated effects will impact the Keddie Ridge project's objectives of forest and watershed health. WE encourage such discussion in NEPA documents since it contributes to improved federal decision-making and public understanding of the effects of climate change on forest ecosystems and forest management, particularly the effects of hotter and drier conditions in stressing trees and contributing to the increasing frequency of bark beetle outbreaks.** (Kathleen Goforth, Environmental Protection Agency, pg. 1).

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2, Improving forest health. The desired condition for forest health includes improving forest resiliency to drought, fire, and insect and disease occurrences. In addition, please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Environmental Consequences, Comparison of Effects by Alternative ,Direct and Indirect Effects : Air Quality, Cumulative Effects: Air Quality, and Climate change considerations for a discussion of air quality and considerations regarding climate change. In addition, the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A includes discussion regarding climate change, likely trends in climate change, uncertainty in climate change, and a project level discussion regarding proposed alternatives and climate change. Lastly, the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B includes discussion on the need for fuel treatments, the scale and intensity of proposed treatments under the alternatives, and the interaction of fuels and forest health objectives.

32. **What is the reason for eliminating the use of Borax for control of root diseases from [Alternative E]?** (Frank Stewart, Counties' QLG Forester, pp. 1-2)

Response: Please refer to the commenter's April 26, 2010 comment letter requesting that the use of "herbicides" be pulled from the project proposal due to potential appeals and challenges. Borax is a fungicide which requires the equivalent analysis as an herbicide and has received similar comments and potential appeals on past vegetation management projects. Consequently, alternative E does not include any herbicide or fungicide treatments.

Wildlife: Terrestrial and Aquatic (WL)

1. **The DEIS fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the DEIS's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future.** (Chad Hanson, JMP, pg. 3)

Response: The proposed action is designed to treat a small percentage of the landbase in strategically located stands to reduce, protect and maintain habitat attributes at the larger scale landscape, which support key wildlife species and biodiversity. It is acknowledged that treatments at the stand level remove attributes that contribute to suitable forest dependent wildlife habitat. This occurs on 5,953 acres over a total of 66,040 acres (9 percent of the analyzed Forest System land in the wildlife analysis area). Yet at the stand scale, treatments maintain and create elements of biodiversity not found on the landscape, including open canopied stands composed of large trees, interspersed with small gaps and openings. This is actually moving biodiversity in a positive way, creating habitat not well represented from habitat considered abundant, and protecting this habitat from stand replacing fire. Please refer to response to comments WL#2, FVFFAQ #23.

2. **The DEIS shows that there are currently low levels of large (over 15 inches in diameter) snags per acre in the Project Area, relative to the needs of many cavity-nesting wildlife species. Yet the DEIS utterly fails to provide any quantitative estimate of the density of large snags within the Project area within coming decades after Project implementation (e.g., 10, 20, 30 years after logging), or any analysis of adverse impacts to cavity-nesting species due to further reductions in large snag densities in future decades from stand density reduction, reduced competition between trees, and the consequent reduction in large snag recruitment. This is a major concern because, due to proposed stand density reduction, large snag densities could remain at deficient**

levels relative to minimum wildlife needs for decades if the Project is implemented. The DEIS does not analyze the adverse impacts of stand density reduction, and perpetuating large snag deficits, on wildlife species that depend directly or indirectly upon substantial large snag densities, including California spotted owl (Sensitive Species), Northern Goshawk (Sensitive Species), Hairy Woodpecker (MIS), and Pileated Woodpecker. (Chad Hanson, JMP, pp. 3-4)

Response:. Table 12 in the FEIS (p.58) presents existing conditions of forested stands in the project area. On average, snags per acre greater than 15" dbh exist at 3/acre in CWHR 4 and CWHR 5 stands. For a discussion on how natural background levels of mortality and project treatments scale and intensity from the perspective of reducing stand density and reducing competition between trees would contribute to future snag recruitment please refer to response to comment FVFFAQ #8. Please refer to FEIS, Chapter 2, Alternatives Considered in Detail, Design Criteria common to all action Alternatives and response to comment FVFFAQ #3 for snag retention design criteria.

The wildlife analysis presented in the FEIS Chapter 3, BE, and MIS Report discusses impacts at the stand and landscape level. Many habitat factors were considered, including within stand structural changes (basal area, canopy cover, snags/acre) and the impacts these changes have on habitat suitability and habitat functionality at both the stand and landscape scales. Analysis of California spotted owl, northern goshawk, and Hairy woodpecker (MIS) are documented in the aforementioned reports. The pileated woodpecker is not specifically analyzed; it is not a TES or MIS species. Habitat provided by snags in Green Forest is analyzed at the project scale and is represented through analysis with the Hairy woodpecker. The pileated woodpecker is a species that uses snags in both green and burned forest. There is no burned forest in the Keddie Ridge Project treatments, thus the changes to habitat for the Hairy woodpecker are representative of direct impacts to snag densities for pileated woodpeckers. In addition, the green forest habitat analysis conducted for goshawks and spotted owl also represent habitat impacts to habitats used by pileated woodpeckers.

Under the Keddie Ridge Project snags would not be designated for removal unless it is a hazard tree, and where large down woody desired conditions are not met, snags would be left for wildlife habitat. Please refer to response to comment WL #13, FVFFAQ #3, and FVFFAQ #8.

3. **The Project documents fail to discuss the fact that patches of high-intensity fire support very high levels of native biodiversity and many wildlife species depend upon such habitat (Hutto 1995, Hutto 2006, Noss et al. 2006, Hanson 2010, Swanson et al. 2010). The DEIS describes fire intensities other than low intensity as being wholly negative for the forest ecosystem and the wildlife species that inhabit it, and this is inaccurate.** (Chad Hanson, JMP, pg. 5)

Response: The FEIS, Chapter 3 Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment shows that within the Keddie Ridge Project, forested stands are highly vulnerable to the effects of uncharacteristically severe wildfire – over 70 percent of NFS lands within the analysis area have a high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Please see response to comment FVFFAQ #26.

The Keddie Ridge Project proposes to treat 5,953 acres to meet desired conditions of an uneven-aged multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Reducing hazardous fuels would meet the objective of modifying fire behavior to protect communities, fire fighters, and biological resources. Approximately 60,000 acres of Forest System lands in the analysis area would remain untreated, with the majority of this acreage remaining highly vulnerable to the effects of uncharacteristically severe wildfire. Therefore, the proposed actions do not preclude high severity burns from occurring in the majority of lands being left untreated. Rather they would reduce the potential of large scale high severity wildfires from occurring in the project area. The effects from the Moonlight Fire of 2007, which burned thru similar habitat conditions which exist in the Keddie Ridge Project area, resulted in high amounts of continuous forest cover fragmentation and severe adverse effects to wildlife species which depend on forested conditions (USDA 2009c).

Early seral habitat created by high intensity wildfires such as the Moonlight Fire of 2007 is discussed in the FEIS (p.151) and BE (p.66). It is acknowledged in the FEIS/BE that such habitat created by wildfire 'are used extensively by early seral and midseral wildlife species but not used by species requiring old forest and continuous forest conifer cover.'(ibid). For a discussion of project impacts to early seral habitat please refer to pages 19-23 of the MIS Report.

4. **In December of 2006, the District sent out a scoping letter stating the proposed action with a map of units and treatments. Unit 84 in 2006 was to be mechanically thinned. In 2011, the treatment is hand thin, pile, and burn trees less than 8 inches DBH and underburn. Mechanically treating this unit as a DFPZ or are thin is being consistent with the purpose and need of the project. Treating this unit by hand thinning will not result in significant fuels reduction, improve stand health, and contribute to the protection or enhancement of habitat for sensitive species.** (Tom Downing, SPI, pg. 2)

Response: A Northern goshawk Protected Activity Center was delineated between 2006 and 2010. The logging system for unit 84 was changed to reduce the impacts to the new PAC and group selections were not permitted. Refer to the FEIS, Appendix A, Tables 1, 3, 5, and 7 for unit specific information.

California Spotted Owl

5. **The project reduces spotted owl habitat quality in the project area to unacceptable levels. Basal area is below recommended levels by owl experts. The BE and DEIS estimate 160-320 ft^2 per acre basal area provides optimal spotted owl habitat (DEIS p. 146). Verner et al. (1992) provides a similar estimate. However, the Keddie project maintains less than even the lowest basal area, 140 ft^2 per acre, in CWHR 4 habitat, and 165ft^2 in CWHR 5 (BE p.146). High quality spotted owl habitat is rare, 10 out of 13 HRCAs have less than 62 percent habitat even for foraging (BE p.64) and should be maintained to support existing owls an provide dispersal, especially in light of the declining status of owls in the Lassen demographic study area.** (, Thomas et al., FL, pg. 2)

Response: Impacts to spotted owls and spotted owl habitat resulting from the Keddie Ridge Project are discussed and displayed in the BE (pgs. 57-70) and the FEIS (pgs. 143-154). Seventy-five percent of the CHWR 4M/4D and CWHR 5M/5D habitat treated under the Keddie Ridge Project (3,282 out of 4,368 acres) would be maintained at conditions recognized by the U.S. Fish and Wildlife Service (USDI 2006) as suitable for the California spotted owl (i.e. stands of trees 12 inches in diameter or greater, with canopy cover 40 percent or greater). Basal area was recognized in the BE and DEIS as an important habitat component to the owl and the effects to basal area in treated CWHR 4 and CWHR 5 stands disclosed. These basal area effects do not necessarily reduce stand conditions to unsuitable nor do they reduce owl habitat quality to unacceptable levels, as the commenter suggests. The basal area amounts that would be maintained falls within acceptable levels for the owl and in CWHR 5 stands would remain in the optimal basal area level (above 160 ft^2 per acre).

Page 64 of the BE that the commenter references does not discuss or show the amount of suitable owl habitat in HRCAs. Rather, it summarizes the effects of project treatments to habitat in thirteen 1.5 mile radius home ranges (4,500 acres), which is a much larger area than HRCAs (approximately 700 acres). Only Forest Service system lands were summarized in this home range analysis. A significant amount of private forested land is present in many of the 13 home ranges, which is acknowledged in the BE and DEIS as likely providing additional suitable habitat to the owl than what is shown in Table 12. Table 12 summarizes existing conditions and project treatment effects to all suitable owl habitat on Forest Service system land in owl home ranges, not just foraging habitat as the commenter states.

The HRCA analysis is discussed on pages 60-61 of the BE and Table 10 (pg. 61, BE). This analysis shows that 6 of 8 HRCA affected by the Keddie Ridge Project would be maintained at 80 percent or greater suitable habitat (4 above 90 percent). The remaining two HRCAs would have 69 percent and 74 percent suitable habitat.

The Lassen Demographic study does still show declines in this study area, but the PLAS owl module reports (2008-2010) indicate that populations in the study areas on the Plumas are stable. This is considered more site specific than the Lassen Demography study

6. **Canopy cover is reduced beyond suitable levels for spotted owl. The risk assessment in the BE (p.29), indicates that closed canopy conditions in the project area will not be retained and that there is a risk to more than half of the owl sites affected by the project area. Overall, canopy cover in DFPZs in CWHR 4 would be 30-40 percent (DEIS p.10-12). This is below the threshold at which owls are normally known to occur (DEIS p.124).** (Thomas et al., FL, pg. 2)

Response: Effects to spotted owls and spotted owl habitat resulting from the Keddie Ridge Project are discussed and displayed in the BE (p. 57-70) and the FEIS (p. 143-154). These sections show that 25 percent of owl habitat after treatment (1,086 of 4,368 acres) would be reduced to an unsuitable condition, due to the maintenance of canopy cover conditions below 40 percent. This reduced amount comprises a 3 percent reduction in all suitable owl habitat in the analysis area (BE, pg.46, DEIS, pg. 139). Therefore, contrary to the commenter's statement, the majority of existing closed canopy conditions would be retained post-project. The commenter is in error in reference to a risk assessment in the BE (p.29). There is no such risk assessment in the BE on that page or in any part of the BE that states the closed canopy condition risk the commenter is referring to.

The commenter's statement that canopy cover in DFPZs in CWHR 4 would overall be 30-40 percent is incorrect. Out of the approximate 5,175 acres of DFPZ proposed, 3,065 acres fall within CHWR 4M/4D stands. The three DFPZ treatments (out of eleven proposed) that would result in thinning CWHR 4 stands to below 40 percent canopy cover (FEIS, p. 11-12) fall within approximately 1,080 acres. This amount comprises 35 percent of the CWHR 4M/4D stands to be treated to DFPZ standards. Therefore, 65 percent of DFPZs in CWHR 4M/4D would not be reduced to below 40 percent canopy cover.

DFPZ's have never been designed to maintain owl habitat within the DFPZ treatment area; DFPZ landbase is devoted to a specific objective – alter fire behavior to allow for firefighters to suppress and keep fire from burning into larger blocks of forested habitat. Based on PLAS monitoring of the Meadow Valley Project Area, owl numbers have fluctuated during the life of the monitoring, both pre and post DFPZ/group selection implementation, but overall owl numbers have been stable in the Meadow Valley project area, which means implementation of DFPZ's between 30-50 percent canopy cover, at least in the short term, is still providing not only adult survival and persistence, but also successful reproduction.

7. **The Keddie BE identifies 16 PACs in the Keddie analysis area but only 6 nestlings have been found in the project area over a 10-year survey period.** (Thomas et al., FL, pg. 2)

Response: The commenter is referring to Table 4 of the BE (pg. 29). This table shows territorial status of 16 PACs, based on survey results from various years since 2002, a 9-year period. This table shows that only the 3 PLAS study area PACs have been surveyed each year since 2002. These three PACs account for 5 of the 6 nestlings shown in Table 4. Of the remaining PACs, 8 have been surveyed over two years, 2 have been surveyed 4 years, and 2 PACs not surveyed at all during this period. Table 4 does not, as the commenter infers, reflect ten years of surveys in each individual PAC.

8. **A primary focus for management should be to avoid "actions which further reduce the survival probabilities for adult females (which) will have disproportionately large and negative effects on population growth rate.**

As stated by leading owl scientists, *"[G]iven the current trend in California spotted owl populations, the most positive step that can be taken to reverse the apparent decline is to identify, and implement, those actions that will lead to increases in adult survival probabilities. Owl studies to date suggest that this will occur with <u>increased retention and recruitment of large trees and retention of closed-canopy conditions</u> throughout the Sierra Nevada landscape." (Blakesley et al. 2001, p. 675) (Emphasis added).* Recent updates to the spotted owl demography study incorporating 2005-2010 data indicate an ongoing decline in the Lassen study area (J.Keane, personal communication, February 3, 2011). This recent finding underscores the importance of implementing fuel reduction projects that protect old forest stand structure and species, and to avoid contributing to protected species population decline, as required by NFMA. (Thomas et al., FL, pp. 2-3)

Response: Actions designed to reduce stand density in strategic areas so that wildfires would burn less severe and thus destroy less acres of limited habitat is viewed as a large scale action that would protect important habitat blocks and habitat features that would "lead to increases in adult survival probabilities". Areas identified for owl management would be better protected from stand replacing events. Out of the 16 PACs in the analysis area, only 2 would be entered for a low intensity underburn treatment, which would result in no change to habitat suitability for the owl (BE, p.57). The BE (p.61) discloses that 8 of the 15 HRCAs in the Keddie Ridge Project would be entered for treatments. Four HRCAs would experience a reduction in suitable owl habitat due to canopy cover reductions and group selections (Table 10, BE, p.61). Six of the 8 treated HRCAs would maintain 80 percent or greater owl suitable habitat. The remaining two HRCAs would have post-treatment 69 percent and 74 percent suitability.

Mechanical thinning treatments would reduce canopy cover to lower limits within mid-seral CWHR 4M and 4D stands to accelerate growth of residual trees into late-seral open canopy stands characterized by CWHR 5. Thinning treatments in CWHR 5 stands and Riparian Habitat Conservation Areas would maintain more closed-canopy conditions as well as more intermediate and large-sized trees to retain later seral structure. On average, 97 percent of trees greater than 20 inches DBH would be retained in the Keddie Ridge Project area (FEIS, p.76).

9. **Research on habitat characteristics of areas similar in size to HRCAs supports the critical importance of retaining high quality habitat with large trees and high canopy cover in spotted owl territories. This correlates to higher owl occupancy and survival.** (Thomas et al., FL, pg.3,)

Response: The effects analysis for owl territories treated under the Keddie Ridge Project is based on suitable habitat availability on the PAC/HRCA level, the 500-acre nest core level, and the 4,500 acre home range scale. This analysis (BE, p.57-58, p.61-64) discloses that the majority of high quality habitat at each of these territorial scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions). The spotted owl effects determination made in the FEIS and BE is based on this multi-scale territorial analysis as well as on cumulative habitat availability on the landscape scale (BE, p.58-60) and implementation of the Keddie Ridge Project is not anticipated to result in loss of occupancy and productivity in known spotted owl territories (BE, p.68).

10. **The USFS risks expanding the Area of Concern 2 (AOC2) (Verner et al. 1992) by removal and degradation of spotted owl habitat in the Keddie project that reduces the likelihood owls will persist on the border of the AOC2.** (Thomas et al., FL, pp. 3-4)

Response: AOC2 is explained in the BE on page 30. AOC2 as defined in Table 3G of Verner (1992) is identified as a concern because of "a gap in known distribution, mainly on private lands, extends east-west in a band almost fully across the width of the owl's range". Private land in the west end of the Keddie Ridge Project is somewhat reflective of the private land situation within AOC2, but overall the majority of the landbase in Keddie is not impacted by private forest land. It is recognized that the 2007 Moonlight Fire Complex due to loss of owl suitability in severe burn areas, potentially expanded the east-west gap in distribution that defines AOC2. One of the primary objectives of the Keddie Ridge Project is to implement actions that would prevent another Moonlight Fire Complex from happening. If stand replacing fire occurs within the Keddie Ridge area, it is anticipated that this northeast section of the Plumas NF would definitely expand into the AOC's identified now. The actions proposed for implementation with the Keddie Ridge Project would not increase fragmentation or habitat continuity to a point that the AOC's may expand.

11. **The USFS should avoid serious negative impacts to spotted owls by retaining more canopy cover in the largest size classes of trees across the project area, rather than selling 137 mbf of trees >24" (DEIS Appx. D, p.2) which provide much-needed large tree stands used by owls and other federally protected species. The impacts are not adequately disclosed.** (Thomas et al., FL, pg. 4,)

Response: Commenter is inferring that the owl is a federally listed species and that there are others. This is a false inference. The California spotted owl is not federally listed. The Pacific fisher is a candidate (but not federally listed) and there are no other species classified as federally listed species on the Plumas NF requiring large tree stands.

The impacts to CWHR size and density classes as a result of implementing the Keddie Ridge Project proposed action are adequately disclosed in the FEIS (Ch.3 Forest Vegetation section, p.70-88, Ch. 3 Wildlife section, p.144-146) and the BE (p.58-60). The majority of trees >24" dbh proposed for harvest would occur in the approximate 284 acres of group selection. To meet the purpose of improving forest health and protect and enhance Forest Service sensitive wildlife (including the owl), all remaining stands to be treated in the Keddie Ridge Project (approximately 5,667 acres or 95 percent of units) would retain 73-100 percent of trees > 20" dbh (on average, 97 percent retention of trees greater than 20" dbh) (FEIS, p. 34, p.76).

Please refer to response to comments WL #4, WL #5, WL #7, WL #8

12. **Impacts to owl nest areas are not evaluated. Based on Blakesley et al. (2005), an evaluation at the 2,010-acre scale should be included in the project analysis.** (Thomas et al., FL, pg.4,)

Response: The effects analysis for owl territories treated under the Keddie Ridge Project is based on suitable habitat availability on the PAC/HRCA level, the 500-acre nest core level, and the 4,500 acre home range scale. This analysis (BE, p.57-58, p.61-64) discloses that the majority of high quality habitat at each of these territorial scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions). The spotted owl effects determination made in the FEIS and BE is based on this multi-scale territorial analysis as well as on cumulative habitat availability on the landscape scale (BE, p.58-60) and implementation of the Keddie Ridge Project is not anticipated to result in loss of occupancy and productivity in known spotted owl territories (BE, p.68). The Forest Service does not see a need for a fifth acre scale analysis to display any additional hard look at the risks to species habitat. Please also refer to response to comment WL #8.

13. **Effects to prey species are not evaluated.** (Thomas et al., FL, pg.4)

Response: The BE effects section for the spotted owl has been updated to include a discussion of the potential effects of treatments on spotted owl prey species (BE, p.61). The BE (p. 57-70) and FEIS (p. 143-154) analyzed the effects to spotted owl nesting and foraging habitat. The cumulative amount of change to suitable habitat resulting from Keddie Ridge Project implementation at four spatial scales (PAC/HRCA, nest core, home range, landscape) formed the primary basis for species effects determination. The MIS Report (p. 25- 27) discloses project effects to the northern flying squirrel, an important owl prey species.

14. **Snags and wildlife tree management intent unclear** (Thomas et al., FL, pg.4). **Alternative A does not acknowledge many concepts that are central to the GTR-220 (i.e. snag retention, old forest wildlife habitat, heterogeneity at multiple scales.** (Thomas et al., FL, pg .5)

Response: Additional clarification for snags and wildlife tree management to be followed under the Keddie Ridge Project and how this coincides with recommendations from the GTR-220 can be found in Appendix C of the Forest Vegetation Specialist Report (full title: Keddie Ridge Hazardous Fuels Reduction Project Forest Vegetation, Fire, Fuels, and Air Quality Report). The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity. Tree marking guidelines and wildlife habitat tree retention standards for the project which incorporates many concepts of the GTR-220 are presented in Appendix C of the Forest Vegetation, Fuels, Fire, and Air Quality Report. Please also refer to response to comments WL #3, FVFFAQ #8

15. **The DEIS fails to adequately divulge or analyze the fact that recent research reveals that California spotted owls preferentially select unlogged high-severity fire patches for foraging, while selecting unburned or low-severity areas for roosting (Bond et al. 2009).Unlogged high-intensity fire patches, with their rich array of montane chaparral and high abundance of large snags and downed logs (which, again, is not mimicked by logging), provide suitable foraging habitat for Spotted Owls (Bond et al. 2009), and the Project documents are obliged to acknowledge this.** (Chad Hanson, JMP, pp. 5-6)

Response: No high severity fire patches are to be logged with the project. No low-severity areas are to be logged with this project. No unburned patches within a fire perimeter are to be logged with this project. Heterogeneity provided by high severity fire will not change with this project. Since burned habitat is not treated with the Keddie Ridge Project, and any affects of treating the habitat discussed by the commenter will not occur, the project documents are not “obliged” to discuss this. The No Action Alternative effects section in the FEIS and BE discuss higher risk of stand replacing fires, but this consequence is not considered a foreseeable cumulative effect, and certainly any logging of future burned habitat is way beyond the planning horizon. Please refer to response to comment WL #3.

16. **The Wildlife BE (p. 27) inaccurately states that 20 Spotted owl PACs were lost in the Moonlight fire. All 20 of these Spotted owl territories were intensively salvage logged on both private and public lands following the Moonlight fire. To be accurate, in terms of reduced Spotted owl occupancy, the Wildlife BE and DEIS must acknowledge that the reduction in occupancy occurred after fire and intensive post-fire logging, not fire alone,**

which can have very beneficial effects for spotted owls, as discussed above. (Chad Hanson, JMP, pg. 6)

Response: The Revised Final EIS for the Moonlight and Wheeler Fires Project, as well as the BE for that project, were completed in June 2009. During the analysis period for the Moonlight Project, the Plumas Lassen Administrative Study owl crews surveyed the Moonlight- Antelope Complex Fire area for spotted owl for two years post fire (2008 and 2009). The BE for Moonlight Project used habitat based analysis as well as the results of the 2008 owl survey to conclude that PACs had been lost as a result of the Moonlight Fire. The results from 2009 surveys reinforced this conclusion. The two years of survey work suggested that the primarily high-severity Moonlight-Antelope fires do not support California spotted owls other than a single pair that was using the landscape and that owl detections were well-distributed within the non-burned buffer areas outside the fir perimeter. The results supported the PLAS hypothesis that high severity fires may result in greater negative effects on spotted owls (California Spotted Owl Module: 2010 Annual Report). The Keddie Ridge Project BE refers to the 2008 and 2009 PLAS surveys.

Within the Antelope portion of the burn complex, in late 2008 and into 2009 only roadside salvage/hazard tree removal occurred along the Indian Creek road and Antelope Lake area. No other area or units were salvage logged. In the much larger Moonlight portion of the complex, the first salvage project was the Eagle sale and it began logging the last week of August, 2009. This was immediately after the two-year PLAS owl surveys were completed. The commenter’s statement infers that owl PACs were lost due to salvage logging in Moonlight; the implementation timeline of these activities show that habitat within PACs was destroyed by high severity fire and subsequent surveys for owls confirmed that owls were not present at these territory sites for two years prior to salvage logging commencing.

17. **The DEIS does not acknowledge the adverse impacts to Spotted Owls from precluding some future high-intensity fire patches, in a mosaic of mixed-severity effects, through implementation of the Proposed Action.** (Chad Hanson, JMP, pg. 6)

Response: Implementation of the Keddie Ridge Project would not preclude future high-intensity fire patches, in a mosaic of mixed-severity effects. Please refer to response to comments WL #3.

18. **The DEIS fails to adequately acknowledge the impacts of the Project on future large snag levels, Spotted Owl prey levels, and Spotted Owls. The DEIS admits that the Project would reduce future large snag densities by reducing stand density and reducing competition between trees, but does not provide estimates of the extent of this reduction on future large snag densities in 10, 20, 30, or 40 years, and the impacts this would have on Spotted Owls.** (Chad Hanson, JMP, pg. 6)

Response: Effects to spotted owls and spotted owl habitat at the project scale and trends in habitat and populations at the bioregional scale are in the BE (p. 57-70), the FEIS (p. 143-154), and the MIS Report (p. 24-27). Please refer to response to comment WL #4, WL #5, WL #7.

For response regarding spotted owl prey species, please refer to response to comment WL #12.

For response regarding snag densities, snag recruitment, and effects to snags from reducing stand density and reducing competition between trees please refer to response to comments WL #2, WL #13, and FVFFAQ #8.

19. **Cumulative effects are inadequate. The Mt. Hough Ranger District should quantify, map, and disclose all projects that reduced old forest habitat on public and private land in the past that have led to the condition the project area is in today.** (Thomas et al., FL, pg. 5)

Response: The quantification of impacts from past projects to old forest habitat is presented in the FEIS, Appendix F, tables 1 and 2. These tables list the activity name, year of implementation, and acreage affected. The impacts from these cited projects on old forest habitat are generally discussed on page 65 of the FEIS, with specific mention of past activities that have resulted in conversion of mid to late seral forests to early seral structure and to those activities that have promoted closed-canopy, higher density stands of small trees with relatively high fuel loads. Current old forest habitat conditions in the Keddie Ridge Project analysis area reflect the aggregate impact of these past actions. Opportunities for owl population movement, expansion and persistence in the Mt. Hough Ranger District and PNF is primarily based on the existing quantity and quality of suitable foraging and nesting habitat. The vegetation layer used for cumulative effects analysis for the Keddie Ridge Project reflect these current conditions.

American Marten

20. **The DEIS does not acknowledge the marten's imperiled status. The DEIS does not discuss or acknowledge the apparent gap in the marten's distribution in the northern Sierra Nevada. Based on this new information, the marten's status is more imperiled than implied in the DEIS. NEPA requires that the project be reconsidered in light of this significant new information.** (Thomas et al., FL, pg. 6)

Response: The marten is a R5 sensitive species thus meeting the definition of sensitive: "designated because of low population numbers, or highly restricted range for which National Forests make up a significant portion of the habitat, or significant detrimental impact to the population may occur from management practices" (USDA 1988). This is acknowledged in the FEIS and BE. As well, distribution of known martens and effects from management actions of the Keddie Ridge Project are discussed in the project FEIS and BE. The 'new information' which the commenter states is based on research findings (Zielinski 2004, Zielinski et al 2005) that indicates marten populations appear to be discontinuous in the northern Sierra Nevada (i.e. an apparent population gap exists in this area). These findings are discussed and acknowledged in both the FEIS (p. 130) and BE (p. 38).

21. **The DEIS does not adequately disclose the project's impacts on the marten. First, vegetation treatments such as mastication, burning, and tree removal may eliminate snags and trees for future snag recruitment, and downed woody materials – all critical habitat elements for marten. DFPZ treatments eliminate understory altogether, thereby eliminating habitat for prey species such as tree squirrels and small rodents needing cover and downed**

woody material as well. The Keddie documents fail to take a hard look at likely impacts on the viability of marten in and adjacent to the project area. (Thomas et al., FL, pg. 7)

Response: The project's impacts on suitable habitat elements for the marten are disclosed in the BE (p. 78-82) and FEIS (p. 143-154, 160-164). Tree marking guidelines and wildlife habitat tree retention standards for the project are disclosed in Appendix C of the Forest Vegetation Specialist report. The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity.

The proposed DFPZ treatments would not eliminate understory altogether. As the FEIS (p. 146) and BE (p.60) discloses, under the proposed action a percentage of stand biomass would be retained in all mechanical thin units, including DFPZs. However, a large majority of this stand attribute would be removed to meet fuel reduction standards and the effects of this removal on prey species for the marten and other forest dependent sensitive species is discussed in the BE (p. 61). The MIS Report (p. 25- 27) discloses project effects to the northern flying squirrel, a prey species for the marten.

Please refer to response to comment WL #5, WL #12.

22. **The extent of cumulative impacts to marten habitat have not been described in the DEIS. The BE simply describes cumulative impacts from past USFS salvage harvest, selection harvest and private timberland management has contributed to "an open patchwork of early seral habitat" (BE p. 79). These impacts are not quantified or discussed further. Surprisingly, the BE concludes that even though the action alternatives would create habitat fragmentation, "connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high severity fire." (BE, p. 80). This conclusion is not supported by any tangible data or quantification of past and future impacts to marten habitat. Given the marten's sensitivity to forest fragmentation and habitat degradation, the implementation of the proposed action has the potential to threaten marten's viability and restrict its distribution. The DEIS should be revised to evaluate the amount and distribution of openings and open canopy habitat existing on private and public lands and to evaluate the site specific effect of placing groups selection openings near areas that currently or proposed for support open habitat conditions (ie. 30-40 percent canopy cover).** (Thomas et al., FL, pg. 7)

Response: Please refer to the FEIS (p. 162-164) and the BE (p. 80-82) for a full discussion and quantification of cumulative impacts to the marten. The BE (p. 80) discloses that cumulative impacts 'would result in increased "patchwork" of open habitat and young age class vegetation between mature forested stands within the analysis area.' The BE then provides further discussion of these impacts and quantifies all possible suitable habitat reductions and amount of contiguous habitat blocks available to the marten. Based on a potential reduction of 7% of suitable marten habitat the BE concluded that the proposed actions would not increase any large-scale, high-contrast fragmentation above existing levels. Implementation of any of the action alternatives would result in little change to available contiguous suitable habitat (BE, p. 80). Group selections placed in areas currently existing at or proposed to exist at 30-40 percent canopy cover following treatments have been analyzed in the FEIS and BE. These areas are discussed and quantified in the analysis as nonsuitable habitat for the marten and the cumulative amount of available suitable habitat following treatments is disclosed.

Please refer to response to comments WL #3, WL #13, FVFFAQ #8

23. **The statement that marten "usually select stands with 40 percent canopy cover" (DEIS p. 131) is inaccurate and does not reflect the marten's dependence on old forests with high canopy cover. The research summarized above demonstrates marten's preference for 50-100 percent canopy cover. The project effects analysis should be redone to accurately reflect potential impacts of canopy cover reduction and snag and large tree removal on marten.** (Thomas et al., FL, pg. 7)

Response: This was a language error in the draft EIS. The FEIS (p.131) and BE (p. 38) have been corrected and now state martens 'select stands with greater than 40 percent canopy closure for both resting and foraging'. The marten analysis was correctly based on what is accepted as suitable canopy cover stands selected by martens. Potential impacts of canopy cover reductions and snag and large tree removal on marten have been analyzed and discussed in the FEIS (p. 160-164) and BE (p. 78-82) and is based on accurate analysis of suitable canopy cover percentages, therefore the effects analysis does not need to be redone.

24. **We offer several strong recommendations for improving the project. The majority of habitat in the project area is old forest. Project impacts are greatest on old forest associated species such as spotted owl, great gray owl, goshawk, fisher, marten, and protected bats. The USFS should expand the project habitat improvement objectives to include these species as well as bald eagle. Improving habitat for old forest species in the short term should be a goal of the project and is compatible with fuels objectives. Prescriptions should be revisited to leave more large trees, more basal area and canopy cover in the larger trees in the stand, especially when these trees are clumped together. Refer to our public scoping letter for a full discussion of achieving these important wildlife considerations using the GTR-220. We also urge the USFS to drop 19 acres of mechanical treatments in forest carnivore network. The carnivore movement corridor should be managed to maintain and enhance this habitat.** (Thomas et al., FL, pp. 7-8)

Response: The majority of habitat in the project area is not considered as the commenter claims 'old forest'. As a result of past management activities the existing conditions of forests in the project area resemble the age and structure of other forests across the Sierra Nevada, which is "generally younger, denser, smaller in diameter, and more homogeneous" (McKelvey et al. 1996). This condition is typical of forests in the analysis area (FEIS, p.53). There is a dominance of CWHR size class 4 stands in the project area where diameter at breast height (DBH) ranges between 11 and 24 inches, which is the WHR small size class category (BE, Figure 1).

The impacts to CWHR size and density classes suitable to old forest species as a result of implementing the Keddie Ridge Project proposed action are disclosed in the FEIS (Ch.3 Forest Vegetation section, p.70-88, Ch. 3 Wildlife section, p.144-146) and the BE (p.58-60). The majority of trees >24” dbh proposed for harvest would occur in the approximate 284 acres of group selection. To meet the purpose of improving forest health and protect and enhance Forest Service sensitive wildlife (including old forest species), all remaining stands to be treated in the Keddie Ridge Project (approximately 5,667 acres or 95 percent of units) would retain 73-100 percent of trees > 20” dbh (on average, 97 percent retention of trees greater than 20” dbh) (FEIS, p. 34, p.76). Tree marking guidelines and wildlife habitat tree retention standards for the project are further disclosed in Appendix C of the Forest Vegetation, Fuels, Fire, and Air Quality Report. The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity.

The Plumas National Forest carnivore network is not incorporated into the Forest Plan as a land allocation with standards and guidelines; rather, it is a plan to evaluate impacts of specific projects on habitat connectivity. The FEIS and BE acknowledged that, cumulatively, the Keddie Ridge Project would slightly reduce habitat connectivity in the analysis area but ‘would not increase any large-scale, high-contrast fragmentation above existing levels’ and connectivity would ‘improve over time as conifer cover is restored through natural processes and increased protection from high severity fire.’(FEIS, p.163, BE, p.80). The project’s effects on the forest carnivore network would be negligible, due to the small amount of acreage proposed for treatment and little to no change to existing suitable habitat post project (ibid).

Please refer to response to comments WL #2, WL #4, WL #5, WL #10, FVFFAQ #8.

Pacific Fisher

25. **As the habitat on private lands is limited, the potential is high for the Pacific Fisher to permanently move on to public lands. The Keddie project area contains suitable denning and foraging habitat for fisher that should be maintained in high quality condition where it presently exists (generally CWHR 4D and 5D).** (Thomas et al., FL, pg. 8)

Response: We disagree with the commenter that fisher habitat on private lands is limited. Aaron Facka, lead researcher for the Northern Sierra Nevada Fisher Translocation Project, Sterling Tract Study recently met with PNF biologists and provided the most recent monitoring information for the 28 fishers released on private timberlands between December 2009 and February 2011. Results indicate that habitat on this private land tract is supporting a fisher population, with documented denning (35 den trees) and reproduction by 4 females all occurring on private land (A. Facka, personal communication, March, 2011). Monitoring data also shows the majority of all individual fisher movements since their release have been on private lands. Detections of released fishers on public lands (both the Lassen and Plumas National Forests) have primarily been from dispersing males, all of which have been documented returning back to private land (ibid). These male movements onto public lands are not considered relevant from a population establishment standpoint and there is no evidence at this time that any re-introduced individual has permanently moved onto the Plumas National Forest (ibid). In April, 2011 a fisher den established by a released Sterling Tract female, was located on the Lassen National Forest (ibid). Due to reproduction occurring on the Sterling Tract private land, the Forest Service anticipates that additional females may likely den on the Lassen NF in the coming years. Remaining fisher releases for 2011-2012 (8 females, 4 males) will likely occur closer to the Plumas NF than previous releases. Therefore, it is likely that the PNF will also have residing fishers in the next coming years.

Impacts to fishers and fisher habitat resulting from the Keddie Ridge Project have been discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). The amount of suitable habitat remaining for the fisher would not preclude fisher occupancy and residency establishment in the project area.

26. **Fisher habitat is characterized by dense conifer forest with structures suitable for denning and resting (Zielinski et al. 2004a and 2004b, Purcell et al. 2009). Providing for fisher habitat in the short and long term is critical to its persistence in the project area as well as the persistence of the larger population. The lack of fire resiliency of the forested areas is also a concern in the project area. We recognize that the reduction of surface and ladder fuels is important to improve the fire resiliency of the habitat. The challenge for this project is to strike an appropriate balance between habitat benefits for fisher in the short term while improving the resiliency of the stands. The Keddie project will render 44 percent of the CWHR 4M and 4D unsuitable to old forest associated species (DEIS p. 138). Unfortunately, the proposed action in the DEIS falls short of an appropriate balance and unnecessarily degrades fisher habitat placing this population at greater risk of extirpation.** (Thomas et al., FL. pg. 8)

Response: Fishers are not established or known to be occupying any part of the Keddie Ridge Project analysis area, therefore persistence of fishers in the project area, as the commenter states, is a misleading statement. Impacts to fishers and fisher habitat resulting from the Keddie Ridge Project have been discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). The analysis concluded that 'post-treatment amounts of suitable mesocarnivore habitat would provide similar numbers and size blocks of contiguous habitat as the existing condition. The reduction of 4.6 percent of suitable denning habitat and the reduction of 1.3 percent of suitable foraging habitat for the fisher would not cause any significant large-scale fragmentation of suitable habitat (table 8).'(BE, p.81). A primary objective of the Keddie Ridge Project is to implement actions to better protect landscape habitats, including fisher habitat, from stand replacing fire and resulting increased habitat fragmentation. The Keddie Ridge Project would render 34 percent (not 44 percent as the commenter states) of CWHR 4M and 4D unsuitable, either by opening the canopy cover to below 40 percent or by group selection (FEIS, p.138). This is a reduction of approximately 1,052 total acres, which when compared cumulatively to suitable CWHR 4M and 4D fisher habitat available post-treatment in the analysis area, equates to a 4 percent reduction (FEIS, p. 139, table 59).

Please refer to response to comments WL #2, WL #4, WL #5, WL #10.

27. **Impacts of the Keddie project at a smaller scale are not addressed. The wildlife analysis area is 115,000 acres, however female territories are typically much smaller, ranging from**

1,200-2,700 acres in the Sierra Nevada (Mazzoni 2002; Zielinski et al. 2004b). A focus at the 100,000+ acre scale overlooks the importance of stand level impacts to habitat quality for fisher and other old forest species. The environmental analysis should be revised to distinguish changes to habitat quality and quantity at both the home range and rest site scales, rather than changes to habitat that are averaged across the entire project area. (Thomas et al., FL, pp. 8-9)

Response: The smaller scale habitat analysis conducted for the spotted owl (BE, p.57-58, p.61-64) can be used as a proxy for smaller scale habitat analysis for the fisher since the same CWHR size and density stands are considered suitable for both species. That analysis, performed basically at the 500 acre,1,000 acre, and 4,500 acres scale, can be used as a surrogate for distinguishing changes to fisher habitat quality and quantity at both the home range and rest site scales. That analysis concluded that the majority of high quality habitat at each of these scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions).

Please refer to response to comments WL #8, WL #11.

28. **Recent efforts to apply rest site characterizations to the prediction of rest site suitability across the landscape indicate that thinning treatments can significantly reduce the quality of rest sites. Zielinski et al. (2010) used forest inventory and analysis (FIA) data from rest sites to create a model predicting rest site suitability. When thinning treatments were applied to actual landscapes on the Sierra National Forest suitability was reduced significantly for treatments that imposed 30" or greater diameter limits and reduced canopy close to 35-40 percent. Less intensive treatments (e.g., 12" dbh limit and retention of 60 percent canopy cover) resulted in only modest reductions in landscape level suitability for resting. This information and analytical tool should be used to evaluate the effects of the alternatives on fisher denning and resting sites. This tool could also be used to identify treatment units for which a less intensive treatment would benefit fishers while still meeting other project objectives.** (Thomas et al., FL, pg. 9)

Response: Potential direct, indirect, and cumulative effects to fisher denning and foraging habitat resulting from the Keddie Ridge Project's proposed four action alternatives are discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). This includes full analysis of the non-commercial alternative C, which proposes less intensive treatments compared to the other alternatives (e.g. a 12" dbh limit and maintaining CWHR 5 stands at 40 percent or greater canopy cover). It was concluded, based primarily on the amount of reduced habitat and remaining contiguous habitat blocks remaining after project implementation, that none of the action alternatives would likely trend the fisher towards federal listing or result in loss of viability.

29. **The Keddie BE states that there are no direct project effects to fisher (p. 77). This does not account for the possibility that fisher could occur in the project area during implementation of mechanical and prescribed burn activities. Potential direct effects include disturbance**

and vehicle collision, a major source of mortality in the Southern Sierra Nevada (SNAMP 2010). (Thomas et al., FL, pg. 9)

Response: Please refer to response to comment WL #24 which discusses recent monitoring results from the fisher translocation project occurring on private lands (Stirling Tract) to the west of the project area and Plumas National Forest. The conclusion in the BE that there would be no direct effects to the fisher was based upon the extreme likelihood that no individuals reside in the project area and would therefore not be directly impacted by project activities. For further clarification, this was based on 1) the known. distribution of fisher in California, 2) the behavior of the released fishers on the Stirling Tract, 3) that fishers are considered not within the project area based on numerous survey efforts/methodologies on the Plumas NF over time, 4) that fisher are not on the Plumas NF and that there is a 240 mile gap in fisher distribution north to south in California along the Sierra Nevada (the Plumas is not within the Southern Sierra Nevada where roadkill are a major source of mortality).

30. **The potential effects of habitat degradation and loss resulting from the Keddie project are further exacerbated by activities being undertaken on private lands. In the area immediately adjacent to the Keddie project, logging activities are proposed that would likely have a dramatic effect on fisher habitat quality (BE, p. 79). The simple conclusion that the Keddie project will contribute to an already existing "patchwork" of open, early-seral habitat (BE p. 79) suggests a perceived habitat stability on the Plumas National Forest, and an assumption that management activities have not or would not reduce suitability. These assumptions should be revised in light of the above information. Management activities are estimated to negatively influence habitat quality and such effects can have subtle and long lasting impacts to individuals. Small populations, such as this fisher population, are especially at risk to disturbance. This risk to species persistence is not adequately disclosed or mitigated in the DEIS.** (Thomas et al., FL, pg. 9)

Response: The Forest Service does not 'assume' that management activities have not or would not reduce suitability. Rather, the FEIS and BE fully disclose and acknowledge cumulative adverse effects of implementing the proposed actions, such as reductions in habitat availability, quality, and connectivity (FEIS, p. 160-164, BE, p. 77-80). Risks to fisher habitat appear to decrease with implementing fuel reduction actions described in the action alternatives when compared to implementing the no action alternative and risking another Moonlight Fire event. In regards to species persistence, please refer to response to comment WL #25.

31. **Black oak has been shown to be very important for fisher den sites (Zielinski et al. 2004). We are concerned with project impacts to oak. The Keddie project objectives highlight group selection as a tool to enhance shade-intolerant species. Although not conifers, black oak seedlings are shade-intolerant. True restoration may very well include hardwood as well as conifer enhancement in project objectives. Instead of restoring oak, the project proposes to cut black oak saplings in group selection units less than 6"dbh. This would interfere with a well-distributed age class of black oak across the landscape. Westside**

hardwoods are one of five management strategies outlined in the 2004 Framework ROD. Hardwood management and protection is central to the rationale for the Framework decision, and there are more management guidelines for oaks than for almost any other resource. Large and small black oaks should be retained in group selection units where operability allows, and Keddie should develop a management plan for oaks as outlined in Standard and Guide #25. (Thomas et al., FL, pp. 9-10)

Response: Zielinski et al. (2004) discusses the importance of large oak structures (greater than 27" dbh) to fisher resting habitat. The Keddie Ridge Project would not impact or remove such large hardwood structures. Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail, Table 6, Design Criteria for Group Selection which states: 'Where black oak is present, retain black oaks greater than or equal to 6 inches in diameter.' Due to the shrubby habit, multiple stems, and sprouting nature of black oaks less than 6 inches, these are more susceptible to damage from harvesting operations such as felling and skidding. In addition, thinning smaller leaders (less than 6 inches in diameter) of multiple stemmed oaks would encourage the growth and development of a primary stem or leader. This would promote tree habit development, which in due course would provide greater beneficial hardwood habitat attributes for fisher and other carnivores.

Hardwood management and guidelines were incorporated in the development of the Keddie Ridge Project. The project's treatments, silvicultural prescriptions and design criteria were designed to maintain important habitat characteristics and structures at the stand and landscape scale, including hardwoods. Please refer to Appendix C of the Forest Vegetation Report for additional criteria relating to hardwood retention and guidelines. Standard and Guide #25 does not apply to HFQLG projects (USDA 2004b, p.67).

Black-backed Woodpecker

32. **The DEIS fails to indicate that there would be adverse impacts of the Project on the Black-backed Woodpecker (BBWP), which is the only MIS bellwether species for all wildlife species associated with snags in heavily burned forest. This habitat type is very ecologically important, and supports high levels of native biodiversity (Swanson et al. 2010). The Project would affect Black-backed Woodpeckers for two reasons. First, recent science shows that pre-fire logging, consistent with the type of mechanical (commercial) thinning proposed in this Project, substantially reduces habitat suitability for Black-backeds even if the affected area later burns in a wildland fire, likely due to reduced potential densities of large snags upon which the birds forage (Hutto 2008, Hutto and Hanson 2009). Second, the DEIS predicts that the Proposed Action would serious reduce or totally eliminate the potential for moderate or high severity fire (passive or active crown fire) in the thinned areas. Black-backeds depend upon areas burned at higher fire severities (Hanson and North 2008, Hutto 2008). Further, the Project would threaten the viability of the Black-backed Woodpecker by further reducing potential habitat across the landscape. The MIS Report does not even**

include a section analyzing the impacts of the Project on the Black-backed Woodpecker. (Chad Hanson, JMP, pg. 5)

Response: The BBWP became an MIS species for the Plumas NF as a result of the Sierra Nevada Forests MIS Amendment Record of Decision (ROD) (USDA 2007e). Based on this ROD, "Species selected for inclusion on the MIS list must occur in and rely on the habitat they are intended to represent". The BBWP (along with the hairy woodpecker) was selected as an MIS because it represented a "species with special habitat needs that may be influenced significantly by planned management programs". Alternative 6 in the SNFMIS (and selected in the ROD) "will ensure that MIS are strongly associated with habitats we (USFS) are currently affecting with our management in the Sierra Nevada". The ROD further clarifies that, "The sole MIS requirement that is applied at the project-level is the assessment of habitat for MIS". The habitat that the BBWP was selected to represent at the bio-regional (Sierra Nevada) scale is "snags in Burned Forest". The hairy woodpecker was selected for "Snags in Green Forest". At the project scale, the Keddie Ridge Project is not treating any habitat classified as burned forest; thus no snags in burned forest are to be impacted. Thus at the project level, the assessment of the BBWP is that no change will occur as no habitat represented by the BBWP is affected. This results in no change in population or habitat trends across the bioregion. This is stated in the Keddie Ridge Project MIS Report (p.7). The Keddie Ridge Project is affecting green forest and thus snags in green forest is subject to an affects analysis; impacts to the MIS hairy woodpecker is articulated in the MIS Report.

Please refer to response to comments WL #2, WL #13, WL #14, FVFFAQ #8.

Watershed (Soils and Hydrology)(WT)

1. **Mechanical harvesting and 35 percent slope restriction statements in Chapters 2 and 3.** (Bill Wickman, AFRC, pp. 1-3; Tom Downing, SPI, pg. 2)

Response: Please refer to the FEIS, Chapter 2, Table 5. The FEIS has been modified to read "Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100') within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined."

2. **We recommend that the FEIS provide a map of the roads/trails proposed for improvement, as well as a detailed closure, restoration, and BMP plan for the proposed road decommissioning. Little information is present in the DEIS as to how the project will specifically improve watershed health. Additionally, the FEIS should explain how decommissioning those particular roads, and not others, will directly contribute to watershed improvements.** (Kathleen Goforth, EPA, pg. 2)

Response: Please refer to the "Hydrology Analysis—Direct and Indirect Effects Common to Alternatives A, C, D, and E" for a detailed description as to how the Keddie Ridge Project will specifically improve watershed health through road improvements and decommissioning. Please refer to the FEIS, Appendix H for a list of applicable project Best Management Practices and Appendix C for a map of roads/trails proposed for improvement.

3. **The soil survey information offers average numbers for various survey results but it is unclear if the reporting is accurate or appropriate to meet soil quality standards. Are the "Geographic Areas" identified in Table 68 management units, stands in an area of the project, or?** (Thomas et al., FL, pg. 14)

Response: As stated on pages 173-174 of the DEIS, standards and guidelines of the Plumas National Forest LRMP (as amended by the Record of Decision for the Sierra Nevada Forest Plan Amendment and the HFQLG FEIS and ROD) provide the relevant substantive standards to comply with the National Forest Management Act. The soil quality analysis standards presented in the Region 5 Soil Management Handbook are thresholds used for consistent project analyses across the Region, but – unlike the LRMP standards and guidelines - those thresholds are not a set of mandatory project standards or requirements, this was emphasized in a 2007 letter from the Regional Forester (USDA 2007b). Please refer to the table of soil survey results under the Soils Affected Environment section of the Hydrology and Soils report in the FEIS.

4. **The numbers of large down logs and fine organic matter reported in the DEIS on pg. 184 do not match the figures in Table 68, what is the range of large logs on a per acre basis in the Taylorsville/Peters Creek geographic area? Are down logs/ac in Table 68 the same as "large logs" at the bottom of pg. 184?** (Thomas et al., FL, pg. 14)

Response: Please refer to the table of soil survey results under the Soils Affected Environment section of the Hydrology and Soils report in the FEIS. Based on surveyed units, large down logs per acre range from 15-20 in the Taylorsville/Peters Creek geographic area. "Large logs" will be referred to as "large down logs" so as to clear up any confusion.

5. Detrimental soil compaction is at or above the acceptable threshold as required by the SQS and the PNF forest plan. The DEIS p.181 is incorrect to suggest that detrimental soil impacts from past activities and those likely to occur from the project should not be considered in the cumulative effects analysis. Acknowledging that past actions (compaction effects) exist and when coupled with impacts from the proposed actions continue a legacy of detrimental soil conditions that are not consistent with the Plumas National Forest Plan or existing law. (Thomas et al., FL, pg. 15)

Response: Cumulative and detrimental soil compaction was surveyed using the same protocol that has been used for the HFQLG Soil Monitoring Reports (and subsequent HFQLG Status Reports to Congress). That protocol directs that an increase in soil porosity of more than 10 percent indicates detrimental soil compaction. The Monitoring Reports then compare the areal extent of detrimental compaction with a 15 percent threshold, which is a LRMP standard and guideline for the Lassen and Tahoe National Forests but is not a standard for the Plumas National Forest. As stated on page 174, the Plumas NF LRMP contains a standard that, to avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Permanent landings and skid trails do not exist within the project area and the Keddie Ridge Project does not propose such permanent features. The revised Forest Service Manual for Soil Management states that a primary objective of Forest soil analyses is to inform managers of the effects of land management activities on soil quality and long-term productivity and to determine if adjustments to activities and practices are necessary to sustain and restore soil quality. The effects analysis for the Keddie Ridge Project states that the expected extent of detrimental soil compaction for each of the action alternatives would not be of a size or pattern that would result in significant changes to soil production potential for the activity area. Detrimental soil impacts from past activities (on private and NFS lands) and those proposed under the Keddie Ridge Project have been considered in the cumulative watershed effects analysis and are reflected in the existing condition and each alternative's ERA value.

Botanical Resources (B)

33. **What is the reason for excluding the other noxious weed treatments and eliminating the use of Borax for control of root diseases from [Alternative E]?** (Frank Stewart, Counties' QLG Forester, pp. 1and 2)

Response: Alternatives C and E propose treatment of noxious weed infestations with non-herbicide methods that include spring underburning, direct flaming with a propane torch, and limited manual removal. Additional treatments, or expansion of these proposed treatments to include all of the project's infestations, were not incorporated into these alternatives due to feasibility constraints, cost, and the lack of effective non-herbicide controls for species such as Canada thistle and hoary cress. Non-herbicide noxious weed treatments that were considered, but eliminated from detailed study, are discussed in detail under Alternative G (in Chapter 2). Please refer to response to comment FVFFQA #32 for a discussion regarding borax.

Economic and Social Environment (E)

1. **The average Plumas unemployment rate in 2010 was 16.8 percent, the highest in the last 30 years. All appropriate employment activities in the forest are welcome. Alternatives C and D do not provide adequate employment opportunities. I believe Alternative E will provide those opportunities.** (John Sheehan, PC, pg. 4)

Response: Each action alternative provides an estimate for potential employee income and direct and indirect jobs. The FEIS, Chapter 3, Social and Economic Environment section provides a discussion of employment opportunities.

2. **There appears to be a significant mathematical error in the economic analysis, appendix D, p.2, which overstates and masks the actual costs of the preferred alternative A.** (John Sheehan, PC, pg. 4)

Response: The mathematical error in appendix D has been corrected. All economic values listed in Chapters 2 and 3 have been corrected as well.

3. **A quick discussion of how the current social and economic situation that surrounded the most recent mill closures within the geographic area of consideration is worth discussing your consideration of providing a complete Social and Economic Analysis within the Keddie document.** (Bill Wickman, PCERC, pg. 1)

Response: Refer to the FEIS, Chapter 3, Social and Economic Environment section for a discussion of businesses within local communities including, but not limited to the timber industry. In order to represent all variables in the social and economic analysis more than the mill closure would need to be considered. Given the changing dynamic of businesses in rural communities, tracking open and closed businesses is not a variable of focus in this analysis. Unemployment is consistently monitored and figures within the social and economic analysis were updated to reflect the most recent unemployment rate. Unemployment reflects the impacts of the mill closure and is a better measure of our local economy. In addition, the social and economic analysis estimates the potential number of direct and indirect jobs and employee income that would be created as a result of implementing any given alternative. The estimates presented are a result of modeling and should be used as an indicator, not absolute values.

4. **Our rural counties cannot stand additional losses of volume that will translate into prolonged mill closures. The impact of the loss of the direct jobs causes the further loss of indirect and induced jobs. The mills closed nearly two years ago causing the loss of jobs. The loss of indirect and induced jobs is now starting to occur.** (Bill Wickman, PCERC, pg. 1)

Response: Refer to response to comment E #1.

5. **Within the three counties in 2009 we lost approximately 450 direct jobs. The associated jobs loss has caused dramatic loss in local community stability.** (Bill Wickman, PCERC, pg. 7)

Response: Refer to response to comment E #1.

6. **Over the last ten years, the School District's enrollment has declined from over 4,000 students to 2,344 today.. The combined loss of 25 percent receipts and loss of enrollment have devastated Plumas County schools. We are currently looking at the necessity to close schools in out four small rural communities within Plumas County.** (Bill Wickman, PCERC, pg. 6)

Response: Noted.

7. **Secure Rural Schools Act terminates at the end of this fiscal year and the current administrations' Draft 2012 Budget for the Forest Service includes a five year extension of the Act through 2016.** (Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Noted.

8. **As such, it is important that Alternative – E be selected as the preferred and action alternative in the Final EIS and subsequent Record of Decision because it provides 49 percent more total project sawlog volume, 39 percent more cable yarder sawlog volume, and 50 percent more skidder/tractor sawlog volume that Alternative – A, the "Collaboration Alternative". This will create additional revenues for the Treasury, FRR funds for Plumas County and additional**

urgently needed jobs for local contractors and associated businesses. (Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Noted.

9. **We support the management of stands located on steep ground using skyline harvesting. The project has identified 269 acres using this harvest method. A total of 131 acres will require whole tree yarding for both the sawlog and biomass components. Sawlog tops and limbs are required to be removed as product according to the design criteria. Sawlog trees will need to be limbed and bucked before yarding. Tree length yarding of the sawlogs will result undue residual tree damage. We request the requirement of yarding biomass be dropped for units 2, 4, 5, 21, 27, 28, 29, 56, and 59. We request the hand piling of slash and biomass be dropped for units 46,50,54,55,95, and 99a. The cost of treating biomass on steep ground far outweigh the benefits. In conducting the pilot project, the Forest Service shall use the most cost-effective means available to implement resource management activities.** (Tom Downing, SPI, pg. 2)

Response: Please refer to the FEIS, Chapter 2, Table 5 for design criteria specific to skyline units and DFPZs and area thinning treatments. There are six skyline units that propose trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. The remaining nine skyline units propose trees less than 10 inches DBH be removed and tops and limbs be yarded to the landing and removed as a product. It is anticipated that the remainder of the tree will be cut to length of 16 or 32 foot logs.

Refer to the FEIS, Chapter 1, Purpose and Needs section for a discussion of existing conditions, which drive proposed treatments and activities, to trend the landscape toward desired conditions. Yarding biomass and tops and limbs, as well has hand thin, pile, and burn, are proposed activities to meet the fuels reduction purpose and need. Although a cost is realized by implementing these activities, the Keddie Ridge Project IDT has identified the need to remove trees less than 12 inches DBH to meet fuels objectives. In addition, removal of tops and limbs is proposed to meet, rather than exceed, residual surface fuels objectives.

The proposed biomass (yarding and hand thin, pile, and burn) and surface fuels (removing tops and limbs) activities would contribute to full time jobs and employee related income. The cost of implementing proposed treatments is one variable among many when choosing to implement one alternative versus another.

10. Lateral yarding would require lift. Side hill set-ups would not be allowed. (Bill Wickman, AFRC, pg. 3) **Prohibiting side hill set ups is not justified. Side hill corridors can result in minimal residual stand damage if proper timber falling and yarding techniques are used. Permit the use of side hill corridors where appropriate.** (Tom Downing, SPI, pg. 2)

Response: The Forest Service Handbook Region 5 provides direction on side hill set ups. The design criteria does not prevent side hill yarding when there are short inclusions of side hill within the corridor. The treatments for these units are a thinning treatment from below. When a side hill set up is implemented, meaning the corridor is entirely side-hill yarding, the remaining stand is less protected, corridors increase in width, and the logs being yarded are more difficult to control. Thinning treatments are removing low volumes from the stand and residual stand protection is important.

Alternative Development/Selection (AD/S)

1. **The selection of Alternative A, the collaboration alternative may make you feel warm and fuzzy because of its title, it does nothing to meet the social and economic crisis that exists within Plumas County, in particular, Indian Valley. PCREC hopes that you will reconsider your alternative selection as we do not find an significant difference in environmental impacts between Alternative A and E. However, Alternative E does address the beneficial social and economical impacts that would also be offered to the other species not addressed in your EIS, the human species.** (Bill Wickman, PCERC, pg. 7)

Response: Please refer to the FEIS, Chapter 2 for a detailed description of how each alternative was developed; Tables 1-13 for design criteria specific to all action alternatives, treatments, and resource areas; and Tables, 14, 15, 15a, and 15b for a comparison of each alternative. An effects analysis for each resource is presented in Chapter 3 of the FEIS. All action alternatives contribute to the local economy through sawlog and biomass value, full time jobs, and employee related income, among other items.

Alternative A is designed to account for suggestions received from collaborators. Collaborators suggested careful consideration of prescriptions for units with regard to land allocation. For example, when treating a California spotted owl home range core area, the Mt. Hough IDT considered treating this land allocation differently than wildland urban interface land allocations. Alternative E is designed to follow Table 2 of the SNFPA ROD (USDA 2004b, pp.68-69) only, with no additional modifications from Table 2 direction. Alternative A provides a balance between resource impacts by proposing a variety of treatment intensities.

2. **The District has done a good job of outreach on this project. I believe everyone who is interested has had a chance to be informed and comment. However, I don't believe that there has been enough agreement on the project to call Alternative A the "Collaboration Alternative." There are substantive difference between Alternative A and Alternative E. There are significant revenue, US Treasury receipts, employment, and treatment methods deviation between the two and with the other alternative.** (John Sheehan, PC, p. 2; Bill Wickman, AFRC, pg. 5; and Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Refer to the FEIS, Chapter 1, Public Involvement section, and Chapter 2, Alternatives Studied in Detail section for detailed information on the collaboration process and development of each action alternative. In the introductory paragraph for alternative A in chapter 2 of the FEIS, collaboration is defined as it relates to the Health Forest Restoration Act (HFRA) and the Forest Service's authority and role. The Mt. Hough Ranger District's goal during collaboration was to solicit written comments, as required by HFRA, from interested parties, such that the IDT could incorporate as much similarly grouped criteria as possible into the proposed action, to accommodate a variety of interests, while still meeting standards and guidelines from the 2004 SNFPA FEIS and ROD (USDA 2004 a, b). There was no expectation that all interested parties would reach an "agreement," or that all interested parties' ideas and suggestions would be fully satisfied. There was no expectation of having all interested parties present at the same time. As a result of collaboration it was clear that the interested parties involved in collaborating have opposing views, ideas, and suggestions. The Mt. Hough IDT incorporated interested parties' comments and suggestions into the proposed action (alternative A) where appropriate.

Issue Identification from Scoping Comments

A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Keddie Ridge Project was published in the Federal Register on Thursday, April 1, 2010. The notice asked that comments on the proposed action be received by Friday, April 16, 2010. The purpose of the scoping process was to inform the public about the proposed action and purpose and need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period.

Comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. Issues are phrased as cause-effect relationships, the concept of describing a specific action and the environmental effect(s) expected to result from that action applies whether one is using an EA or an EIS. Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. Significant issues were defined as those where there may be a cause-effect relationship between a proposed action and a significant effect and the disclosure of that effect is documented in an EIS. Non- issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. Non-significant issues were identified as those not resulting in a significant effect. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…".

One verbal and thirteen written comments on the proposed action were received during the scoping period. After receiving scoping comments, the Mt. Hough Interdisciplinary Team (IDT) separated the issues into two groups: significant and non-significant. The Mt. Hough IDT created cause-effect relationships from each letter, where appropriate, and these relationships were categorized as issues. All issues identified resulted with no significant effects; therefore only non-significant issues resulted. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. Table 1 below includes scoping comments that resulted in issues (a cause-effect relationship was created) and provides rationale for why the issue was not significant. Two alternatives, D and E, were requested by commenters who submitted scoping comments during the scoping period. A complete set of comment letters, the list of comments that resulted in categories other than issues, and how those were processed can be found in the project record at the Mt. Hough Ranger District in Quincy, CA.

<table>
<tr><td colspan="5">Proposal: <u>Keddie Ridge Hazardous Fuels Reduction Project</u></td></tr>
<tr><td colspan="5">Interdisciplinary Team Review: <u>LL, KC, RB, RT, KG, CW, GR, MC</u> Date: <u>April-July 2010</u></td></tr>
<tr><td colspan="5">Responsible Official Approval: <u>Michael A. Donald</u> Date: <u>07/26/2010</u></td></tr>
<tr><th>Source</th><th>Scoping Comments</th><th>Screen 1

Issue or Non-Issue?

Cause-Effect Relationship?</th><th>Screen 2

Significant?

Alternative Elim. From Detailed Study?</th><th>Measures of Change</th></tr>
<tr><td rowspan="2">Letter and Source</td><td></td><td>List any possible issues, clarified in cause-effect relationship.</td><td>Significant (cause-effect relationship between a proposed action and a significant effect)? Yes or No?</td><td>Pertinent measures of change for each affected element.</td></tr>
<tr><td></td><td>If an issue statement may not be formed the comment is a non-issue.</td><td>Provide brief rationale and reasons why issues are determined to be non-significant.</td><td></td></tr>
</table>

Steve Brink - 4/5/2010	If sufficient commercial-size trees (where appropriate and consistent with the purpose and need) are not included, then most of the costs of the service items necessary to fully implement the project will not be covered.	**ISSUE** The project will be economically unviable if you don't cut enough large trees.	**NON-SIGNIFICANT ISSUE** There are a few options for implementing non-commercial components of this project. This project will be a stewardship project. Once the analysis for the economics of the project is complete, a determination will be made to request appropriated monies to implement any remaining service items that cannot be implemented using the value of the commercial-size trees.	**Measurement Indicators:** 1. Economics a) potential direct and indirect jobs b) volume of i) sawlogs and ii) biomass removed from public lands c) total cost d) potential employee income e) potential advertised value to the Government f) forest health improvements g) value of i) sawlogs and ii) biomass
Chad Hanson - 4/13/2010	The DFPZ proposal is inconsistent with current Forest Service science about protecting homes from fire. The only effective way to protect homes is to reduce the ignitability of the homes themselves and to thin brush and small trees within at most 100-200 feet of individual homes; therefore DFPZs are ineffective in protecting homes. Because DFPZs give homeowners a false sense of security, they increase risks to homeowners and divert scarce resources away from true home protection.	**ISSUE** DFPZs will give homeowners a false sense of security, leave homeowners with an increased risk of their home burning, and divert resources away from true home protection.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge HFR Project has 5 purposes and need statements. One purpose is to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources. There is currently no research indicating what and how homeowners feel about DFPZs and their associated risk to homeowners.	N/A

Chad Hanson - 4/13/2010	The SN fails to indicate the current densities of large (over 15 inches in diameter, and especially over 30 inches in diameter) snags in the Project area. Nor does the SN provide any quantitative estimate of the density of large snags within the Project area within coming decades after Project implementation (e.g., 10, 20, 30 years after logging). This is a major concern because stand density reduction reduces competition between trees and reduces the potential for large snag recruitment in future years—meaning that large snag densities could remain at deficient levels relative to minimum wildlife needs for decades if the Project is implemented.	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** A sufficient number of snags per acre will be left within each unit, the project area, and across the landscape to maintain the viability of snag dependent wildlife species.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre. The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre.	**Effects:** 1. Wildlife 2. Forest Veg

Chad Hanson - John Muir Project - 4/13/2010	The EIS must analyze the adverse impacts of stand density reduction, and perpetuating large snag deficits, on wildlife species that depend directly or indirectly upon substantial large snag densities, including California spotted owl (Sensitive Species), Northern Goshawk (Sensitive Species), Hairy Woodpecker (MIS), and Pileated Woodpecker. This is particularly important, given that the Forest Service's own research reveals that there is a pervasive deficit of large snags, relative to minimum habitat needs of native cavity-nesting wildlife species, in all forested regions of California (Christensen et al. 2008).	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** A sufficient number of snags per acre will be left within each unit, the project area, and across the landscape to maintain the viability of snag dependent wildlife species. The wildlife effects analysis in the EIS will provide an assessment of the number of snags per acres with regard to snag dependent wildlife species. The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre.	**Effects:** 1. Wildlife 2. Forest Veg

Chad Hanson - John Muir Project - 4/13/2010	There are now more openings and more open forests on the eastside of the northern Sierra Nevada than there were historically, and fewer dense, old forests. This is a special concern, given the fact that the Project appears to target dense, old stands. These dense, mature forest areas are the areas that are capable of producing (recruiting) large snags through competition between trees. If such habitat areas are already in deficit on the eastside, as the QLG FEIS states, then the Project would have significant adverse cumulative effects—i.e., cumulative effects on native wildlife species dependent upon high densities of large snags within green forests.	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is not on the eastside of the Forest as defined by the HFQLG EIS. The project area is in the transition zone. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	**N/A**
Chad Hanson - John Muir Project - 4/13/2010	The Project SN fails to indicate that there would be adverse impacts of the Project on the Black-backed Woodpecker, which is the only MIS bellwether species for all wildlife species associated with snags in heavily burned forest (p.4).	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat. The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

			Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	The Project would affect Black-backed Woodpeckers for two reasons. First, recent science shows that pre-fire logging, consistent with the type of mechanical (commercial) thinning proposed in this Project, substantially reduces habitat suitability for Black-backeds even if the affected area later burns in a wildland fire, likely due to reduced potential densities of	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat. The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

	large snags upon which the birds forage (Hutto 2008, Hutto and Hanson 2009). Second, the Project SN predicts that the Proposed Action would seriously reduce or totally eliminate the potential for moderate or high severity fire (passive or active crown fire) in the thinned areas. Black-backeds depend upon areas burned at higher fire severities (Hutto 2008).		Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape.	

Chad Hanson - John Muir Project - 4/13/2010	Further, the Project would threaten the viability of the Black-backed Woodpecker by further reducing potential habitat across the landscape, thus violating the forest plan's requirement to ensure viability.	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat.The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape.	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

Chad Hanson - John Muir Project - 4/13/2010	The SN fails to acknowledge potential adverse impacts to the Fox Sparrow, which is the MIS in the Sierra Nevada for the montane chaparral habitat created by high-intensity fire. These impacts must be analyzed, given that the SN predicts that the Project will seriously reduce or eliminate the potential for the high-intensity fire effects that create the montane chaparral habitat upon which the Fox Sparrow depends, and given the widespread elimination of montane chaparral habitat in the nearby Moonlight/Wheeler fire area through post-fire logging and conifer plantation establishment, and artificial conifer planting in the absence of salvage logging (p.5).	**ISSUE** The project will reduce or eliminate the potential for high intensity fire, therefore montane chaparral habitat will not be created, and the Fox Sparrow will therefore be adversely affected.	**NON-SIGNIFICANT ISSUE** Currently there is fox sparrow habitat in the Keddie Ridge Project. The wildlife and silviculture effects analyses in the EIS will provide an assessment of the montane chaparral habitat. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	**Effects:** 1. Wildlife 2. Forest Veg
Chad Hanson - John Muir Project - 4/13/2010	1) The SN fails to adequately divulge or analyze the fact that recent research reveals that California spotted owls preferentially select unlogged high-severity fire patches for foraging, while selecting unburned or low-severity areas for roosting (Bond et al. 2009). High-severity patches enhance habitat (e.g., montane chaparral, large downed logs,	**ISSUE** Logging high-intensity fire patches will reduce suitable foraging habitat for spotted owls.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project does not propose treating any burned areas. There is no purpose and need to removed burned timber. All areas that were burned by the Moonlight Fire have been removed from the analysis. The wildlife and silviculture effects analyses in the EIS will provide an	**Effects:** 1. Wildlife 2. Forest Veg

	and snags) for the Spotted Owl's small mammal prey species (Bond et al. 2009). The most recent scientific evidence makes clear that Spotted Owls benefit from natural heterogeneity created by patches of high-severity fire—habitat that is not mimicked by logging. Unlogged high-intensity fire patches, with their rich array of montane chaparral and high abundance of large snags and downed logs (which, again, is not mimicked by logging), provide suitable foraging habitat for Spotted Owls (Bond et al. 2009), and the Project documents are obliged to acknowledge this (p.5).		assessment of spotted owl foraging and nesting habitat. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	3) The SN fails to adequately acknowledge the impacts of the Project on future large snag levels, Spotted Owl prey levels, and Spotted Owls. Verner et al. (1992) recommended at least 20 square feet per acre of basal area of large snags (over 15 inches dbh), or about 7-8 large snags per acre on average, for suitable spotted owl habitat. Abundant large snags are essential for spotted owls	**ISSUE** The project will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height	**Effects:** 1. Wildlife 2. Forest Veg

	because owl prey species depend upon them (Verner et al. 1992). The SN admits that the Project would reduce future large snag densities by reducing stand density and reducing competition between trees. However, the SN does not provide estimates of the extent of this reduction on future large snag densities in 10, 20, 30, or 40 years, and the impacts this would have on Spotted Owls (pp. 5-6).		would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	1) The SN implies that stands in the Project Area exceed some desired percentage of the maximum stand density index for ponderosa pine. The SN fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the SN's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future (p.6).	**ISSUE** Reducing stand density below some arbitrary threshold will negatively impact wildlife species and further reduce large snag densities.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is incorporating cruise plot data into the FVS model. The FVS model projects a maximum stand density index (SDI), canopy closure, and upper diameter. The silviculture effects analyses in the EIS will provide an assessment of the FVS model inputs and outputs, SDI, canopy closure, and upper diameters, and will be presented in time intervals for future estimates.	**Snags Effects:** 1. Wildlife 2. Forest Veg **SDI Effects:** 1. Forest Veg

Tom Downing - Sierra Pacific Industries - 4/14/2010	Because the costs of falling, yarding, processing, and hauling biomass far outweigh the value of this product delivered to local electric generation plants, we recommend the agency drop the removal of biomass on skyline harvest acres.	**ISSUE** The inclusion of biomass on skyline harvest acres will make the project uneconomical.	**NON-SIGNIFICANT ISSUE** There are a few options for implementing the non-commercial components of this project. Once the analysis for the economics of the project is complete and a decision is issued, a determination will be made to request appropriated monies to implement any remaining service items that cannot be implemented using the value of the commercial-size trees. Economics will be analyzed using current prices in the EIS. Plumas County has 5 co-generation plants within a reasonable haul distance. There is a market for chips.	**Effects:** 1. Forest Veg 2. Fuels 3. Economics
Tom Downing - Sierra Pacific Industries - 4/14/2010	If prescribed fire is to be used as in the 2006 proposal (1604 acres underburned), then the agency may not be able to treat these acres in a timely manner due to unpredictable and limited windows of opportunity to burn. This will add to the current backlog of untreated acres. Therefore, mechanical treatments should be considered because they can reduce ground fuel loading while providing timely	**ISSUE** Prescribed fire treatments as proposed will not get implemented because of unpredictable and limited windows of opportunity to burn, thus adding to your current backlog of acres.	**NON-SIGNIFCANT ISSUE** Currently, the Mt. Hough Ranger District uses prescribed fire (pile and underburning) to treat approximately 1,000-2,000 acres per year. Past and current trends with air quality restrictions, limited burn days, and extended fire seasons, are expected to continue. Therefore, based on the amount of burning the Keddie Ridge Project is proposing (approximately 6,000	**Effects:** 1. Fuels

	implementation.		acres) implementation of prescribed fire would take about 6 years to complete. The estimated 6 years needed to implement approximately 6, 000 acres of underburning and pile burning is considered timely.	
Frank Stewart - Counties' QLG Forester - 4/16/2010	Herbicides should not be included in this project because their use in the project will be used by obstructionists to appeal and challenge the project from going forward. Because herbicides will hold up the project, they should be examined in a separate NEPA document.	**ISSUE** If herbicides are included in the project, then the project will get held up in court and never implemented.	**NON-SIGNIFICANT ISSUE** An alternative will be analyzed that will exclude the use of herbicides for noxious weed control.	**Measurement Indicators:** 1. Botany **Effects:** 1. Botany 2. Grazing 3. Recreation 4. Wildlife
Vanessa Vasquez - CATS - 4/19/2010	How will the undergrowth vegetation that will grow rapidly where the canopy is opened up (after DFPZ creation) in these heavily thinned areas be managed? CATs is concerned that forestry management tactics (i.e. DFPZ creation) will lead to future use of herbicides from native brush re-growth and the spread of invasive plants through disturbance, including greater	**ISSUE** When you create DFPZs, you will need to come back in and use herbicides to clear native brush.	**NON-SIGNIFICANT ISSUE** Herbicides will only be applied to non-native noxious weeds. At this time, there is no intention to apply herbicides to native brush or to maintain DFPZs within the Keddie Ridge Project area.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation

	sunlight reaching the forest floor.			
Vanessa Vasquez - CATS - 4/19/2010	The use of herbicides to manage vegetation creates potential for water pollution (p.1).	**ISSUE** Herbicide use will create the potential for water pollution.	**NON-SIGNIFICANT ISSUE** The effects analysis in the EIS will provide an assessment of herbicide use and the potential for water pollution. In all alternatives, herbicide treatments will be designed to minimize the risk of water contamination; herbicides will be applied at recommended rates, site specifically, and with design criteria specific to each herbicide and/or noxious weed.	Effects: 1. Watershed 2. Wildlife (aquatics) 3. Recreation 4. Human Health Chapter 2, Design Criteria

Vanessa Vasquez - CATS - 4/19/2010	Creating bare earth with herbicides, such as non-selective ones like the proposed glyphosate, creates a situation where banks become destabilized or heavy rains wash dirt into streams and lakes. Therefore, only non-chemical vegetation treatments should be used, and native plant re-seeding and re-vegetation should be designed and implemented to prevent invasion of unwanted species (p.1).	**ISSUE** Glyphosate use will cause bare soil, which will in turn cause erosion.	NON SIGNIFICANT ISSUE The glyphosate treatments proposed within riparian areas incorporate design features that will minimize the amount of bare soil created from herbicide applications. These features focus on minimizing drift to non-target vegetation and include wick applications and wind speed restrictions. In areas where bare soil is considered to be a concern, re-vegetation (using native plants) will be incorporated.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation Chapter 2, Design Criteria
Vanessa Vasquez - CATS - 4/19/2010	Herbicide use in sacred sites and historic collection and foraging areas will affect both native basket weavers and plant materials collectors. What basketry materials are present in the project area? Are basketry materials found in areas where herbicides are planned for use? Do members of the public have permits to gather seeds and other materials in or near the project area? Will signs be posted prior and post herbicide application? The EIS will need to mention the effects of herbicide application to non-target, non-timber forest products collected by tribal members or the general public.	**ISSUE** If you use herbicides in sacred sites or sites where collection occurs, then native basket weavers and plant materials collectors will be adversely affected.	**NON-SIGNIFICANT ISSUE** Consultation has been initiated with tribes. There is one known bear grass area south of Canyon Dam. We will not spray in or around the Canyon Dam bear grass areas. No other plant collection areas are known in the project area. The weed infestations are not documented collecting sites. There are no individuals with permits to collect in these areas. A human health risk assessment will be incorporated into the EIS. Signs may be posted prior and post herbicide application. All relevant federal, state, and local laws will be followed with respect to herbicide application.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation 6. Human Health 7. Cultural Resources Appendix I

Vanessa Vasquez - CATS - 4/19/2010	Glyphosate can have harmful effects on non-target plants and native soil microorganisms. Glyphosate and the toxic surfactants it is mixed with translocate from the body of the plant into the root where it leaches into soil and affects soil organisms.	**ISSUE** Glyphosate use will cause harmful affects on plant and native soil microorganisms.	**NON-SIGNIFICANT ISSUE** The EIS will include an analysis of the potential effects of glyphosate on non-target plants and soil microorganisms. All proposed glyphosate treatments include criteria (i.e. wick applications) to minimize herbicide drift to non-target vegetation and the soil surface. The proposed surfactant will be fully analyzed in the EIS.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation Chapter 2, Design Criteria
Vanessa Vasquez - CATS - 4/19/2010	Bare chemically treated soil provides an opportunity for hardy non-native weeds to establish colonies and out-compete the already struggling native plant species.	**ISSUE** Herbicide use will cause bare soil, which will in turn allow non-native weeds to establish.	**NON-SIGNIFICANT ISSUE** The proposed herbicide treatments incorporate features designed to minimize drift and reduce the amount of bare soil resulting from herbicide application; these include the use of selective herbicides wherever feasible and wick application in sensitive habitats. Standard Management Requirements are also incorporated into all Plumas NF projects to limit the risk of noxious weed introduction, establishment, and spread.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation Chapter 2, Design Criteria Appendix H

Vanessa Vasquez - CATS - 4/19/2010	Chlorsulfuron is listed on the California Safe Drinking Water and Toxic Enforcement Act of 1984 (Prop 65) as a known female and male developmental toxin. It is also listed on the CA Department of Pesticide Regulation Groundwater Protection List for its known potential to pollute groundwater. This herbicide seems a particularly risky choice for our public lands and especially a project that aims to “improve watershed health”.	**ISSUE** Chlorsulfuron will cause effects to watershed health.	**NON-SIGNIFICANT ISSUE** Chlorsulfuron will not be used in this project. Publication of chlorsulfuron in the scoping attachment was in error.	N/A
Vanessa Vasquez - CATS - 4/19/2010	Aminopyralid is extremely persistent and when ingested by grazing mammals, it passes through the system unchanged and maintains its toxicity. This chemical is of great concern because of the potential to affect foraging wildlife and non-target plants after excretion.	**ISSUE** Aminopyralid use will cause effects to foraging wildlife and non-target plants.	**NON-SIGNIFICANT ISSUE** The effects analysis in the EIS will provide an analysis of aminopyralid and its potential impact to non-target plants and wildlife. . In all alternatives, herbicide treatments will be designed to minimize the risk of water contamination; herbicides will be applied at recommended rates, site specifically, and with design criteria specific to each herbicide and/or noxious weed.	Effects: 1. Botany 2. Wildlife 3. Cultural Resources 4. Grazing

Vanessa Vasquez - CATS - 4/19/2010	Herbicides are not an appropriate choice of treatment for Canada thistle or Scotch broom because both populations are relatively small and have recorded marginal success with chemical treatments alone. Chemical treatments for these plants will require a follow-up treatment, leading to compounding toxins impacting soil, water, and non-target species.	**ISSUE** Chemical treatments for Canada thistle or Scotch broom will require a follow-up treatment and lead to compounding toxins impacting soil, water, and non-target species.	**NON-SIGNIFICANT ISSUE** Herbicide treatments are not proposed for Scotch broom; publication of herbicide treatment for Scotch broom in the Keddie project scoping attachment was in error. The botany effects analysis in the EIS will provide an analysis of proposed herbicides.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation

Appendix H

Standard Management Requirements and Monitoring

Wildlife and Fisheries

The wildlife and fisheries standard management requirements (SMRs) are contained in the Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment/Biological Evaluation. This report is part of the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) record on file at the Mt. Hough Ranger District; a copy is available upon request.

Bald Eagle

A Limited Operating Period (LOP) would be implemented not allowing area thinning treatments in the Round Valley bald eagle territory (units 75 and 75a) between January 1 and August 15 along National Forest System (NFS) road 26N19. No log haul is to occur on this road during the LOP.

California Spotted Owl

Limited Operating Periods (LOPs) would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections. An LOP would also be applied to haul routes within 0.25 mile of an active nest from March 1 to August 15. LOPs are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location.

Northern Goshawk

Limited Operating Periods (LOPs) would be implemented for treatment units and haul roads within 0.25 mile of active nest sites from February 15 to September 15. The LOPs are expected to eliminate effects from increased human activity and vehicle and equipment noise. If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, protected activity centers (PACs) would be delineated and applicable resource protection measures (such as LOPs) would be applied.

Mountain Yellow-Legged Frog

1. Slash piles would be ignited using a pattern that allows frogs to escape the fire. For example, piles would be lit at one end and an area would be left unlit in order to serve as an escape route.
2. Water drafting sites would be located and managed to minimize adverse effects on sedimentation and in-stream flows required to maintain riparian resources, channel condition, and amphibian habitat. Forest personnel and contractors would use the Forest Service approved suction strainer (FGM 5161) or other foot valves with screens having openings less than 2mm in size at the end of drafting hoses. Drafting sites would be visually surveyed for frogs and their eggs before drafting begins. The suction strainer would be inserted close to the substrate in the deepest water available; the suction strainer would be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid substrate and amphibian disturbance (the Water Drafting Plan is available elsewhere in this appendix).

3. Effectiveness monitoring of all applicable best management practices (BMPs) would occur for all prescribed burns or fuels management projects.
4. The Forest would prevent underburns or broadcast burns from entering riparian vegetation within identified suitable habitat, as delineated by the presence of riparian vegetation. Methods include the timing of ignition, ignition pattern, wet line, use of natural barriers, line construction or other methods that prevent the burn from entering riparian vegetation. If fire lines are employed, they would not be wider than 36 inches, unless they already exist.

Hydrology and Soils

The hydrology and soils standard management requirements (SMRs) are displayed in the Keddie Ridge Hazardous Fuels Reduction Project Watershed Report. This report is part of the Keddie Ridge Project record on file at the Mt. Hough Ranger District; a copy is available upon request.

Water quality would be protected through the use of BMPs (USDA 2000). BMPs are the primary method employed by the Forest Service and the State of California to prevent water quality degradation and to meet California State water quality objectives relating to nonpoint sources of pollution. BMPs were incorporated in the design of the action alternatives and are listed under the regulatory framework (Table 1).

Table 1. Best Management Practices (BMPs).

Resource Concern	Standard Management Requirements		Responsible Person(s)	Timeframe
Implement Best Management Practices (BMPs):				
Timber Management Practices				
Wildlife Fish Soils Hydrology	1.1	Planning Process	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	1.2	Timber Harvest Area Design		
	1.3	Use of Erosion Hazard Rating (EHR) for Timber Harvest Area		
	1.4	Use of Sale Area Maps for Designating Water Quality Protection Needs		
	1.5	Limiting the Operating Period of Timber Sale Activities		
	1.6	Protection of Unstable Lands		
	1.8	Streamside Management Zone Designation		
	1.9	Determining Tractor Loggable Ground		
	1.10	Tractor Skidding Design		
	1.11	Suspended Log Yarding in Timber Havesting	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	1.12	Log Landing Location		
	1.13	Erosion Prevention and Control Measures During Timber Sale Operations		
	1.14	Special Erosion Prevention Measures On disturbed Land		
Wildlife Fish Soils Hydrology	1.15	Re-vegetation of Areas Disturbed by Harvest		
	1.16	Log Landing Erosion Prevention and Control		
	1.17	Erosion Control on Skid Trails		
	1.18	Meadow Protection During Timber Harvesting		
	1.19	Streamcourse Protection		
	1.20	Erosion Control Structure Maintenance		
	1.21	Acceptance of Timber Sale Erosion Control Measures		

Resource Concern	Standard Management Requirements		Responsible Person(s)	Timeframe
		Before Sale Closure		
	1.22	Slash Treatment in Sensitive Areas		
	1.23	Five-Year Reforestation Requirement		
	1.25	Modification of the Timber Sale Contract		
Road and Building Site Construction Practices				
Wildlife Fish Soils Hydrology	2.1	General Guidelines for the Location And Design Of Roads	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	2.2	Erosion Control Plan		
	2.3	Timing of Construction Activities		
	2.4	Stabilization of Road Slope Surfaces and Spoil Disposal Areas		
	2.5	Road Slope Stabilization		
	2.6	Dispersion of Subsurface Drainage from Cut and Fill Slopes		
	2.7	Control of Road Drainage		
	2.8	Timely Erosion Control Measures on Incomplete Roads and Streamcrossing Projects		
	2.9	Timely Erosion Control Measures on Incomplete Roads and Streamcourses		
	2.10	Construction of Stable Embankments (fills)		
	2.11	Control of Sidecast Material		
	2.12	Servicing and Refueling of Equipment (similar to BMP 7.4 – Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasure [SPCC] Plan)		
	2.13	Control of Construction in Streamside Management Zones (the riparian habitat conservation areas [RHCAs])		
	2.14	Controlling In-channel Excavation		
	2.15	Diversion of Flows Around Construction Sites	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	2.16	Streamcourses on Temporary Roads		
	2.17	Bridge and Culvert Installation (disposition of Spoil Materials and Protection of Fisheries)		
	2.19	Disposal of Right-of-way and Roadside Debris		
	2.20	Specifying Riprap Composition		
	2.21	Water Source Development Consistent with Water Quality Protection		
	2.22	Maintenance of Roads		
	2.23	Road Surface Treatment to Prevent Loss of Materials		
	2.24	Traffic Control During Wet Periods		
	2.26	Obliteration or Decommissioning of Roads		
Vegetation Manipulation Practices				
Wildlife Fish Soils Hydrology	5.2	Slope Limitations for Mechanical Equipment Operations	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	5.3	Tractor Operation Limitation in Wetlands and Meadows		
	5.5	Disposal of Organic Debris		
	5.6	Soil Moisture for Mechanical Equipment Operations		
Watershed Management Practices				
Wildlife Fish Soils Hydrology	7.3	Protection of Wetlands	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	7.4	Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasure (SPCC) Plan		
	7.8	Cumulative Off-site Watershed Effects		

Site-specific measures that relate directly to these BMPs would be used on the Keddie Ridge Project to minimize erosion and resultant sedimentation. The BMPs would also be used to minimize negative changes in other water quality parameters such as dissolved oxygen, water temperature, and turbidity.

These measures follow the Scientific Analysis Team (SAT) guidelines for areas adjacent to stream courses, lakes and wetland areas, and streamside guidelines presented in the Plumas National Forest Land and Resource Management Plan (the Forest Plan). Protection and improvement measures would include minimizing disturbance of riparian habitat conservation areas (RHCAs), retention of snags for wildlife, stream shading, recruitment of large organic debris in stream channels, maintenance of side slope and stream channel stability, and prevention of an over accumulation of activity-generated organic debris in stream channels. Timber sale contracts contain many standard provisions that help ensure protection of soil and water resources. These include provisions for an erosion control plan, road maintenance, and skid trail spacing—see the “Standards and Guidelines for RHCAs” section below for a list. The following measures, which were incorporated in the design of the action alternatives, would further reduce the risk of cumulative and local impacts on water quality and channel stability.

Soil protection measures are described below. Incorporate the following practices into the project design:

1. Unless otherwise agreed to by the physical scientist and sale administrator, landings, skid trail approaches to landings (to a distance of 200 feet), and new temporary roads would be subsoiled through the full depth of compaction to restore soil porosity. The subsoiler would be lifted where substantial root and bole damage to larger trees would occur from subsoiling. Subsoiling would not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots. Vehicle access to temporary roads would be blocked and water bars would be installed prior to subsoiling operations.
2. Ground-based equipment would be restricted to slopes less than 35 percent.
3. Subsoiling to 18 inches minimum depth would occur on temporary roads and landings within the same year as harvest.
4. Trails would be spaced an average of 100 feet. Though larger spacing is typically recommended, the 100 foot spacing may actually reduce off trail harvest traffic.

Implement the following wet weather standards in all mechanically treated units:

1. Operations may occur when soil is dry; that is, in the spring when soil moisture in the upper 8 inches is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped. In the summer and early fall after storm event(s) when soil moisture between 2-8 inches in depth is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped.
2. Winter operations may occur only when the ground is frozen to a depth of 5 inches or over 8 inches of well packed snow.

Water Drafting Plan

1. New or existing water draft sites would be evaluated with the Mt. Hough district biologist prior to changes or use. Drafting sites shall be visually surveyed for amphibians and their eggs before drafting begins.

2. “Mucked out” debris, bedload sediment, etc. shall be transported to an appropriate disposal site (to be designated) if no apparent site is feasible.
3. Maximum draw-down volumes would be estimated prior to use of the draft site. Minimum pool sites would be maintained during drafting using measurements such as staff gauges, stadia rods, tape measures, etc.
4. Back down ramps would be constructed and or maintained to ensure the streambank stability is maintained and sedimentation is minimized. Rocking, chipping, mulching, or other effective methods are acceptable in achieving this objective. As necessary, earthen or log berm, straw waffle, certified hay or rice straw bale berms, or other containment structures would be constructed at the bank full water line to protect the stream bank.
5. Forest personnel and contractors shall use the Forest Service approved suction strainer (FGM 5161) or other foot vales with screens having openings less than 2mm in size at the end of drafting hoses. The suction strainer shall be inserted close to the substrate in the deepest water available; the suction strainer shall be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid substrate and amphibian.

Streamside Management Zones

As defined by the Plumas National Forest Land and Resource Management Plan (the Forest Plan), the streamside management zone (SMZ) is the land adjoining a stream channel that is managed to meet water quality and riparian objectives. This zone harbors the most complex biotic communities within the National Forest System (NFS). The management of these communities is particularly challenging, for their high diversity and inherent values demand a sound understanding of the natural processes involved as well as a commitment by management to perpetuate these values. Important qualities associated with the streamside environment include its unique visual character, abundant and diverse wildlife, timber producing capabilities, and recreational opportunities, in addition to its ability to maintain and improve water quality.

Wildlife utilize the riparian environment disproportionately more than other habitat types. Here the microclimate is measurably different from the surrounding forest, grassland, or brushland. Air temperature, relative humidity, wind speed, and radiation are moderated, creating a unique environment available to wildlife. Within this environment, food, cover, and water, are in close proximity, maximizing the density and diversity of wildlife. In addition, the streamside zone along permanent and intermittent streams provides migration routes and travel corridors, serving as a forested connector between forest habitats.

The streamside environment also enhances plant species diversity and fosters high plant biomass production. SMZs are well noted as a premium-growing site for timber. Conifers grow rapidly in these environs and intense shade encourages the growth of good quality timber. Plant species diversity is high and many plants are unique to the moist environments of the streamside area. Botanical interest is acute in these areas.

The streamside area also serves as a moderator of stream temperature and as a filter for sediments originating within or beyond the streamside zone. The vegetation growing here anchors geologic instabilities and secures the stream channel, while downed logs lying across the stream channel dissipate the energy of flowing water, enhancing stream stability. Given water of good quality and a healthy streamside environment, recreational opportunities are numerous. Quality recreational experiences can include swimming, fishing, hiking, aesthetics appreciation, and historical appreciation.

Standards and Guidelines for RHCAs

SAT developed standards and guidelines that address the types of management activities that are allowed in RHCAs. In general, these standards and guidelines prohibit activities in RHCAs that are not designed specifically to improve the structure and function of the RHCA and benefit fish habitat. Further, for areas where riparian conditions are presently degraded, management activities must be designed to improve habitat conditions.

The standards and guidelines that follow apply directly to this project. For a complete description of standard and guidelines for RHCAs, refer to Appendix L of the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (HFQLG EIS). In addition, watershed and riparian area management on National Forest System (NFS) lands is guided by a variety of direction, including BMPs, Land and Resource Management Plans, Forest Service manuals and handbooks, and other plans and directives.

Timber Management

TM-1. Prohibit scheduled timber harvest, including fuelwood cutting, in RHCAs. Allow unscheduled harvest only as described in TM-2 and TM-3.

TM-2. Where catastrophic events such as fire, flooding, volcanic eruptions, severe winds, or insect or disease damage result in degraded riparian conditions, allow unscheduled timber harvest (salvage and fuelwood cutting) to attain RMOs. Remove salvage trees only when site-specific analysis by an interdisciplinary team determines that present and future woody debris needs are met and other RMOs are not adversely affected.

TM-3. Design silvicultural prescriptions for RHCAs and allow unscheduled harvest to control stocking, reestablish and culture stands, and acquire desired vegetation characteristics needed to attain RMOs.

Roads Management

RF-1. Keep road and landing construction in RHCAs to a minimum. No new roads or landing would be constructed in RHCAs until watershed, transportation, and geotechnical analyses are completed. Appropriate standards for road construction, maintenance, and operations would be developed from this analysis to ensure that RMOs are met. Valley bottom and mid-slope road locations may be used only when this analysis indicates that roads can be constructed and maintained in these locations and meet RMOs.

RF-2. Require that all roads on NFS lands, including those operated by others, are maintained and operated in a manner consistent with the planned uses and with meeting RMOs.

RF-5. Locate design, construct, maintain, and operate roads to minimize disruption to natural hydrologic flow paths. This includes road-related activities that would divert streamflow and/or interrupt surface or subsurface flow paths.

RF-6. Apply design construction, and maintenance procedures to limit sediment delivery to streams from the road surface. Outsloping of the roadway surface is preferred unless outsloping would increase sediment delivery to streams or where outsloping is infeasible. Road drainage would be routed away from potentially unstable channels and hillslopes.

RF-7. Construct, reconstruct, and maintain all road crossings of existing and historic fish-bearing streams to provide for fish passage.

RF-9. Designate sites to be used as water drafting locations during project-level analysis, or as part of road maintenance for fire management planning. Do not locate drafting sites where instream flows could become limiting to aquatic organisms. During periods of low flow, examine the drafting site and decide if water can continue to be extracted from that site. Design, construct, and maintain water drafting sites so they would not destabilize stream channels or contribute sediment to streams.

RF-10. Prohibit sidecasting of loose material in RHCAs during construction or maintenance activities.

General Riparian Area Management

RA-1. Exclude heavy equipment from RHCAs, unless specifically approved for road construction and maintenance, or unless an interdisciplinary team finds that proposed activity is needed to meet the RMOs.

RA-2. Fell hazard trees only when they are found to pose an unacceptable safety risk. Such trees may be removed from RHCAs only when adequate sources of woody debris remain to meet RMOs. If long-term sources of woody debris are inadequate, and a tree is found to pose an unacceptable safety risk, that risk must be reduced in a way that contributes to woody debris objectives.

Project Specific RHCA Design Criteria

Management activities in RHCAs must contribute to improving or maintaining watershed and aquatic habitat conditions described in the RMOs (appendix E). Equipment restriction zones in RHCAs, would be implemented according to the following tables:

Table 2. Design Criteria for RHCAs

Criterion	Actions
RHCA Equipment constraints	No mechanical equipment operations on slopes steeper than 25 percent. Establish equipment exclusion zones adjacent to stream channels according to table 2-24 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.

Criterion	Actions
Diameter constraints	Within mechanical harvest areas, implement a 20-inch upper diameter limit, except where needed for operability. Minimize damage to trees larger than 20 inches dbh as much as practicable. In equipment exclusion zones, implement an 8-inch upper diameter limit on hand thinning treatments.
Residual species preference	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees.Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.
Burn constraints	Establish pile burning exclusion zones (see table 2-25 below) adjacent to stream channels, according to the table below. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.
Fireline	Construct firelines using hand crews around areas to be underburned or pile burned, as needed,, Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain large woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Fish passage improvement	Reclaim fish passage and habitat by improving or replacing culverts at specific locations where roads cross streams.

Table 3. Scientific Analysis Team (SAT) Guidelines for RHCA Buffer Widths Based on Stream Type (USDA 1999b, page 2-11)

Stream Type	Prescribed Stream Buffer Widths
Perennial, fish bearing[1]	300 feet
Perennial, non-fish bearing[2]	150 feet
Intermittent[3]	100 feet
Ephemeral[3]	100 feet
[1]-Perennial fish bearing streams and lakes. [2]-Perennial non-fish bearing streams, ponds, wetlands greater than 1 acre, and lakes. [3]-intermittent and ephemeral streams, wetlands less than 1 acre, and landslides.	

Table 3 displays the Scientific Analysis Team guidelines for RHCA buffer widths based on stream type. For the Keddie Ridge Project, the above listed widths would be the maximum buffer width identified for each stream type. Ponds, reservoirs, and wetlands greater than one acre in size would be protected by a RHCA width of 150 feet, springs and seeps less than one acre in size would be protected by a RHCA width of 100 feet, measured from the outer edge of the feature. SMZ widths would be 50 feet for those stream segments that are not classified as RHCAs, but require protection from equipment to ensure the integrity of subsurface flow is maintained. These channels, commonly referred to as ‘swales’, do not show indications of annual scour or deposition. Table 4 below displays an additional buffer (inner buffer or equipment exclusion zone) within the RHCA and within the SAT guideline buffer identified above.

For example, there is a perennial fish bearing stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 150 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 150 feet. Equipment can enter the remaining 150 feet of the 300 foot maximum buffer.

When the slope within the SAT guideline buffer is greater than 25 percent, no mechanical equipment is allowed to enter the RHCA (Table 4). For example, there is a perennial stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 100 feet from the edge of the active channel, the slope is 32 percent; no equipment is allowed within any portion of the 300 foot buffer.

Table 4. Equipment Exclusion Zones in RHCAs

	Slope Class		
Stream Type	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial, fish bearing	100	150	No mechanical equipment allowed

Stream Type	Slope Class		
	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial, no fish	50	100	No mechanical equipment allowed
Intermittent	25	50	No mechanical equipment allowed
Ephemeral	25	25	No mechanical equipment allowed
Reservoirs/wetlands greater than 1 acre	50	75	No mechanical equipment allowed

Within the SAT guideline buffer, a project specific distance (feet) is applied to the placement of piles for future burning (Table 5). For example, there is an ephemeral stream within a treatment unit; a 100 foot buffer is applied. Within that 100 foot buffer, approximately 70 feet from the active stream channel, the slope is 26 percent. First, no mechanical equipment is allowed within any portion of the 100 foot buffer (Table 4). Second, piles must be placed 15 feet from the center of the stream bed (Table 5). Distances shown would apply to each side of the stream channel and are based on stream type and slope steepness.

Table 5. Pile Burning Exclusion Zones in RHCAs

Stream Type	Slope Class	
	0–15% (feet)	Greater Than 15% (feet)
Perennial	25	40
Intermittent	15	25
Ephemeral	15	15
Reservoirs/wetlands greater than 1 acre	15	25
Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.		

Botanical Resources and Noxious Weeds

The SMRs for botanical resources and noxious weeds, as well as the associated site-specific maps, are provided in the Biological Evaluation, Noxious Weed Risk Assessment, and the Plant Protection Plan for the Keddie Ridge Project. These reports are part of the Keddie Ridge Project record, which is on file at the Mt. Hough Ranger District and available upon request.

Botanical Resources

Table 6 identifies those sensitive plant species that would be protected under all action alternatives through the designation of control areas. No herbicide applications or ground-disturbing activities would occur within any of the control areas. Limited prescribed fire activities and some hand thinning treatments would be allowable within some of the control areas identified below.

Table 6. Sensitive Plant Species Within Designated Control Areas

Species	Control Area Locations	Restrictions
Arabis constancei (Constance's rock cress)	Units: 64 and 71	Prohibit ground disturbing activities (such as mechanical thinning, group selection harvest, construction of fireline, etc.) within control areas; hand thinning treatments would be allowed. Pile slash at a sufficient distance (i.e. 20 feet or greater) to protect individual plants and the seedbank from excessive heat.
Cypripedium fasciculatum (clustered lady's-slipper)	Units: 51, 52, 54, 55, 66, 67, and 68	Prohibit ground disturbing activities (such as mechanical thinning, group selection harvest, construction of fireline, etc.) within control areas; hand thinning treatments would be allowed. Manipulate fuels within control areas to reduce impacts to individuals during prescribed fire treatments. Pile slash at a sufficient distance (i.e. 20 feet or greater) to protect individual plants and the seedbank from excessive heat.
Lupinus dalesiae (Quincy lupine)	Units: 78a, 78b, and 89	Allow hand thinning and prescribed fire treatments within control areas. Construct hand piles at least 20 feet from plants to protect individuals and the seedbank from excessive heat.
Oreostemma elatum (Plumas alpine-aster)	Units: 11 and 66	Prohibit all ground disturbing (such as mechanical thinning, group selection harvest, construction of fireline, etc.) activities within control areas; prescribed fire treatments would be allowed.

Noxious Weeds

The following noxious weed SMRs were developed in accordance with the direction provided in Table 2.4 of the HFQLG EIS to reduce the introduction and spread of noxious weeds on NFS lands.

Cleaning Off-Road Equipment. Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be free of weeds. Clean all equipment and vehicles of all mud, dirt, and plant parts. This would be done at a vehicle washing station or steam-cleaning facility before the equipment and vehicles enter the project area. Cleaning is not required for vehicles that would stay on the roadway. All off-road equipment must be cleaned *prior to leaving designated weed units* if weeds are present at the time of implementation and are unavoidable.

Staging Areas. Do not stage equipment, materials, or crews in noxious weed-infested areas where there is a risk of spread to areas of low infestation.

Control Areas. Where feasible, noxious weed locations would be designated as control areas, where equipment and soil-disturbing project activities would be excluded. These areas would be identified on project maps and delineated in the field with day-glow orange noxious weed flagging. If avoidance is not possible, off-road equipment would be cleaned prior to leaving the designated weed unit.

Road Construction, Reconstruction, and Maintenance. All earth-moving equipment, gravel, fill, or other materials need to be weed free. Onsite sand, gravel, rock, or organic matter would be used where possible.

Revegetation. If skid trails, landings, or stream crossings require soil stabilization, weed-free equipment, mulches, and seed sources would be used. On-site material would be chipped to use as mulch to the extent possible. If mulch is imported to the site use weed free rice straw (preferred) or certified weed free straw. Avoid seeding in areas where revegetation would occur naturally, unless noxious weeds or erosion are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds. All activities that require seeding or planting would need to use locally collected native seed sources or those identified by the Botanist. A seed mix would be developed when specific site locations and conditions (dry, moist, wet, etc) are determined.

Heritage Resources

These heritage SMRs are displayed in the Keddie Ridge Hazardous Fuels Reduction Project Heritage Resource Inventory Report. This report is part of the Keddie Ridge Project record on file at the Mt. Hough Ranger District; a copy is available upon request.

1. All proposed activities, facilities, improvements, and disturbances would avoid heritage resource sites. “Avoidance” means that no activities associated with the project that may affect heritage resource sites would occur within a site’s boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid heritage resource sites.
2. All heritage resource sites within the area of potential effect would be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
3. Buffer zones may be established to ensure added protection where the Forest or District archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District archaeologist on a case-by-case basis.
4. When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes would be completed prior to initiating any activities.
5. Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.
6. If heritage resources are inadvertently discovered during project implementation, the Mt. Hough Ranger District archaeologist would be contacted immediately. The heritage resources would be recorded, clearly delineated, and protected.

Treatment Implementation

Pre-existing skid trails and landings would be used whenever available, feasible, and in a desirable location. In order to avoid loss of land base productivity, no more than 15 percent of timber stands would be dedicated to landings and permanent skid trails (USDA 1988). In areas where pre-existing skid trails and landings are not present, construction of such facilities would occur as agreed upon by the Forest Service and purchaser. All landings and skid trails utilized would conform to the standards and guidelines set forth in the Timber Sale Administration Handbook (FSH 2409.15) and the Forest Plan.

Monitoring

Soils

The Forest Plan sets out objectives and protocol for monitoring of plan standards and guidelines, BMP compliance and effectiveness, and soil productivity parameters. Monitoring is to be completed by Forest staff on a per annum basis, either project by project, or a sampling of projects. Sampling should include at least five units each on granite and metasedimentary rock soils for a total of ten units for implementation monitoring. Specific methods would be defined by district watershed personnel. In addition, effectiveness and forensic monitoring would occur on watersheds that exceed the threshold of concern, as required by California Central Valley Regional Water Quality Control Board Resolution R5-2005-0052, "Conditional Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities".

Heritage Resources

Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

Aquatic Wildlife

Stream condition inventory, including rapid bioassessment: Stream habitat features are measured according to the stream condition inventory (SCI) manual. The following streams are monitored within the Watershed Analysis Area: Little Antelope Creek, Clark's Creek, Boulder Creek (just outside), Lone Rock Creek, Upper Moonlight Creek, Light's Creek, Hungry Creek and Cold Stream. Upper Moonlight, Lights Creek, and Lone Rock Creek have been monitored post fire in 2008 and would be completed the first year after the proposed project implementation and monitored every five years thereafter.

Noxious Weeds

Monitoring during and after project implementation would be used to assess the effectiveness of the SMRs and the control measures at preventing the introduction and spread of noxious weed species in the project area. The measurement indicators described in this analysis—for example, the number of existing infestations and the number of acres treated—would be used in this assessment. Post-treatment monitoring would identify the need for follow-up treatment, assess the effectiveness of the different treatment methods, and/or identify the need for alternative methods of control. Monitoring would be conducted by District personnel during and following project implementation and is expected to greatly reduce the likelihood of uncontrollable weed spread in the Keddie Ridge Project area.

Range

End of season use monitoring is done at the designated monitoring area for the Lights Creek Allotment at Indicator Meadow each year at the end of the growing season. Indicator Meadow is outside of the treatment area. There is no range monitoring done within the treatment area because livestock use is limited, there is no meadow, nor ‘C’ channels within the treatment areas. End of season use monitoring includes: bank alteration; percent meadow use, and percent use of riparian shrubs.

Appendix I

Human Health Risk Assessment

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Human Health Risk Assessment

Introduction

The treatments proposed under the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) present some risks to human health and safety. The risks associated with hand thinning, mechanical thinning, and prescribed fire have been analyzed in detail under the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (EIS) (USDA 2003) and are hereby incorporated by reference. The purpose of this appendix is to present a summary of the potential risks to human health from the proposed herbicide and fungicide treatments.

The hazards associated with using aminopyralid, glyphosate, and borax have been determined through comprehensive reviews of available toxicological studies; these reviews, which are compiled in a group of risk assessments completed by Syracuse Environmental Research Associates (SERA) under contract with the Forest Service, are also incorporated by reference into this risk assessment. Copies of these risk assessments are included in the project record.

The proposed application rates for aminopyralid, glyphosate, and borax fall within the range analyzed in the most recent SERA risk assessments (SERA 2003, 2006, 2007a); therefore a separate human health risk assessment for the Keddie Ridge Project is not required. Consequently, this appendix includes those portions of the human health risk assessment that pertain to the proposed use of aminopyralid, glyphosate, and borax formulations within the Keddie Ridge Project area. It also presents project-specific results from an analysis conducted for the Keddie Ridge Project to further characterize risk of herbicide exposure to workers and members of the general public. The tables included in this appendix are a summary of calculations contained in worksheets in the project file and are based on the most recent and relevant SERA risk assessments (SERA 2003, 2006, 2007a).

Table 1. Comparison of the Chemicals and Application Rates Proposed Under the Keddie Ridge Project with those Analyzed Under the SERA Risk Assessments (SERA 2003, 2006, 2007a).

Chemical	Keddie Ridge Project		SERA Risk Assessment	
	Lower Application Rate[1]	Upper Application Rate[1]	Lower Application Rate[1]	Upper Application Rate[1]
Aminopyralid	0.05 a.e. lbs/acre	0.11 a.e. lbs/acre	0.03 a.e. lbs/acre	0.11 a.e. lbs/acre
Glyphosate	1 a.e. lbs/acre	3 a.e. lbs/acre	0.5 a.e. lbs/acre	7 a.e. lbs/acre
Borax	0.1 a.e. lbs/acre	2.7 a.e. lbs/acre	0.1 a.e. lbs/acre	5 a.e. lbs/acre

[1] application rate units: acid equivalent pounds per acre (a.e. lbs/acre)

The application of aminopyralid, glyphosate, and borax, as proposed by the Keddie Ridge Project, is expected to present a low risk to human health and safety. Based on the available information, the addition of the proposed surfactant and dye, would also pose a low risk to human health and safety. The incorporation of Best Management Practices (included in Appendix H) would also reduce the level of exposure and associated risk to the health and safety of workers and members of the general public. This is based on the analysis included in the SERA risk assessments (SERA 2003, 2006, 2007a) as well as the project-level risk characterization described in this appendix, which was conducted using the specific chemicals, application rates, and volumes proposed for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project.

Summary of Project Proposal

Two herbicides (aminopyralid and glyphosate) and one fungicide (borax) are proposed under alternatives A and D for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project area. Aminopyralid and glyphosate are proposed for treatment of hoary cress, yellow starthistle, and Canada thistle. Aminopyralid (e.g. Milestone® or an equivalent formulation) would be applied over a maximum of 61 acres; glyphosate (e.g. Accord® or an equivalent formulation) would be applied over a maximum of one acre. A non-ionic modified vegetable oil surfactant (such as Competitor® or an equivalent formulation) and a marker dye (such as Hi-Lite Blue® or an equivalent formulation) would also be used to increase the efficacy of the herbicide treatments. Herbicide treatments would occur over a period of two to five years, as needed.

Alternatives A and D also propose the use of the fungicide borax (e.g., Sporax® or an equivalent formulation) for control of *Heterobasidion* root disease within the Keddie Ridge Project area. Under these alternatives, borax would be applied in granular form to all harvested conifer stumps 14 inches and greater in diameter within treatment units 45, 46, 49, and 50. Application rates within thinning units would range from 0.1 pounds per acre (lbs/acre) to 1.1 lbs/acre; rates within group selection units would be higher with as much as 2.7 lbs/acre applied.

The proposed applications would comply with all applicable state and federal regulations for the safe use of pesticides (including the label requirements). For example, applicators would be adequately trained, medical aid would be available, wash water and eye wash water would be on-site or nearby, and personal protective equipment would be used (e.g. eye protection, gloves, long-sleeved shirt, and long pants). Best Management Practices for pesticide application, including a spill contingency plan, would be implemented.

The proposed application rates for all of the proposed chemicals are included in Table 1 above. Chapter 2 also provides a more detailed summary of the herbicide and fungicide treatment design elements that are proposed under alternatives A and D.

Hazard Analysis

A considerable body of information describing the hazards associated with using each of the proposed herbicides and the proposed fungicide is contained in the risk assessments completed by SERA (SERA 2003, 2006, 2007a) under contract to the Forest Service and in the HFQLG final supplemental EIS (USDA 2003). All of these documents are incorporated by reference into this risk assessment. The following section includes relevant portions of the hazard analysis provided in the most recent SERA risk assessments (SERA 2003, 2006, 2007a).

A note specific to impurities and metabolites - virtually no chemical synthesis yields a totally pure product. Technical grade herbicides and fungicides, as with other technical grade products, undoubtedly contain some impurities. The U.S. Environmental Protection Agency (EPA) defines the term impurity as "…any substance…in a pesticide product other than an active ingredient or an inert ingredient, including un-reacted starting materials, side reaction products, contaminants, and degradation products" (40 CFR 158.153(d)). To some extent, concern for impurities in technical grade herbicides and fungicides is reduced by the fact that the existing toxicity studies on these herbicides and fungicides were conducted with the technical grade product. Thus, if toxic impurities are present in the technical grade product, they are likely to be encompassed by the available toxicity studies on the technical grade product. An exception to this general rule involves carcinogens, most of which are presumed to act by non-threshold mechanisms. Because of the non-threshold assumption, any amount of a carcinogen in an otherwise non-carcinogenic mixture is assumed to pose some carcinogenic risk.

As with contaminants, the potential effect of metabolites on a risk assessment is often encompassed by the available *in vivo* toxicity studies under the assumption that the toxicological consequences of metabolism in the species on which toxicity studies are available will be similar to those in the species of concern (human in this case). Uncertainties in this assumption are encompassed by using an uncertainty factor in deriving the reference dose (RfD) and may sometimes influence the selection of the study used to derive the RfD.

Unless otherwise specifically referenced, all of the information in the following sections was taken directly from the executive summary of the most recent SERA risk assessment (SERA 2003, 2006, 2007a).

Aminopyralid (Source: SERA 2007a)

Because aminopyralid is a new herbicide, no information is available in the published literature on the toxicity of aminopyralid to humans or other mammalian species. The only information on aminopyralid that is available for assessing potential hazards in humans is a series of toxicity studies that have been submitted to and evaluated by the U.S. EPA's Office of Pesticides in support of the registration for aminopyralid.

Although the mechanism of action of aminopyralid and other pyridine carboxylic acid herbicides is fairly well characterized in plants, the mechanism of action of aminopyralid in mammals is not well characterized. The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects. The effects that are most commonly seen involve effects on the gastrointestinal tract after oral exposure and these may be viewed as portal of entry effects rather than systemic toxic effects. The location of these effects within the gastrointestinal tract appears to vary among species with the ceca being the most common site of action in rats and the stomach being the most common site of action in dogs and rabbits. Mice do not seem to display any remarkable gastrointestinal effects after oral doses of aminopyralid. The reason for these differences among species is not clear but may simply reflect differences in methods of exposure (gavage versus dietary) and/or differences in anatomy.

In one acute oral toxicity study in rats using the aminopyralid TIPA formulation, lacrimation and cloudy eyes were noted in all test animals on the first day of the study but not on subsequent days.

Clouding of the eyes is an unusual effect that has not been noted in other studies on aminopyralid, either the acid or the TIPA salt. The significance of this observation, if any, is unclear.

Aminopyralid is rapidly absorbed and excreted and is not substantially metabolized in mammals. As a consequence of rapid absorption and excretion, gavage and dietary exposures probably lead to very different patterns in the time-course of distribution in mammals. The oral LD_{50} of aminopyralid has not been determined because aminopyralid does not cause any mortality at the dose limits set by the U.S. EPA for acute oral toxicity studies – i.e. up to 5,000 mg/kg bw. Similarly, subchronic and chronic toxicity studies have failed to demonstrate any clear signs of systemic toxic effects. Developmental studies involving gavage administration, however, have noted signs of incoordination in adult female rabbits. The incoordination was rapidly reversible and did not persist past the day of dosing. Two chronic oral bioassays have been conducted, one in mice and the other in rats, and a 1-year feeding study is available in dogs. Based on the results of the chronic bioassays as well as the lack of mutagenic activity in several mutagenicity screening assays, there is no basis for asserting that aminopyralid is a carcinogen. Similarly, based on the chronic bioassays and several additional subchronic bioassays in mice, rats, dogs, and rabbits, there is no basis for asserting that aminopyralid will cause adverse effects on the immune system or endocrine function. The potential for effects on the nervous system is less clear. Aminopyralid has also been subject to several bioassays for developmental toxicity and one multi-generation study for reproductive performance. No adverse effects on offspring have been noted in these studies other than decreased body weight in offspring that is associated with decreased food consumption and decreased body weight in adult females.

Glyphosate (Source: SERA 2003)

The herbicidal activity of glyphosate is due primarily to the inhibition of the shikimate pathway which is involved in the synthesis of aromatic amino acids in plants and microorganisms. This metabolic pathway does not occur in humans or other animals and thus this mechanism of action is not directly relevant to the human health risk assessment. Two specific biochemical mechanisms of action have been identified or proposed for glyphosate: uncoupling of oxidative phosphorylation and inhibition of hepatic mixed function oxidases. Both glyphosate and the polyethoxylated tallow amine (POEA) surfactant used in Roundup will damage mucosal tissue, although the mechanism of this damage is likely to differ for these two agents. Many of the effects of acute oral exposure to high doses of glyphosate or Roundup are consistent with corrosive effects on the mucosa.

The available experimental studies indicate that glyphosate is not completely absorbed after oral administration and is poorly absorbed after dermal applications. Two dermal absorption studies have been published on glyphosate and both of these studies indicate that glyphosate is very poorly absorbed across the skin.

Like all chemicals, glyphosate as well as commercial formulations of glyphosate may be toxic at sufficiently high exposure levels. In rats and mice, acute oral LD_{50} values of glyphosate range from approximately 2,000 to 6,000 mg/kg. Formulations of glyphosate with a POEA surfactant have been used in many suicides and attempted suicides. Gastrointestinal effects (vomiting, abdominal pain, diarrhea), irritation, congestion, or other forms of damage to the respiratory tract, pulmonary edema, decreased urinary output sometimes accompanied by acute renal tubular necrosis, hypotension, metabolic acidosis, and electrolyte imbalances, probably secondary to the gastrointestinal and renal effects, are seen in human cases of glyphosate/surfactant exposure.

One of the more consistent signs of subchronic or chronic exposure to glyphosate is loss of body weight. This effect has been noted in mice, rats, dogs, and rabbits. This observation is consistent with experimental data indicating that glyphosate may be an uncoupler of oxidative phosphorylation. Other signs of toxicity seem general and non-specific. A few studies report changes in liver weight, blood chemistry that would suggest mild liver toxicity, or liver pathology. Changes in pituitary weight have also been observed. Signs of kidney toxicity, which might be expected based on the acute toxicity of glyphosate, have not been reported consistently and are not severe. Various hematological changes have been observed that may be secondary to mild dehydration.

Glyphosate has been specifically tested for neurotoxicity in rats after both acute and subchronic exposures and has been tested for delayed neurotoxicity in hens. In both the animal data as well as the clinical literature involving suicide attempts, there is no clear pattern suggestive of a specific neurotoxic action for glyphosate or its commercial formulations. The weight of evidence suggests that any neurologic symptoms associated with glyphosate exposures are secondary to other toxic effects. No studies are reported that indicate morphologic abnormalities in lymphoid tissues which could be suggestive of an effect on the immune system. As discussed in the ecological risk assessment, one study has asserted that glyphosate causes immune suppression in a species of fish. This study, however, is deficient in several respects and does not provide a basis for impacting the hazard identification for effects on the immune system.

Only three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. All of these assays are *in vitro* – i.e., not conducted in whole animals. Thus, such studies are used qualitatively in the hazard identification to assess whether there is a plausible biologic mechanism for asserting that endocrine disruption is plausible. Because they are *in vitro* assays, measures of *dose* and quantitative use of the information in dose/response assessment is not appropriate. For glyphosate, these studies do not indicate a basis for suggesting that glyphosate is an endocrine disruptor. Nonetheless, glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems. Thus, the assessment of the potential endocrine effects of glyphosate cannot be overly interpreted.

Glyphosate has been subject to multi-generation reproduction studies which measure overall effects on reproductive capacity as well as teratology studies which assay for a compounds ability to cause birth defects. Signs of teratogenic activity have not been observed in standard assays in both rats and rabbits. In a multi-generation reproduction study in rats, effects on the kidney were observed in male offspring. This effect is consistent with the acute systemic toxicity of glyphosate, rather than a specific reproductive effect. Several other subchronic and chronic studies of glyphosate have been conducted with no mention of treatment-related effects on endocrine glands or reproductive organs. A single study has reported substantial decreases in libido, ejaculate volume, sperm concentrations, semen initial fructose and semen osmolality as well as increases in abnormal and dead sperm in rabbits after acute oral exposures to glyphosate. This study is inconsistent with other studies reported on glyphosate and is poorly documented –i.e., specific doses administered to the animals are not specified. In addition, the use of gelatin capsules, as in this study results, in a high spike in body burden that is not typical or particularly relevant to potential human exposures – other than attempted suicides. Numerous epidemiological studies have examined relationships between pesticide exposures or assumed pesticide exposures in agricultural workers and reproductive outcomes. Of those studies that have specifically addressed potential risks from glyphosate exposures, adverse reproductive effects have not been noted.

Based on standard animal bioassays for carcinogenic activity *in vivo*, there is no basis for asserting that glyphosate is likely to pose a substantial risk. The Re-registration Eligibility Decision (RED) document on glyphosate prepared by the U.S. EPA indicates that glyphosate is classified as Group E: Evidence of non-carcinogenicity for humans. This classification is also indicated in U.S. EPA's most recent publication of tolerances for glyphosate and is consistent with an assessment by the World Health Organization. This assessment has been challenged based on some studies that indicate marginal carcinogenic activity. As with any compound that has been studied for a long period of time and tested in a large number of different systems, some equivocal evidence of carcinogenic potential is apparent and may remain a cause of concern, at least in terms of risk perception. While these concerns are understandable, there is no compelling basis for challenging the position taken by the U.S. EPA and no quantitative risk assessment for cancer is conducted as part of the current analysis.

Glyphosate formulations used by the Forest Service are classified as either non-irritating or only slightly irritating to the skin and eyes in standard assays required for product registration. Based on a total of 1513 calls to a poison control center reporting ocular effects associated with the use of Roundup, 21 percent were associated with no injury, 70 percent with transient minor injury, 2 percent with some temporary injury. The most frequently noted symptoms included blurred vision, a stinging or burning sensation, lacrimation. No cases of permanent damage were reported.

Various glyphosate formulations contain a POEA surfactant at a level of up to about 20 percent. Other formulations of glyphosate recommend the use of a surfactant to improve the efficacy of glyphosate. While surfactants are typically classified as “inert” ingredients in herbicides, these compounds are not toxicologically inert and some surfactants may be more toxic than the herbicides with which they are used. Although surfactants may play a substantial role in the interpretation of a large number of suicides and attempted suicides involving the ingestion of glyphosate formulations, primarily Roundup, the acute mammalian toxicity of different glyphosate formulations do not appear to differ substantially. This is in contrast to the available data on the toxicity of various formulations to aquatic species, as detailed in the ecological risk assessment.

Borax (Source: SERA 2006)

The toxicity of borate compounds has been extensively studied in both humans and laboratory animals, with most studies conducted using boric acid and borax. Boric acid and borax have similar toxicological properties across different species. In order to facilitate any comparisons between borax and boric acid, data are expressed in terms of the dose or concentration of borate compound (borax or boric acid) and in terms of boron equivalents (B).

At physiologic pH, borate salts convert almost entirely to unionized boric acid; thus, boric acid and borate salts have similar toxicologic properties. Inorganic borates are well absorbed following oral administration, with an oral absorption of greater than 90 percent of the administered dose. Borate is not readily absorbed through intact skin but is more quickly absorbed across abraded skin. Percutaneous absorption of borax from intact human skin was shown to be very low, with a dermal permeability coefficient of 1.8×10^{-7} cm/hr. Boron is also absorbed following inhalation exposure to borate dust, but absorption does not appear to be complete. Borates are distributed in body soft tissues and eliminated in the urine, primarily in the form of boric acid, with a half-life of approximately 12 hours. Due to the excessive energy required to break the boron-oxygen bond, borates are not metabolized by humans or animals.

Based on the results of acute exposure studies, borax is classified as moderately toxic, with an LD_{50} in male rats of 4.5 g borax/kg. Clinical signs of toxicity observed following acute exposures include depression, ataxia and convulsions. In dogs, acute exposure to borax produced a strong dose-dependent emetic response. As expected of a compound with low percutaneous absorption, the LD_{50} of borax following single dermal application is > 5 g borax/kg in rats and >2 g borax/kg in rabbits. Results of a single inhalation exposure study yield a 4-hour LC_{50} > 2.0 mg borax/kg.

Results of developmental, subchronic and chronic toxicity studies show that the primary targets for borate toxicity are the developing fetus and the male reproductive system. Regarding developmental effects, gestational exposure of rats, mice, and rabbits to boric acid resulted in increased fetal deaths, decreased in fetal weight, and increased fetal malformations. The types of fetal malformations observed include anomalies of the eyes, central nervous system, cardiovascular system, and axial skeleton in rats, short rib XIII and other skeletal anomalies pertaining to ribs in mice, and cardiovascular malformations in rabbits. The most sensitive effect observed following gestational exposure to boric acid is decreased body weight. No mechanism has been identified for the developmental effects of borates. Results of subchronic and chronic toxicity studies show that the testis is the primary target organ for borate compounds in adult animals. Testicular toxicity is characterized by atrophy of the testes, degeneration of the seminiferous epithelium, and sterility. Results of reproductive studies show a dose-dependent decrease in fertility in male rats and dogs, with dogs being slightly more sensitive than rats. At lower exposure levels, testicular effects and infertility may be reversed, but adverse effects can persist for at least 8 months at higher exposure levels. Results of one study in rats indicate that borax exposure may also reduce ovulation in female rats. Although no mechanism has been identified for borax-induced toxicity to the male reproductive system, data are consistent with the Sertoli cell as the primary target. Borax and borate compounds do not appear to act as direct neurotoxins or cause effects on immune system function. Studies assessing carcinogenic and mutagenic potential show no carcinogenic or mutagenic activity for borax and other borate compounds. Borax is not irritating to skin (Toxicity Category 4). Borax can cause severe irritation to eyes (Toxicity Category 1). In standard mammalian studies to assay ocular irritation, the damage persisted for the duration of the study – i.e., 14 days.

Exposure Assessment

This exposure assessment examines the potential health effects to two groups of people that are most likely to be exposed to aminopyralid, glyphosate, or borax: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of herbicides. The public includes other Forest Service personnel, visitors, or nearby residents who could be exposed through herbicide drift, contact with sprayed vegetation, by drinking water that contains herbicide residue, or by eating contaminated vegetation (such as berries or foliage), game, or fish.

In these analyses, data are displayed for three different exposure scenarios: typical, lower, and upper. The upper level represents a conservative estimate of a worst-case scenario resulting from the highest application rate, lowest dilution rate, and largest number of acres treated per day. This approach is used to encompass as broadly as possible the range of potential exposures.

Workers

Pesticide applicators are the individuals who are most likely to be exposed to a pesticide during the application process. For purpose of this analysis, two different types of worker exposure assessments were considered: general and accidental/incidental. General exposure scenarios were used to analyze exposure resulting from normal use (i.e. handling and application) of the chemicals (SERA 2007b). Accidental and incidental exposure scenarios were used to analyze specific types of exposures associated with mischance or mishandling of a chemical (SERA 2007b).

The USDA Forest Service has generally used an absorption-based model for worker exposure modeling, in which the amount of chemical absorbed is estimated from the amount of chemical handled. Absorption based models have been used by the USDA Forest Service because of two common observations from field studies. First, most studies that attempt to differentiate occupational exposure by route of exposure indicate that dermal exposure is the dominant route of exposure for pesticide workers. Second, most studies of pesticide exposure that monitored both dermal deposition and chemical absorption or some other method of bio-monitoring noted a very poor correlation between the two values (e.g., Cowell et al. 1991, Franklin et al. 1981, Lavy et al. 1982, referenced in SERA 2007b). In this exposure assessment for workers, the primary goal is to estimate the absorbed dose so that the absorbed dose estimate can be compared with available information on the dose-response relationships for the chemical of concern.

Although pesticide application involves many different job activities, exposure rates can be defined for three broad categories: directed application such as those involving the use of backpacks or similar devices; broadcast hydraulic spray applications; and broadcast aerial applications. All of the methods proposed for control of noxious weeds and *Heterobasidion* root disease in the Keddie Ridge Project (i.e. backpack spraying, wick, and spot application) fall under the category of direct application; therefore only the risks associated with this job activity will be presented in this risk analysis.

Exposure rates for workers are calculated using a number of factors that include: proposed application rates, dilution rates, estimated hours worked per day, number of acres treated per hour and human dermal absorption rates. As described in SERA (2007b), worker exposure rates are expressed in units of milligrams (mg) of absorbed dose per kilogram (kg) of body weight per pound of chemical handled (mg/kg/lb applied). A summary of the exposure scenarios calculated for workers is provided in the tables at the end of this section.

General Exposure

Table 2 and Table 3 display the exposure rates calculated for a scenario involving general exposure to aminopyralid and glyphosate. This scenario represents the type of exposure that might be expected to occur over the course of each work day during a prolonged application program. Borax is not included in this scenario because of the method in which it is applied (i.e. granular form to the surfaces of cut tree stumps). Although there are several reports detailing local irritant effects resulting from occupational exposures to borate dust, these exposures are not considered in this assessment due to the implausibility of inhalation exposures in the field reaching the high concentrations of boron that are reported in confined industrial facilities (SERA 2006). Therefore, the only exposure scenario that is considered plausible for workers is accidental dermal exposure to the hands and lower legs of granular borax during application, which is discussed in the next section.

Accidental and Incidental Exposures

Typical occupational exposures may involve multiple routes of exposure (i.e., oral, dermal, and inhalation); nonetheless, dermal exposure is generally the predominant route for herbicide applicators. Typical multi-route exposures are encompassed by the methods used in general exposures. Accidental exposures, on the other hand, are most likely to involve splashing a solution of herbicide or fungicide into the eyes or to involve various dermal exposure scenarios.

The available literature does not include quantitative methods for characterizing exposure or responses associated with splashing a solution of a chemical into the eyes; furthermore, there appear to be no reasonable approaches to modeling this type of exposure scenario quantitatively. Consequently, accidental exposure scenarios of this type are considered qualitatively in the risk characterization.

There are various methods for estimating absorbed doses associated with accidental dermal exposure. Two general types of exposure are modeled: those involving direct contact with a solution of the herbicide and those associated with accidental spills of the herbicide or fungicide onto the surface of the skin. Any number of specific exposure scenarios could be developed for direct contact or accidental spills by varying the amount or concentration of the chemical on or in contact with the surface of the skin and by varying the surface area of the skin that is contaminated.

Exposure scenarios involving direct contact with solutions of the chemical are characterized by immersion of the hands for one minute or wearing contaminated gloves for one hour. Generally, it is not reasonable to assume or postulate that the hands or any other part of a worker will be immersed in a solution of an herbicide for any period of time. On the other hand, contamination of gloves or other clothing is quite plausible. For these exposure scenarios, the key element is the assumption that wearing gloves grossly contaminated with a chemical solution is equivalent to immersing the hands in a solution.

In either case, the concentration of the chemical in solution that is in contact with the surface of the skin and the resulting dermal absorption rate are essentially constant.

Exposure scenarios involving chemical spills on to the skin are characterized by a spill on to the lower legs as well as a spill on to the hands. In these scenarios, it is assumed that a solution of the chemical is spilled onto a given surface area of skin and that a certain amount of the chemical adheres to the skin. The absorbed dose is then calculated as the product of the amount of the chemical on the surface of the skin (i.e., the amount of liquid per unit surface area multiplied by the surface area of the skin over which the spill occurs and the concentration of the chemical in the liquid) the first-order absorption rate, and the duration of exposure. For both scenarios, it is assumed that the contaminated skin is effectively cleaned after one hour. As with the exposure assessments based on Fick's first law, this product (mg of absorbed dose) is divided by bodyweight (kg) to yield an estimated dose in units of mg chemical/kg body weight. The specific equation used in these exposure assessments is taken from SERA (2007b).

Summary of Worker Exposures

The following tables provide a summary of the general and accidental exposure scenarios calculated for workers.

Table 2. Summary of Worker Exposure Scenarios for Aminopyralid Applied at the Maximum Application Rate of 0.11 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.001	5×10^{-5}	0.009
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	1×10^{-7}	1×10^{-8}	5×10^{-6}
Contaminated Gloves, 1 hour	6×10^{-6}	9×10^{-7}	0.0003
Spill on hands,1 hour	2×10^{-5}	3×10^{-6}	0.002
Spill on lower legs,1 hour	6×10^{-5}	7×10^{-6}	0.004

Table 3. Summary of Worker Exposure Scenarios for Glyphosate Applied at the Maximum Application Rate of 3 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.04	0.003	0.2
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	4×10^{-6}	7×10^{-7}	0.0002
Contaminated Gloves, 1 hour	0.0003	4×10^{-5}	0.01
Spill on hands,1 hour	0.0006	0.0001	0.02

Spill on lower legs,1 hour	0.001	0.0003	0.04

Table 4. Summary of Worker Exposure Scenarios for Borax Applied at the Maximum Application Rate of a.e. lbs/Acre.

Scenario[1]	**Typical Dose (mg/kg/day)**	**Lower Range (mg/kg/day)**	**Upper Range (mg/kg/day)**
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	4×10^{-5}	2×10^{-5}	9×10^{-5}
Contaminated Gloves, 1 hour	3×10^{-4}	1×10^{-4}	7×10^{-4}

[1]Note that many of the scenarios included for aminopyralid and glyphosate (above) are not applicable to borax because of the granular stump application method

General Public

Under normal conditions, members of the general public should not be exposed to substantial levels of aminopyralid, glyphosate, or borax. Nonetheless, exposure scenarios can be constructed for the general public, depending on various assumptions regarding application rates, dispersion, canopy interception, and human activity. Several highly conservative scenarios are utilized to characterize this risk.

The two types of exposure scenarios developed for the general public include acute exposure and longer-term or chronic exposure. All of the acute exposure scenarios are primarily accidental. They assume that an individual is exposed to the compound either during or shortly after its application. Specific scenarios are developed for direct spray, dermal contact with contaminated vegetation, and consumption of contaminated fruit, vegetation, water, and fish. Most of these scenarios should be regarded as extreme, some to the point of limited plausibility (SERA 2007b). The longer-term or chronic exposure scenarios parallel the acute exposure scenarios for the consumption of contaminated fruit, vegetation, water, and fish but are based on estimated levels of exposure for longer periods after application. A summary of the exposure scenarios calculated for workers is provided in the three tables at the end of this section.

As discussed in the exposure assessment for workers (SERA 2006), the atypical application method for borax limits the number of exposure scenarios for the general public that can be reasonably expected to occur; therefore, typical exposures involving spray of a chemical to vegetation, such as dermal contact with contaminated vegetation and the consumption of contaminated fruit, are not applicable to the assessment of borax. Exposure scenarios based on oral exposures from consumption of contaminated fish are also not considered since borate compounds do no bio-accumulate in fish (SERA 2006).

The two types of exposure scenarios that are considered most likely for borax include ingestion of borax from a tree stump by a child and ingestion of contaminated water. For ingestion of borax from a tree stump, only acute exposure is considered. Exposure scenarios developed for the general public for contaminated water include acute exposure and longer-term or chronic exposure. The scenarios developed for this risk assessment should tend to over-estimate exposures in general.

Direct Spray

Direct sprays involving ground applications are modeled in a manner similar to accidental spills for workers. In other words, it is assumed that the individual is sprayed with a solution containing the compound and that an amount of the compound remains on the skin and is absorbed by first-order kinetics. As with the worker exposure scenarios, the first-order absorption kinetics are estimated from the empirical relationship of first-order absorption rate coefficients to molecular weight and octanol-water partition coefficients (SERA 2007b).

For direct spray scenarios, it is assumed that during a ground application, a naked child is sprayed directly with the herbicide. The scenario also assumes that the child is completely covered (that is, 100 percent of the surface area of the body is exposed), which makes this an extremely conservative exposure scenario that is likely to represent the upper limits of plausible exposure. An additional set of scenarios are included involving a young woman who is accidentally sprayed over the feet and legs. For each of these scenarios, some standard assumptions are made regarding the surface area of the skin and body weight.

Dermal Exposure from Contaminated Vegetation

In this exposure scenario, it is assumed that the herbicide is sprayed at a given application rate and that an individual comes in contact with sprayed vegetation or other contaminated surfaces at some period after the spray operation. For these exposure scenarios, some estimates of dislodgeable residue and the rate of transfer from the contaminated vegetation to the surface of the skin must be available. When no such data are directly available for these herbicides the estimation methods of Durkin et al. (SERA 2007b) are used. Other estimates used in this exposure scenario involve estimates of body weight, skin surface area, and first-order dermal absorption rates.

Contaminated Water

Water can be contaminated from runoff, as a result of leaching from contaminated soil, from a direct spill, or from unintentional contamination from applications. For this risk assessment, the two types of estimates made for the concentration of these herbicides in ambient water are acute/accidental exposure from an accidental spill and longer-term exposure to the herbicides in ambient water that could be associated with the typical application of these compounds to a 100-acre treatment area.

The acute exposure scenario assumes that a young child (2- to 3-years old) consumes one liter (L) of contaminated water (a range of 0.6 to 1.5 L) shortly after an accidental spill of 200 gallons of a field solution into a pond that has an average depth of 1 meter and a surface area of 1000 square meters or about one-quarter acre. Because this scenario is based on the assumption that exposure occurs shortly after the spill, no dissipation or degradation of the herbicide is considered. This is an extremely conservative scenario dominated by arbitrary variability. The actual concentrations in the water would depend heavily on the amount of compound spilled, the size of the water body into which it is spilled, the time at which water consumption occurs relative to the time of the spill, and the amount of contaminated water that is consumed. It is also unlikely that ponds would be the water body receiving any herbicides in this project. Flowing streams are the more likely recipients, so dilution would occur.

The scenario for chronic exposure to these herbicides from contaminated water assumes that an adult (70 kg male) consumes contaminated ambient water for a lifetime. There are some monitoring studies available on these herbicides (i.e. glyphosate) that allow for an estimation of expected concentrations in ambient water associated with ground applications of the compound over a wide area. However, for others (i.e. aminopyralid), such monitoring data does not exist. For those herbicides without monitoring data, for this component of the exposure assessment, estimates of levels in ambient water were made based on the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model.

GLEAMS is a root zone model that can be used to examine the fate of chemicals in various types of soils under different meteorological and hydro-geological conditions (SERA 2007b). SERA (2004) illustrated the general application of the GLEAMS model to estimating concentrations in ambient water. The results of the GLEAMS modeling runs are displayed in the respective SERA risk assessments. It is important to note that water monitoring conducted in the Pacific Southwest Region since 1991 involving glyphosate (USDA 2001) has shown that the assumptions in this risk assessment (in terms of water contamination) provide for a conservative (i.e. protective) assessment of risk.

The borax application method considered in this risk assessment (i.e. application to tree stumps) has a limited potential to contaminate water. Nonetheless, after application of tree stumps, rainfall and consequent runoff could lead to contamination of standing water or streams. In addition, accidental spills of the borax formulation into a small body of water are possible. Exposure assessments for both of these scenarios are presented.

Oral Exposure from Contaminated Fish

Many chemicals may be concentrated or partitioned from water into the tissues of animals or plants in the water. This process is referred to as bio-concentration. Generally, bio-concentration is measured as the ratio of the concentration in the organism to the concentration in the water. For example, if the concentration in the organism is 5 mg/kg and the concentration in the water is 1 mg/L, the bio-concentration factor (BCF) is 5 L/kg. As with most absorption processes, bio-concentration depends initially on the duration of exposure but eventually reaches steady state. Details regarding the relationship of bio-concentration factor to standard pharmacokinetic principles are provided in Calabrese and Baldwin (1993, referenced in SERA 2007b).

Both of the herbicides in this risk assessment have BCF values for fish of one or less. These values are generally determined from a standardized test that is required as part of the registration process. Borate compounds do not bio-concentrate in fish (Ohlendorf et al.1986; Klasing and Pilch 1988 referenced in SERA 2006)

For both the acute and longer-term exposure scenarios involving the consumption of contaminated fish, the water concentrations of the herbicides used are identical to the concentrations used in the contaminated water scenarios. The acute exposure scenario is based on the assumption that an adult angler consumes fish taken from contaminated water shortly after an accidental spill of 200 gallons of a field solution into a pond that has an average depth of one meter and a surface area of 1,000 square meters or about one-quarter acre. No dissipation or degradation is considered. Because of the available and well-documented information and substantial differences in the amount of caught fish consumed by the general public and Native American subsistence populations (U.S. EPA 1996, referenced in SERA 2007b), separate exposure estimates are made for these two groups. The chronic exposure scenario is constructed in a similar way.

Oral Exposure from Contaminated Vegetation

Under normal circumstances and in most types of applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. Nonetheless, any number of scenarios could be developed involving either accidental spraying of edible wild vegetation, like berries, or the spraying of plants collected by Native Americans for basket weaving or medicinal use. Again, in most instances and particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure. Notwithstanding that assertion, it is conceivable that individuals could consume contaminated vegetation.

One of the more plausible scenarios involves the consumption of contaminated berries after treatment along a road or some other area in which wild berries grow. The two accidental exposure scenarios developed for this exposure assessment include one scenario for acute exposure and one scenario for longer-term exposure. In both scenarios, the concentration of herbicide on contaminated vegetation is estimated using the empirical relationships between application rate and concentration on vegetation developed by (Hoerger and Kenaga 1972, referenced in SERA 2007b). For the acute exposure scenario, the estimated residue level is taken as the product of the application rate and the residue rate. For the longer-term exposure scenario, a duration of 90 days is used and the dissipation on the vegetation is estimated based on the estimated or established foliar half-times.

Although the duration of exposure of 90 days may appear to be somewhat arbitrarily chosen, it is intended to represent the consumption of contaminated vegetation that might be available over one season. Longer durations could be used for certain kinds of vegetation but would lower the estimated dose (i.e., would result in a less conservative exposure assessment). The central estimate of dose for the longer-term exposure period is taken as the time-weighted average of the initial concentration and concentration after 90 days. For the acute exposure scenario, it is assumed that a woman consumes one pound (0.4536 kg) of contaminated fruit. Based on statistics summarized in EPA (1996, referenced in SERA 2007b), this consumption rate is approximately the mid-range between the mean and upper 95 percent confidence interval for the total vegetable intake for a 64 kilogram woman. The longer-term exposure scenario is constructed in a similar way, except that the estimated exposures include the range of vegetable consumption (U.S. EPA 1996, referenced in SERA 2007b) as well as the range of concentrations on vegetation and the range of application rates for the herbicides.

Oral Exposure of Borax Applied to Tree Stumps

For borax, the acute exposure scenario is used in which a child ingests borax applied to tree stumps. There is no information in the available literature to estimate the amount of borax that a child could be predicted to consume in one day. The estimated amount of borax that a child may consume in one day is based on the amount of soil that an average child may ingest per day. According to the EPA Exposure Factors Handbook (U.S. EPA 1996, referenced in SERA 2006), the mean amount of soil that a child consumes per day is estimated to be 100 mg soil/day, with an upper bound estimate of 400 mg soil/day. For this risk assessment, the amount of borax consumed from tree stumps in a single day is taken as the range of 50 (an estimated lower bound) to 400 mg borax /day. A central estimate for borax consumption is taken as 100 mg borax /day. It should be emphasized that this exposure estimate is highly uncertain and not based on empirical data for consumption of any borate compound; thus exposures via this scenario may be under- or overestimated.

Summary of General Public Exposures

The following tables provide a summary of the exposure scenarios calculated for members of the general public.

Table 5. Summary of General Public Scenarios for Aminopyralid Applied at the Maximum Application Rate of 0.11 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.0009	0.0001	0.06
Direct Spray, lower legs, woman	9×10^{-5}	1×10^{-5}	0.006
Dermal Exposure, contaminated vegetation	0.0001	2×10^{-5}	0.0005
Contaminated Fruit	0.001	0.0006	0.02
Contaminated Vegetation	0.02	0.001	0.2
Contaminated Water, spill, child	0.02	0.001	0.6
Consumption of Fish, general public	0.0005	6×10^{-5}	0.01
Consumption of Fish, subsistence populations	0.002	0.0003	0.06
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0003	0.0001	0.005
Contaminated Vegetation	0.004	0.0002	0.04
Consumption of Water	0.0001	2×10^{-6}	0.001
Consumption of Fish, general public	6×10^{-7}	2×10^{-8}	4×10^{-6}
Consumption of Fish, subsistence population	5×10^{-6}	1×10^{-7}	3×10^{-5}

Table 6. Summary of General Public Scenarios for Glyphosate Applied at the Maximum Application Rate of 3 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.02	0.004	0.7
Direct Spray, lower legs, woman	0.002	0.0004	0.07
Dermal Exposure, contaminated vegetation	0.003	0.001	0.008
Contaminated Fruit	0.04	0.02	0.6
Contaminated Vegetation	0.5	0.03	4.05
Contaminated Water, spill, child	0.4	0.03	15.4
Consumption of Fish, general public	0.005	0.0006	0.2
Consumption of Fish, subsistence populations	0.02	0.003	0.6
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.02	0.009	0.3
Contaminated Vegetation	0.3	0.02	2.2
Consumption of Water	9×10^{-5}	6×10^{-6}	0.0008
Consumption of Fish, general public	2×10^{-7}	2×10^{-8}	1×10^{-6}
Consumption of Fish, subsistence population	1×10^{-6}	1×10^{-7}	1×10^{-5}

Table 7. Summary of General Public Scenarios for Borax Applied at the Maximum Application Rate of a.e. lbs/Acre.

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct consumption from tree stump, child	0.9	0.4	3.2
Contaminated Water, spill, child	0.05	0.01	0.1
Contaminated Water, ambient, child	0.01	0.001	0.03
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Consumption of Water	0.001	0.0001	0.007

Dose Response Assessment

The purpose of this section is to describe the degree or severity of risk as a function of dose (SERA 2007b). In general, dose-response assessments use reference doses (RfD), or dose levels associated with a negligible or defined level of risk, as indices of “acceptable exposure” (SERA 2007b). Table 8 provides a summary of the established reference doses (RfD) for aminopyralid, glyphosate, and borax. In this table, RfD values are derived for both acute exposures (i.e. those occurring within a short time frame) as well as chronic exposures (i.e. long-term exposures).

Table 8. Summary of the Reference Doses (RfD) Established for the two Proposed Herbicides and the one Proposed Fungicide. (SERA 2003, 2006, 2007a).

Chemical	Reference Dose (RfD)	
	Acute (mg/kg bw)[a]	Chronic (mg/kg bw/day)
Aminopyralid	1	0.5
Glyphosate	2	2
Borax	0.2	0.2

[a] mg/kg/day = milligrams of agent per kilogram of body weight per day.

The following sections contain relevant excerpts from the dose response assessment contained within the SERA risk assessments for aminopyralid, glyphosate, and borax (SERA 2003, 2006, 2007a). Unless otherwise specifically referenced, all of the information in the following sections was taken directly from the executive summary of the most recent SERA risk assessments (SERA 2003, 2006, 2007a).

Aminopyralid (Source: SERA 2007a)

The Office of Pesticide Programs of the U.S. EPA has derived a chronic RfD of 0.5 mg/kg/day for aminopyralid. This RfD is based on a chronic rat NOAEL [No Observed Adverse Effect Level] of 50 mg/kg/day and an uncertainty factor of 100. The Office of Pesticide Programs has also derived an acute RfD of 1 mg/kg bw/day based on a NOAEL from a reproduction study of about 100 mg/kg/day. In deriving both of these RfD values, the U.S. EPA used an uncertainty factor of 100, a factor of 10 for extrapolating from animals to humans and a factor of 10 for extrapolating to sensitive individuals within the human population. Both of these RfD values are based on NOAELs for the most sensitive endpoint in the most sensitive species and studies in which LOAEL values were identified. In addition, both of the NOAEL values are supported by other studies. Thus, the RfD values recommended by the U.S. EPA are adopted directly in the current risk assessment.

Glyphosate (Source: SERA 2003)

Generally, the dose-response assessments used in Forest Service risk assessments adopt RfDs proposed by the U.S. EPA as indices of 'acceptable' exposure. An RfD is basically defined as a level of exposure that will not result in any adverse effects in any individual. The U.S. EPA RfDs are used because they generally provide a level of analysis, review, and resources that far exceed those that are or can be conducted in the support of most Forest Service risk assessments. In addition, it is desirable for different agencies and organizations within the federal government to use concordant risk assessment values.

The most recent RfD on glyphosate is that proposed by the U.S. EPA Office of Pesticide Programs. This RfD of 2 mg/kg/day was proposed originally in the RED for glyphosate and was also used in the recent glyphosate pesticide tolerances. This RfD is based on teratogenicity study in rabbits (Rodwell et al. 1980b in 2003) in which no effects observed in offspring at any dose levels and maternal toxicity was observed at 350 mg/kg/day with a NOAEL of 175 mg/kg/day . Using an uncertainty factor of 100 – 10 for sensitive individuals and 10 for species-to-species extrapolation – U.S. EPA/OPP derived the RfD of 2 mg/kg/day, rounding the value of 1.75 mg/kg/day to one significant digit.

For the current risk assessment, the RfD 2 mg/kg/day derived by U.S. EPA/OPP is used as the basis for characterizing risk from longer-term exposures in this risk assessment. For short-term exposures, the value of 2 mg/kg/day recommended by U.S. EPA's Office of Drinking Water is used. Since this is identical to the chronic RfD, this approach is equivalent to applying the same RfD to be short-term and long-term exposures. Given the lack of a significant dose-duration relationship for glyphosate, this approach seems appropriate.

Borax (Source: SERA 2006)

The U.S. EPA (2004, as referenced in 2006) has recently derived a chronic RfD of 0.2 mg/kg/day for boron (from boric acid and borates), using the combined data of two developmental toxicity studies in rats using decreased fetal weight as the most sensitive endpoint. The RfD is based benchmark dose analyses identifying a 5 percent decrease in mean fetal body weight compared to control as the benchmark response (BMR) level. The 95 percent lower bound on the dose corresponding to the BMR, i.e., the $BMDL_{05}$, of 10.3 mg B/kg/day is used as the *critical dose* value to calculate the RfD. The uncertainty factor of 66, which considers both the toxicokinetic and toxicodynamic aspects associated with interspecies and interindividual variability, was applied to the critical dose to derive the chronic RfD of 0.2 mg B/kg/day. The U.S. EPA has not derived an acute RfD for boron. Therefore, the chronic RfD of 0.2 mg B/kg/day will also be used to characterize risks associated with incidents or accidents that involve an exposure period of 1 day.

Risk Assessment

The following section presents a quantitative summary of the risk to workers and members of the general public associated with exposure to aminopyralid, glyphosate, and borax. This assessment utilizes the specific chemicals, application rates, and volumes proposed for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project.

Risk characterization is a process that compares doses that people may get from applying pesticides (i.e. workers) or from being near an application site (i.e. members of the general public) with the U.S. Environmental Protection Agency's established Reference Doses (RfD), a level of exposure considered protective of lifetime or chronic exposures. Risk characterization is expressed as a hazard quotient; a hazard quotient of one or less indicates that the likelihood of adverse effects are low (SERA 2006).

The only reservation attached to this assessment is that associated with any risk assessment: absolute safety cannot be proven and the absence of risk can never be demonstrated. No chemical has been studied for all possible effects and the use of data from laboratory animals to estimate hazard or the lack of hazard to humans is a process that contains uncertainty. Prudence dictates that normal and reasonable care should be taken in the handling of these chemicals.

Workers

Table 9 and Table 10 illustrate that none of the exposure scenarios for workers approach a level of concern (i.e. are greater than one). The highest hazard quotient is 0.1, which is below the level of concern (1.0) by a factor of 10. Based on these values, the risk characterization for workers is considered negligible. This implies that even under the maximum proposed application rates, workers can apply aminopyralid, glyphosate, and borax over the long-term without any expected toxic effects. It also implies that even under the most conservative set of accidental exposures (which should be infrequent events) workers will not face an unacceptable level of risk. All of these chemicals can cause irritation and damage to the skin and eyes (see below); however these effects can be minimized or avoided by safe handling practices and the use of personal protective equipment such as eye protection.

As noted in the Exposure Assessment Section, borax is not included in either the general or the accidental spill scenario because of the method in which it is applied, which is in granular form to the surfaces of cut tree stumps. Therefore, the only exposure scenario that is considered plausible for workers is accidental dermal exposure to the hands and lower legs of granular borax during application, which is displayed in Table 10.

Table 9. Hazard Quotients for Backpack Applicators from General (Non-Accidental) Exposures to Aminopyralid and Glyphosate.

Chemical	Hazard Quotient[a]		
	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.003	0.0001	0.02
Glyphosate	0.02	0.0007	0.1

[a] Hazard Quotient is the level of exposure divided by the RfD (reference dose), then rounded to one significant digit.

Table 10. Hazard Quotient for Herbicides (Backpack Applicators) and Fungicide (Granular Application) for Accidental/Incidental Exposures to Lower and Upper Application Rates.

Chemical	Hazard Quotient[a]							
	Immersion of Hands (1 minute)		Contaminated Gloves (1 hour)		Spill on Hands (1 hour)		Spill on Lower Legs (1 hour)	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Aminopyralid	1×10^{-8}	5×10^{-6}	9×10^{-7}	0.0003	3×10^{-6}	0.002	7×10^{-6}	0.004
Glyphosate	3×10^{-7}	1×10^{-4}	2×10^{-5}	0.007	6×10^{-5}	0.009	0.0001	0.02
Borax[b]	8×10^{-5}	4×10^{-4}	0.0006	0.004	N/A	N/A	N/A	N/A

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.
[b] Spill on Hands and Spill on Lower Legs scenarios are not applicable to granular formulations of borax.

Technical grade aminopyralid in powder form can cause severe eye irritation with corneal damage (SERA 2007a); however aminopyralid applications within the Keddie Ridge Project area propose solutions of aminopyralid-triisopropanolamine (TIPA) salt in water (such as that found in Milestone®), which is considered much less irritating to the eyes. The U.S. EPA has classified aminopyralid-TIPA as a

Category IV, the minimal classification for eye irritants (U.S. EPA/OPP-HED 2005, referenced in SERA 2007a).

Glyphosate is considered a skin and eye irritant. As discussed in SERA (2003), the irritation level of glyphosate with a POEA surfactant (which is not included in the proposed formulation under Keddie) has been shown to be equivalent to standard dishwashing detergents, all purpose cleaners, and baby shampoos.

Boric acid is rated as a Category III skin irritant (moderate irritant) and anhydrous borax is rated as a Category IV skin irritant (mild irritant) (U.S. EPA 1993a, referenced in SERA 2006). Borax is not irritating to the skin (Toxicity Category IV), but can cause severe irritation to the eyes (Toxicity Category I). Effects to the eyes and skin from aminopyralid, glyphosate, and borax can be minimized or avoided by safe handling practices.

General Public

Direct Spray

As seen in Table 11, the hazard quotients for the two direct spray scenarios are below one; therefore, it can be determined that based on the available information and under the foreseeable conditions of application there is no route of exposure or scenario that suggests that the general public will be at any substantial risk from general exposure.

Table 11. Hazard Quotient for the General Public - Direct Spray Scenario.

Chemical	Hazard Quotient[a]					
	Child (whole body)			Woman (feet and lower legs)		
	Typical Application Rate	Lower Application Rate	Upper Application Rate	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.0009	0.0001	0.06	9×10^{-5}	1×10^{-5}	0.006
Glyphosate	0.01	0.002	0.3	0.001	0.0002	0.03

[a] Hazard Quotient is the level of exposure divided by the reference dose (RfD), then rounded to one significant digit.

Contaminated Vegetation

Table 12 demonstrates that, for members of the general public that may contact vegetation sprayed with aminopyralid or glyphosate, there is a negligible level of exposure risk. Due to the method of application, this scenario is not applicable to borax.

Table 12. Hazard Quotient for the Public – Contact with Vegetation Sprayed with Herbicides.

Chemical	Hazard Quotient[a]		
	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.0001	2×10^{-5}	0.0005
Glyphosate	0.002	0.0005	0.004

[a.] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Contaminated Water

For the accidental spill scenarios, the only exposure level that exceeds the level of concern (i.e. a hazard quotient greater than one) is in the scenario involving a child that consumes water contaminated with glyphosate (Table 13). When interpreting this scenario, it is important to take into consideration that this is an arbitrary exposure scenario. In other words, scenarios that are more or less severe (all of which may be equally probable or improbable) could easily be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Therefore, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of glyphosate, all of the hazard quotients would be a factor of 10 less.

Table 13. Hazard Quotient for the Public - Drinking Water Contaminated by Herbicides and Fungicide.

	Hazard Quotient[a]					
	Acute-Spill Scenario (child)			Chronic-Spill Scenario (adult male)		
Chemical	Typical	Lower	Upper	Typical	Lower	Upper
Aminopyralid	0.02	0.001	0.6	0.0003	4×10^{-6}	0.002
Glyphosate	0.2	0.02	**8**	4×10^{-5}	3×10^{-6}	0.0004
Borax	0.2	0.07	0.7	0.006	0.0006	0.04

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Another conservative aspect to the water contamination scenario is that it represents standing water, with no dilution or decomposition of the herbicide. This is unlikely in a forested situation where flowing streams are more likely to be contaminated in a spill, rather than a standing pond of water. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and those that may warrant the greatest steps to mitigate. For glyphosate, such scenarios involve oral (contaminated water) rather than dermal (spills or accidental spray) exposure.

Oral Exposure from Contaminated Fish

For members of the general public, there is no unacceptable level of risk associated with consumption of fish caught from water contaminated with either aminopyralid or glyphosate (see Table 14).
The highest hazard quotient under these scenarios is 0.3, which was calculated using the upper application limits to represent the worst-case scenario; this value is below the level of concern (1.0) by a factor of 3.

Table 14. Hazard Quotient for the Public – Consumption of Fish Caught from Water Contaminated by Aminopyralid and Glyphosate. Upper Limits are Presented to Represent the Worst-Case Scenario.

	Hazard Quotient[a]			
	Fish Consumption (accidental spill)		Chronic Fish Consumption	
Chemical	Adult Male	Subsistence Population	Adult Male	Subsistence Population
Aminopyralid	0.01	0.05	8×10^{-6}	7×10^{-5}

Glyphosate	0.06	0.3	7×10^{-7}	5×10^{-6}

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Oral Exposure from Contaminated Vegetation

Table 15 displays the hazard quotient values for scenarios involving a woman eating contaminated fruit and vegetation shortly after spraying and for 90 days after they were sprayed. Under the lower and typical rates of application, the hazard quotients are well below one for both the chronic and acute scenarios. However, at the upper application rate, the hazard quotient is slightly above one in the case of acute and chronic exposure to glyphosate as a result of consuming contaminated vegetation.

Table 15. Hazard Quotient for the Public – Ingesting Fruit and Vegetation Contaminated by Herbicides

Chemical	Hazard Quotient a					
	Acute Exposure			Chronic Exposure		
	Typical Application Rate	Lower Application Rate	Upper Application Rate	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid						
Fruit	0.001	0.0006	0.02	0.0006	0.0002	0.01
Vegetation	0.02	0.001	0.1	0.008	0.0004	0.08
Glyphosate						
Fruit	0.02	0.008	0.3	0.01	0.004	0.2
Vegetation	0.2	0.02	**2**	0.1	0.009	**1.1**

[a.] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

These hazard quotients illustrate that there is some uncertainty regarding the potential effects of consuming contaminated vegetation; however considering that these hazard quotients are very close to one (the acceptable level of risk), it is unlikely that adverse health effects would result in either of these scenarios. It is also important to take into account the fact that these scenarios do not include the mitigative effects of washing contaminated vegetation. Also, after treatment, vegetation would show obvious signs of herbicide effects and would likely be undesirable for consumption.

Oral Exposure of Borax Applied to Tree Stumps

As seen in Table 16, the hazard quotients for consumption of borax from a tree stump by a child range from 2 to 16 for ingestion of 50 to 400 mg of borax. These estimated levels of exposure are below the levels of exposure associated with nonlethal effects such as diarrhea and vomiting by factors of about 4 to 32 (SERA 2006). They are also below the documented lethal doses, which range from 505 mg/kg/day and 765 mg/kg/day, by factors of about 11 to 135. Therefore, while this exposure scenario raises concern in that the RfD could be substantially exceeded in a child directly consuming borax from a treated stump, the most likely adverse effects would probably be vomiting and diarrhea (SERA 2006).

Table 16. Hazard Quotient for the Public – Acute-Oral Ingestion of Borax by a Child.

Chemical	Hazard Quotient[a]

	Typical Application Rate	Lower Application Rate	Upper Application Rate
Borax	4	2	16

[a.] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Risk Assessment Summary

The risk characterization for workers is reasonably simple and unambiguous; based on a generally conservative and protective set of assumptions regarding both the toxicity of the proposed chemicals and the potential exposures, there is no basis for suggesting that adverse effects are likely in workers even at the maximum application rates proposed under the Keddie Ridge Project for aminopyralid, glyphosate, or borax (SERA 2003, 2006, 2007a). From a practical perspective, the most likely accidental exposure for workers (i.e. one that might require medical attention) may involve accidental contamination of the eyes. All of the proposed chemicals can cause irritation and damage to the skin and eyes; however these effects can be minimized or avoided by safe handling practices and the use of personal protective equipment such as eye protection.

For members of the general public, aminopyralid applications would result in a negligible risk under all of the scenarios. Even at the highest application rate of 0.11 lb a.e./acre, the hazard quotients are below the level of concern by factors of 2 to 122,000 for longer term exposures.

For borax, the only general public scenario that yielded a hazard quotient above the level of concern (above 1.0) was the scenario in which a child ingests borax straight from the tree stump. While this exposure scenario does raise concern that the reference dose (RfD) could be substantially exceeded if a child directly consumes borax from a treated stump, the most likely adverse effects would probably be vomiting and diarrhea (SERA 2006). This scenario is also extreme and highly unlikely as 1) treatment units are away from high visitor-use or recreation areas, and 2) borax would be applied during or immediately after active logging operations where unsupervised visitor-use is highly discouraged for safety reasons.

For glyphosate, the only two general public scenarios that exceeded the level of concern (i.e. a hazard quotient above 1.0) were the scenario involving a child drinking from a spill-contaminated pond and the scenario involving short and long-term exposure from consumption of contaminated vegetation. For all of these scenarios, the hazard quotient only exceeded the level of concern in the upper range of the application rate; the typical and lower application ranges produced hazard quotients that were below the level of concern.

The exposure scenario that involved the consumption of contaminated water after an accidental spill of glyphosate into a small pond produced a hazard quotient of eight (Table 13). This sort of scenario is routinely used in Forest Service risk assessments as an index of the measures that should be taken to limit exposure in the event of a relatively large spill into a relatively small body of water. For glyphosate, as well as for most other chemicals, this exposure assessment indicates that such an event would require measures to ensure that members of the general public do not consume contaminated water. As detailed in Table 6, the upper range of the exposure scenario involves a dose of 15.4 mg/kg bw. While this is an unacceptable level of exposure, it is far below doses that would likely result in overt signs of toxicity. As detailed in the SERA risk assessment (2003), a dose of 184 mg/kg as Roundup (i.e. glyphosate plus a surfactant) was not associated with any overt signs of toxicity in humans; mild signs of toxicity were apparent at doses of 427 mg/kg, which is over 27 times higher than the upper range of 15.4 mg/kg in the accidental spill scenario.

The only other general public scenario that produced a hazard quotient above one was one that involved the consumption of glyphosate-contaminated vegetation. Under normal circumstances, particularly in the case of noxious weed treatment applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. One exception to this could be plants collected by Native Americans for basket weaving or medicinal use. However, in most instances, particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure.

Cumulative Effects

Cumulative effects from the proposed herbicides or fungicide may result from (a) repeated exposure to one particular chemical or (b) simultaneous exposure to a particular chemical and other agents that may cause the same effect or effects by the same or similar modes of action.

In terms of repeated exposure to one particular chemical, the analysis of chronic exposure scenarios discussed in this risk analysis specifically addresses the potential long-term cumulative impacts associated with aminopyralid, glyphosate, and (to a limited extent) borax. This risk assessment determined that there is a low likelihood of cumulative adverse effects associated with long-term or repeated exposures to the proposed chemicals.

Since these herbicides persist in the environment for a relatively short time (generally less than one year), do not bio-accumulate, and are rapidly eliminated from the body, additive doses from re-treatments in subsequent years are not anticipated. According to work completed by Ando et al. (2003), some plant material can contain glyphosate residues up to 67 weeks after treatment, however, these levels were less than one part per million (Ando et al. 2003). Based on the re-treatment schedule proposed under alternatives A and D (2 to 5 years), it is possible that residues from the initial herbicide application could still be detectable during subsequent re-treatments the following year, but these plants would represent a low risk to humans as they would show obvious signs of herbicide effects and would be undesirable for collection.

It is conceivable that workers or members of the public could be exposed to herbicides as a result of treatments on surrounding public or private forestlands. Where individuals could be exposed by more than one route, the risk of such cases can be quantitatively characterized by simply adding the hazard quotients for each exposure scenario. Using glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs (HQ = 0.00009), staying in contact with contaminated vegetation (HQ = 0.002), eating contaminated fruit (HQ = 0.02), and consuming contaminated vegetation (HQ = 0.2) leads to a combined hazard quotient of 0.22. With the exception of a child ingesting borax from a treated stump (discussed in the section above), using the typical rates of application, the addition of all possible exposure scenarios leads to hazard quotients that are substantially less than one for all of the proposed pesticides.

Additional sources of pesticide exposure include use of herbicides and fungicides on adjacent private timberlands or home use by a worker or member of the general public. Table 17 displays the total reported herbicide application (in pounds) within Plumas County. The Plumas NF has not been extensively involved in herbicide applications in the last five years; therefore much of this reported use is on private lands.

Table 17. Total Herbicide Applications (in Pounds) within Plumas County between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Report Year	Total pounds of pesticide reported
2004	10,882
2005	6,815
2006	6,272
2007	18,505
2008	38,551
Average	**16,205**

Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County. This table includes all pesticides used between 2004 and 2008, not just the three proposed for use in Keddie Ridge Project.

Table 18 shows that between 2004 and 2008, the average amount of active ingredient applied annually within Plumas County was approximately 50 lbs of aminopyralid, 4,775 lbs of glyphosate, and 1,393 lbs of borax (California DPR 2009). Over this same time period the average number of acres treated annually was 88 acres of aminopyralid, 2,251 acres of glyphosate, and 2,030 acres of borax (California DPR 2009).

Table 18. Total Pounds of Aminopyralid, Glyphosate, and Borax Applied within Plumas County between 2004 and 2008. Data are not currently available for 2009 or 2010.

Chemical	Total pounds of pesticide reported (by year)					Average per year
	2004	2005	2006	2007	2008	
Aminopyralid					50	50
Glyphosate	4,546	1,826	3,726	2,144	11,632	4,775
Borax	3,592	350	955	38	2,031	1,393

Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County.

Table 19. Approximate Number of Acres Treated with Aminopyralid, Glyphosate, and Borax Within Plumas County between 2004 and 2008. Data are not currently available for 2009 or 2010.

Chemical	Estimated number of acres treated (by year)					Average per year
	2004	2005	2006	2007	2008	

Aminopyralid					88	88
Glyphosate	2948	538	1204	870	5697	2,251
Borax	2093		1966			2,030

[a] Acres Treated are only for forestry and rangeland uses as these are the only categories that have acres reported in the CDPR database.
Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County.

We assume that, with the exception of the use proposed under alternatives A and D, there would not be any significant changes in the use patterns displayed above in the near future. At this time there are no other pesticide-related projects listed on the Plumas National Forest Schedule of Proposed Action (SOPA) that occur within the proposed Keddie Ridge Project area.

Under alternatives A and D it is estimated that approximately 62 acres of noxious weeds (hoary cress, Canada thistle, and yellow starthistle) would be treated with aminopyralid or glyphosate for a period of two to five years. Alternatives C and E would not involve any herbicide use. The average number of acres treated annually with aminopyralid and glyphosate in Plumas County (calculated from Table 19) is approximately 2,339 acres. Therefore, alternatives A and D would result in at most a three percent increase in the number of acres treated with these two herbicides in Plumas County.

The U.S. EPA has developed the theoretical maximum residue contribution (TMRC), which can be used to consider the cumulative effects associated with use of these herbicides outside of the Keddie Ridge Project. The TMRC is an estimate of maximum daily exposure to chemical residues that a member of the general public could be exposed to from all published and pending uses of a pesticide on a food crop (Table 20). Adding the TMRC to this project's chronic dose estimates can be used as an estimate of the cumulative effects of this project with theoretical background exposure levels of these herbicides. The result of doing this doesn't change the risk conclusions based on the project-related HQ values.

Table 20. TMRC Values for U.S. Population as a Whole.

Pesticide	TMRC (mg/kg/day)	Percent of RfD
Aminopyralid	0.0002	0.1
Glyphosate	0.03	1.5

Sources: (U.S. Environmental Protection Agency 2000, 2004)

Cumulative effects can also be caused by the interaction of different chemicals with a common metabolite or a common toxic action; however, neither the herbicides nor fungicide in this analysis has been demonstrated to share a common metabolite.

Inert Ingredients

The approach used in USDA (1989, as referenced in USDA 2008), the SERA Risk Assessments (SERA 2003, 2006, 2007a), and this analysis to assess the human health effects of inert ingredients and full formulations has been to: (1) compare acute toxicity data between the formulated products (including inert ingredients) and their active ingredients alone; (2) disclose whether or not the formulated products have undergone chronic toxicity testing; and (3) identify, with the help of EPA and the chemical companies, ingredients of known toxicological concern in the formulated products and assess the risks of those ingredients.

Researchers have studied the relationships between acute and chronic toxicity and while the biological end-points are different, relationships do exist and acute toxicity data can be used to give an indication of overall toxicity (Zeise, et al. 1984, as referenced in USDA 2008). The court in *NCAP v. Lyng*, 844 F.2d 598 (9th Cir 1988) decided that this method of analysis provided sufficient information for a decision maker to make a reasoned decision. In SRCC v. Robertson, Civ.No. S-91-217 (E.D. Cal., June 12, 1992) and again in *CATs v. Dombeck*, Civ. S-00-2016 (E.D. Cal., Aug 31, 2001) the district court upheld the adequacy of the methodology used in USDA (1989, as referenced in USDA 2008) for disclosure of inert ingredients and additives.

Since most information about inert ingredients is classified as “Confidential Business Information” (CBI) the Forest Service asked EPA to review the thirteen herbicides for the preparation of USDA 1989 (includes glyphosate) and the commercial formulations and advise if they contained inert ingredients of toxicological concern (Inerts List 1 or 2) (USDA 1989, as referenced in USDA 2008). The EPA determined that there were no inerts on List 1 or 2. In addition, the CBI files were reviewed in the development of the most recent SERA risk assessments (SERA 2003, 2006, 2007a). Information has also been received from the companies who produce the herbicides and spray additives.

Comparison of acute toxicity (LD_{50} values) data between the formulated products (including inert ingredients) and their active ingredients alone shows that the formulated products are generally less toxic than their active ingredients (SERA 2003, 2006, 2007a, USDA 1989, as referenced in USDA 2008).

According to the SERA risk assessment (2006), Sporax contains 100 percent sodium tetraborate decahydrate (borax) and has no other active or inert ingredients. The sole inert ingredient listed for the formulations of aminopyralid and glyphosate most likely to be used in the Keddie Ridge project (i.e. Milestone® and Accord®) is water (SERA 2003, 2007a).

While these formulated products have not undergone chronic toxicity testing like their active ingredients, the acute toxicity comparisons, the EPA review, and our examination of toxicity information on the inert ingredients in each product leads us to conclude that the inert ingredients in these formulations do not significantly increase the risk to human health and safety over the risks identified for the active ingredients.

Additives

Additives (also known as adjuvants) are mixed with an herbicide solution to improve the performance of the spray mixture by either enhancing the activity of the herbicide’s active ingredient or by offsetting problems associated with application, such as water or wind factors (Bakke 2007). The two additives proposed for use in the Keddie Ridge Project are: an esterified vegetable oil surfactant (e.g., Competitor® or an equivalent formulation) to facilitate and enhance the spreading and penetrating properties of the herbicides and a marker dye (e.g., Hi-light® Blue or an equivalent formulation) to allow for the identification of plants that have been treated. Borax would not be applied in combination with other products or additives.

Additives are not under the same registration guidelines as are pesticides; therefore much of the information that describes the active ingredients in additives is considered confidential business information (CBI). The EPA does not register or approve the labeling of spray additives, although the California Department of Pesticide Regulation (DPR) does require the registration of those that are considered to increase the action of the pesticide it is used with. All additives are generally field tested by the manufacturer in combination with several different herbicides and weed species, and under a number of different environmental conditions (Bakke 2007).

The most common risk factor associated with the use of the proposed additives is skin or eye exposure. This risk can be minimized through good industrial hygiene practices (i.e. personal protective eyewear and gloves) while utilizing these products. Overall, the additives proposed for use within the Keddie Ridge Project are not expected to pose an adverse risk to the health and safety of workers or members of the general public. This is based on information provided on the product labels as well as in the discussion contained in Bakke (2007) in which the two additives proposed for use under this project are discussed and some acute toxicity data presented. The following provides further discussion of the additives analyzed for the Keddie Ridge Project.

Competitor® (or an Equivalent Formulation)

Product labels contain “signal words” (caution, warning, danger, and poison) which indicate the product’s relative toxicity to humans. The signal word is assigned using a combination of acute toxicity studies and the toxicity of each of the product’s components (Tu et al. 2001). Competitor® has been assigned a “caution” signal word and the label indicates that improper use may cause irritation to the skin and eyes.

The main ingredient in Competitor® is an esterified vegetable oil. It also contains two emulsifiers, sorbitan alkylpolyethoxylate ester and dialkyl polyethoxylene glycol. Vegetable oil surfactants are gaining in popularity due to their capability to increase herbicide absorption and spray retention (Bakke 2007). The U.S. Food and Drug Administration (FDA) considers methyl and ethyl esters of fatty acids produced from edible fats and oils to be food grade additives (21 CFR 172.225). However, because of the lack of exact ingredient statements on these surfactants, it is not always clear whether the oils used meet the U.S. FDA standard.

Hi-light® Blue (or an Equivalent Formulation).

Hi-Light® Blue dye is not required to be registered as a pesticide; therefore there is no signal word included on the label. However, according to Bakke (2007), this product would likely have a “caution” signal word if required to identify one. The label does indicate that this product is mildly irritating to the skin and eyes. Hi-Light® Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (SERA 1997). This dye is water-soluble, contains no listed hazardous substances, and is considered virtually non-toxic to humans (SERA 1997, Bakke 2007) .The effect of use on non-target terrestrial and aquatic species is unknown; however the use of this dye use has not resulted in any known problems (Bakke 2007).

The use of Hi-Light® Blue in the proposed herbicide formulations would result in almost no increased risk to the health and safety of the workers or members of the general public. In fact, the use of dye in herbicide application can reduce likelihood and risk of exposure by facilitating avoidance of treated vegetation.

Synergistic Effects

Synergistic effects are those effects resulting from exposure to a combination of two or more chemicals that are greater than the sum of the effects of each chemical alone (additive). Refer to USDA (1989, as referenced in USDA 2003) for a detailed discussion on synergistic effects.

It is not anticipated that synergistic effects would be seen with the additives proposed in the Keddie Ridge Project. Based on a review of several recent studies, there is no demonstrated synergistic relationship between herbicides and surfactants (Abdelghani et al 1997; Henry et al 1994; Lewis 1992; Oakes and Pollak 1999, 2000 as referenced in Bakke 2007).

Although the combination of surfactant and herbicide might indicate an increased rate of absorption through the skin, a review of recent studies indicates this is not often true (Ashton et al 1986; Boman et al 1989; Chowan and Pritchard 1978; Dalvi and Zatz 1981; Eagle et al 1992; Sarpotdar and Zatz 1986; Walters et al 1993, 1998; Whitworth and Carter 1969 as referenced in Bakke 2007). For a surfactant to increase the absorption of another compound, the surfactant must affect the upper layer of the skin. Without some physical effect to the skin, there will be no change in absorption as compared to the other compound alone. The studies indicate that in general non-ionic surfactants have less of an effect on the skin, and hence absorption, then anionic or cationic surfactants. Compound specific studies indicate that the alkylphenol ethoxylates generally have little or no effect on absorption of other compounds. In several studies, the addition of a surfactant actually decreased the absorption through the skin. It would appear that there is little support for the contention that the addition of surfactants to herbicide mixtures would increase the absorption through the skin of these herbicides.

Borax is not applied in combination with other products or additives. In addition, no data are available regarding the effects of boron compounds applied in conjunction with other chemicals. Thus, an assessment of toxicological effects of borax mixed with other chemicals cannot be made.

Sensitive Individuals

The uncertainty factors used in the development of the reference dose (RfD) takes into account much of the variation in human response. The uncertainty factor of 10 for sensitive subgroups is sufficient to ensure that most people will experience no toxic effects. “Sensitive” individuals are those that might respond to a lower dose than average, which includes women and children. As stated in National Academy of Sciences (1993, as referenced in USDA 2003), the quantitative differences in toxicity between children and adults are usually less than a factor of approximately 10-fold. An uncertainty factor of 10 for sensitive subgroups may not cover all individuals that may be sensitive to herbicides because human susceptibility to toxic substances can vary by two to three orders of magnitude. Factors affecting individual susceptibility include diet, age, heredity, preexisting diseases, and life style. Individual susceptibility to the herbicides proposed in this project cannot be specifically predicted. Unusually sensitive individuals may experience effects even when the HQ is equal to or less than 1. Further information concerning risks to sensitive individuals can be found in USDA (1989, as referenced in USDA 2003).

There is no information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of aminopyralid or glyphosate (SERA 2003, 2007a). The primary targets for boron toxicity are the developing fetus and the testes. Thus, exposure of pregnant women to borate compounds places the developing fetus at risk. Since the oral (chronic) RfD for boron and borates is based on the effects in the developing fetus, risk to this subgroup is assessed throughout the risk assessment (SERA 2006). Regarding other sensitive subgroups, males with underlying testicular dysfunction could be at increased risk for boron-induced testicular toxicity; however, no data are available to quantify this risk.

Worksheets

All worksheets related to the information noted in this document can be found in the Keddie Ridge Project record and are hereby incorporated by reference.

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Glossary

Acid equivalent – when making herbicide rate recommendations for herbicides that are available as either salts or esters or both, it is common practice to make the recommendations on the basis of pounds of the acid equivalent of the active ingredients per acre (lb ae / A). The acid equivalent of a salt or ester form of a herbicide is that portion of the molecule that represents the parent acid (herbicidal portion) form of the molecule (Wood et al. 1996).

Adjuvant – Additives that are mixed with an herbicide solution to improve the performance of the spray mixture by either enhancing the activity of the herbicide's active ingredient or by offsetting problems associated with application, such as water or wind factors

Hazard Quotient – the ratio of the estimated level of exposure to the reference dose or some other index of acceptable exposure.

LC_{50} (lethal concentration) – a calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal population.

LD_{50} (lethal dose) – the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over an observation period, typically 14 days.

No Observed Adverse Effect Level (NOAEL) – the dose of a chemical at which no statistically or biologically significant increases in frequency of severity of adverse effects were observed between the exposed population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse.

RfD, reference dose – a daily dose which is not anticipated to cause any adverse effects in a human population over a lifetime of exposure. These values are derived by the U.S. Environmental Protection Agency.

Surfactant – a vegetable oil or silicon-based adjuvant (e.g., Competitor® or an equivalent formulation) added to herbicides in order to facilitate and enhance their spreading and penetrating properties.

Appendix J

Project Specific Land Allocation Maps

Introduction

This appendix provides an overview of the Plumas National Forest Land and Resource Management Plan (PNF LRMP)(USDA 1988) as amended by two other plan amendments. Each plan or plan amendment discussion includes a brief overview of: the plan or plan amendment; land allocations or management areas that apply; and a figure to provide a spatial relationship of land allocations and, in some cases, associated prescriptions.

Forest Plan Direction

Forest Plan

The proposed action and alternatives are guided by the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003b, 2003c), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b). In addition, the HFQLG/SNFPA Implementation Consistency Crosswalk, revised December 2007, provides clarification for applying standards and guidelines for 2004 SNFPA FSEIS and ROD (USDA 2004a, 2004b) and for HFQLG FEIS and ROD (USDA 1999a, 1999b, 2003b 2003c) (HFQLG/SNFPA Implementation Consistency Crosswalk and cover letter, December 12, 2007) (USDA 2007). This project is being planned under authorization of the Healthy Forest Restoration Act (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process).

Land allocations within the Plumas National Forest have been allocated to certain primary uses through three planning processes: the original PNF LRMP (USA1988) development process, the HFQLG FEIS, FSEIS, and RODs (USDA 1999a, 1999b, 2003b, 2003c), and the SNFPA ROD (USDA 2004a, 2004b). Each of these plan components include standards and guidelines for land and resource management unique to each land allocation. Many of these allocations overlap. During the life of the HFQLG Act Pilot Project, HFQLG land allocations are to be employed for vegetation management projects, with one exception (SNFPA ROD allocation for Northern goshawk PACs).

Prescriptions in the PNF LRMP are still applicable in whole or in part, because they were not superseded by three amendments. Those allocations still in effect for the Keddie Ridge Project area are discussed further below.

The PNF LRMP (USDA 1988) displays management areas, which include descriptions, standards and guidelines, prescriptions, and management objectives specific to each management area (page 4-113). Management areas that overlap with the Keddie Ridge Project area include: Rich (#20), Grizzly Ridge (#23), Butt Lake (#26), Indian Valley (#27), Lights Creek (#28), Antelope (#29), and Ward (#30). Management areas that overlap with proposed treatment units within the Keddie Ridge Project area include: Indian Valley (#27) and Lights Creek (#28). Because Rich, Grizzly Ridge, Butt Lake, Antelope, and Ward management areas do not overlap with treatment units and very small portions of the management areas overlap with the Keddie Ridge Project area, these management areas are removed from further discussion. Of the management areas that overlap with proposed treatment units, prescriptions that apply include: Rx5-Recreation Area Prescription; Rx3-Special Interest Areas Prescription; Rx6-Developed Recreation Site Prescription; Rx7-Minimal Management Prescription; Rx8-Semi-Primitive Area Prescription; Rx10-Visual Retention Prescription; Rx13-Goshawk Habitat Prescription; Rx14-Visual Partial Retention Prescription; Rx 15-Timber Emphasis Prescription; and Rx16-Intensive Ranger. Areas of general direction and standards and guidelines are located on pages 4-274 – 4-293. Figure 1 displays management areas that overlap with the Keddie Ridge Project area. Figure 2 displays the prescriptions specific to Indian Valley and Lights Creek management areas, which overlap with the Keddie Ridge Project area and treatment units.

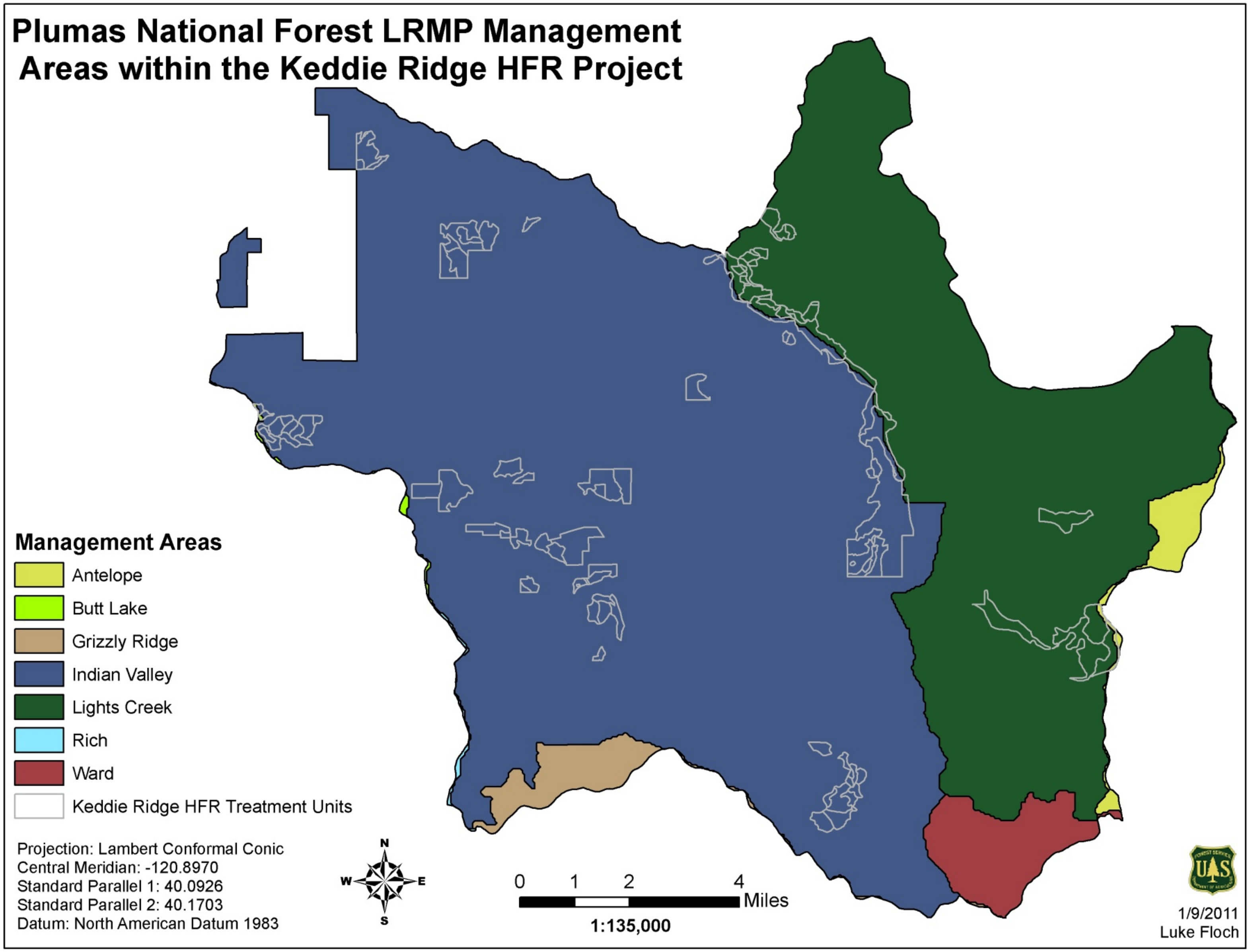

Figure 1 Plumas National Forest Land Resource Management Plan Management Areas within the Keddie Ridge Project Area

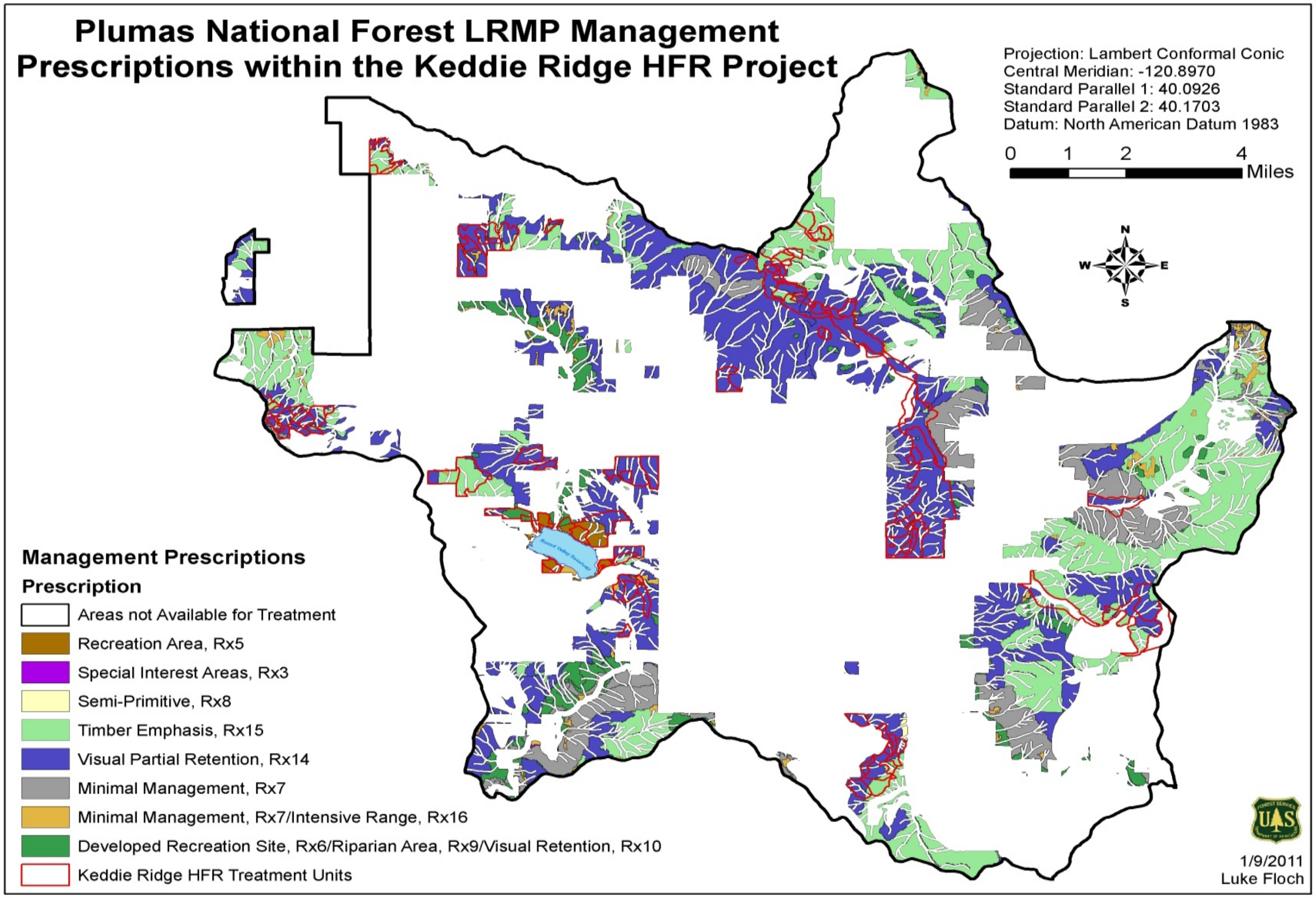

Figure 2 Plumas National Forest Land Resource Management Plan Management Areas within the Keddie Ridge Project Area

Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the Department of the Interior and Related Agencies Appropriations Act, including section 401—the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of group selection across the Pilot Project Area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA Forest Service 1999). The Record of Decision amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG Final Supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA Forest Service 2003). In February 2003, the Department of the Interior and Related Agencies Appropriations Act was signed and extended the HFQLG Pilot Project legislation by another five years. The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

The 1999 HFQLG Record of Decision (pages 8-10) displays the changes in management direction applicable to the HFQLG Pilot Project Area. Amendments to the PNF LRMP are discussed in detail in the HFQLG Final Environmental Impact Statement on pages 2-6 – 2-18. Land allocations that apply to the Pilot Project area include offbase and deferred lands, late-successional old-growth stands (ranks 4 and 5), California spotted owl protected activity centers (PAC), spotted owl habitat areas (SOHA), and riparian habitat conservation areas (RHCAs).

The HFQLG Act has specific standards and guidelines listed on pages 8-10 of the HFQLG ROD and pages 2-6 – 2-18 of the HFQLG FEIS. Figure 3 displays HFQLG land allocations specific to the Keddie Ridge Project.

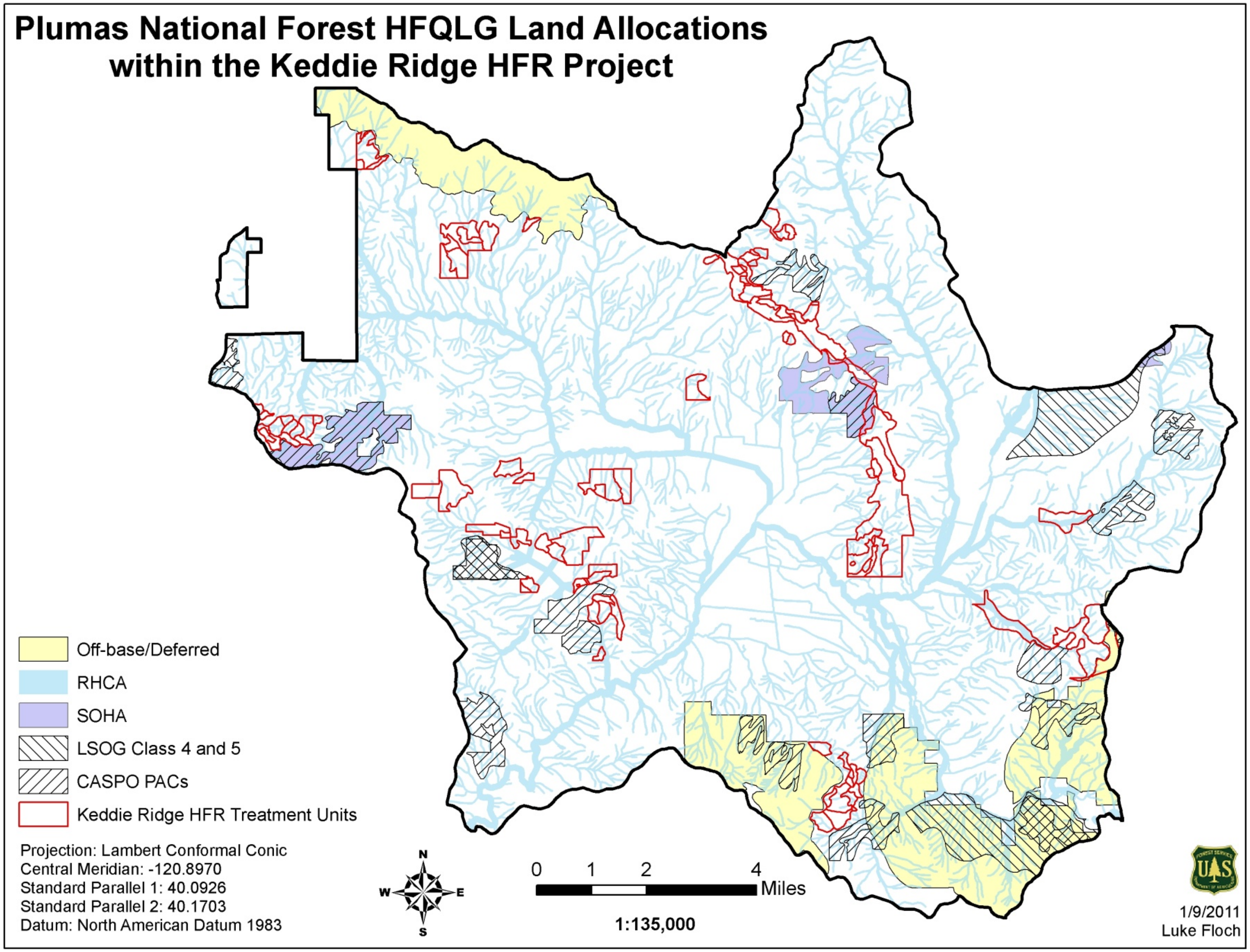

Figure 3 HFQLG Land Allocations within the Keddie Ridge Project Area

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA Final Supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA Final Supplemental EIS.

The 2004 Record of Decision on the SNFPA Final Supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires will lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

The 2004 SNFPA Record of Decision (pages 68 and 69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposal, in addition to the PNF LRMP and HFQLG ROD and FEIS, include California spotted owl home range core areas (HRCAs), Northern goshawk PACs, wildland urban interface (WUI), and extended WUI.

The SNFPA ROD has specific standards and guidelines listed on pages 68 and 69 of the SNFPA ROD (Table 2). Figure 4 displays SNFPA ROD land allocations specific to the Keddie Ridge Project.

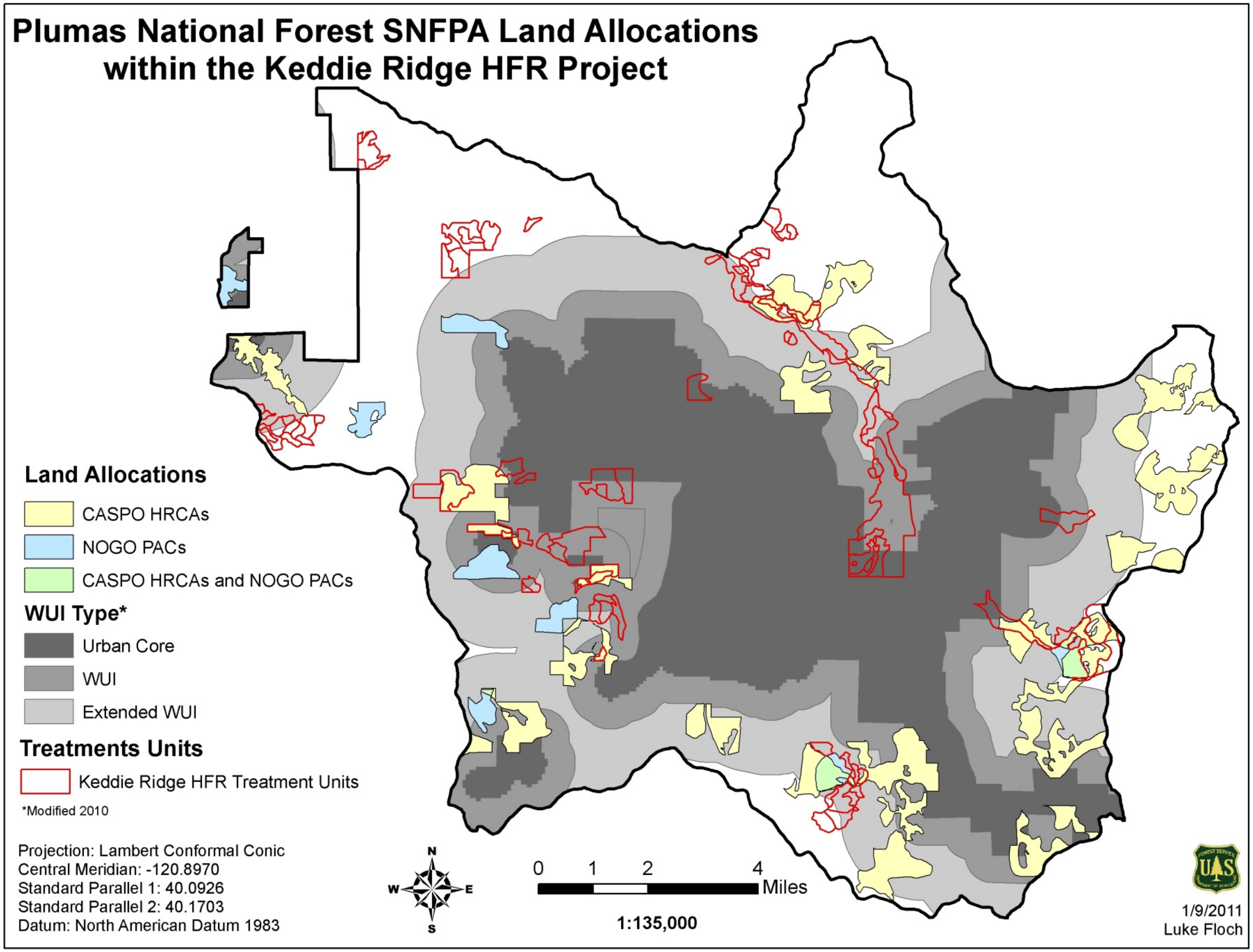

Figure 4 SNFPA ROD Land Allocations within the Keddie Ridge Project Area

United States
Department of
Agriculture

Forest Service

Pacific Southwest
Region

Plumas
National Forest

Plumas County
California

R5-MB-121

September 2006

Freeman Project

Final Environmental Impact Statement

Record of Decision

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Introduction

The Freeman Project is located north of Portola and west of Lake Davis in Plumas County, California, within the Beckwourth Ranger District of the Plumas National Forest. The project area covers approximately 14,967 acres. It is within all or parts of T23N, R12E; T23N, R13E; T24N, R12E; and T24N, R13E.

Background

This project was proposed according to management direction provided by the Plumas National Forest Land and Resource Management Plan (LRMP) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD, the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) and ROD as amended by the 2004 SNFPA Supplemental EIS and ROD. The 2004 SNFPA required that land allocations and application of Standards and Guidelines embodied in the HFQLG ROD be preserved for the life of the pilot study. The pilot study provided for by the HFQLG Act was designed to test the effectiveness of certain resource management activities at meeting various ecologic, economic and fuel reduction objectives. Fuel break construction consisting of a strategic system of Defensible Fuel Profile Zones (DFPZ) is just one of the requirements of the Act. Other activities include Group Selection (GS), Area Thinning treatments (or Individual Tree Selection), as well as riparian management and restoration projects.

The 2002 Healthy Forests Initiative and 2003 Healthy Forest Restoration Act (HFRA), affirmed the need to reduce the risk of wildland fire to communities, municipal water supplies, forests, rangelands and other important landscape components. One of the primary goals of this Act was to create a National Fire Plan that would address the fuels reduction needs in the Wildland Urban/Interface (WUI).

The Plumas County Fire Safe Council finalized the 2005 Plumas County Communities Wildfire Mitigation Plan, which was adopted by the Plumas County Board of Supervisors. The Wildfire Mitigation Plan was developed through a collaborative process involving participation from county, state, federal agencies and the public. As a partner in the development of this Plan, the Forest Service is committed to do its part to implement the Plan in a coordinated fashion and reduce fuels in WUI on National Forest System (NFS) land. The Freeman Project is part of the commitment to implement the Plumas County Communities Wildfire Mitigation Plan, as well as the HFQLG Act.

On September 1, 2006, the California Department of Fish and Game and the Plumas National Forest issued a Draft Environmental Impact Report/Environmental Impact Statement for the Lake Davis Pike Eradication Project. This project affects Lake Davis and its tributaries. The tributaries overlap the Freeman Project Area. The potential cumulative effects of the Pike Eradication project that were known at the time the analysis for the Freeman Project have been considered. These effects are primarily addressed in the consultation with USFWS for the Bald Eagle and as a reasonably foreseeable action in the project area. Should the Pike Eradication project be implemented during the operation of the Freeman Project, scheduling coordination should enable both projects to continue with little conflict.

Purpose and Need

Reduce Fuels

The first purpose is to reduce fuels to achieve the following results: provide continuity with existing DFPZ and existing fuel reduction project areas; provide continuity with Plumas Fire Safe Council's efforts to reduce fuels inside the WUI; contribute to the larger HFQLG landscape level DFPZ network; reduce the potential size and intensity of wildfires by creating conditions that improve fire suppression effectiveness in the Lake Davis Recreation Area; and reduce the risk of stand-replacing fire in riparian habitat conservation areas (RHCA).

Improve Forest Health

The second purpose is to improve forest health by reducing the amount of and susceptibility to disease infection and insect infestation of forested areas; accelerating the growth of California Wildlife Habitat Relationship (CWHR) size class 4 towards size class 5; and reducing fuels and improving conifer-growing conditions in the Area Thinning treatment areas.

Improve Bald Eagle Habitat

The third purpose is to improve bald eagle (*Haliaeetus leucocephalus*) habitat by promoting the growth and development of CWHR size class 5 trees, which are preferred for foraging, roosting and nesting habitat.

Contribute to the Economic Stability of the Local Community

The fourth purpose is to provide an adequate timber supply that contributes to the economic stability of rural communities.

Improve Aspen Stands

The fifth purpose is to provide for greater biological diversity in the Freeman project area by releasing aspen stands from conifer competition.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

The sixth purpose is to reduce impacts of the transportation system on forest resources and provide the necessary access for the vegetation treatments.

Decision

Based on the analysis in the 2006 Freeman Project Final Environmental Impact Statement (FEIS), and the associated planning record, **I have decided to implement Alternative 4 with the following modification:**

- In response to public comments, the economic viability of the helicopter logging was reconsidered for this project. Two area thinning helicopter units totaling 186 acres (including 14 group selection acres) were re-evaluated and it was determined that 22 acres of unit 87 could be treated as tractor ground. The remaining acreage in these units was too steep to use this method of treatment and the volumes per acre were too low to support this method of logging and are therefore being dropped from this decision. The numbers of acres involved did not significantly change the effects analysis.

Alternative 4 will create 3,037 acres of DFPZ and treat an additional 2,211 acres in the area thinning zone to improve forest health surrounding the DFPZ. This alternative will change the original Proposed Action (Alternative 1) treatments on approximately 1,000 acres from grapple pile, masticate and hand thin to mechanical thinning. It would create group selection openings on approximately 160 acres. Whenever possible, these openings will focus on treating insect and disease centers, while keeping economic feasibility in mind.

All DFPZ, area thinning treatments and group selection treatments will meet the standards and guidelines as described in the Sierra Nevada Forest Plan Amendment Supplemental Environmental Impact Statement (SEIS) ROD (2004). The project will adhere to the Specific Design Features and Resource Specific Mitigations Section Chapter 2 and the Standard Operating Procedures described in Appendix D of the Freeman FEIS. The Resource Specific Mitigations are for soils, range, recreation, air quality, botany and visual quality.

Alternative 4 will implement 232 acres of aspen restoration, eliminate the variable width extended treatment zone surrounding each aspen stand, leaving some conifers within the aspen stands, offering both visual retention for recreation users and ecological diversity.

Road access for treatments will be provided by reconstructing 15-miles of road, along with construction and subsequent decommissioning of approximately 2-miles of temporary road. Decommissioning will occur on approximately 7.9-miles of system roads as identified for riparian habitat and water quality needs.

Reasons for the Decision

In reaching my decision, I have considered the purpose and need for action, the issues and range of alternatives and environmental consequences. I have also considered public comments on the Draft Environmental Impact Statement (DEIS) and the original proposed action (Alternative 1), the LMRP and amendments, the FEIS, the documents incorporated by reference and the specialist reports. My decision to implement Alternative 4, with the modification, will best address the concerns expressed by the public, while meeting the purpose and need for action. Alternative 4 will result in a more cost effective and efficient fuels treatment by minimizing the need for post-treatment pile burning, while simultaneously providing for the removal of more biomass materials which can be generated into electricity. The aspen treatment in Alternative 4 will also address visual concerns regarding the large openings (extended treatment zones) that would have been created surrounding the aspen stands; as well as, ecological concerns regarding the removal of all conifers up to 30 inches dbh within the aspen treatment areas.

Reducing Fuels

I have determined that this decision will meet the purpose and need to reduce hazardous fuels by reducing the potential size and intensity of wildfires and providing firefighters with a safe place to control and suppress fires. It will also provide continuity with existing DFPZ and fuel reduction projects adjacent to the Freeman Project area. The proposed treatments will reduce the risk of stand-replacing fire in RHCAs.

This alternative meets the desired 40% canopy cover in the DFPZ and 50% in the area thinning units over more of the project area than any of the other action alternatives; just 3% of the treatment units would not meet the desired canopy cover conditions. As with all of the action alternatives fire types become surface fires after treatment; surface fuels will be between 5-10 tons/acre; canopy base heights will be raised to greater than 12 feet tall; and flame lengths modeled to less than 4 feet tall should a wildland fire occur. These fuels treatments will result in a significant increase in the rate of fire-line construction, thus resulting in a reduction of fire suppression costs and increased firefighter safety. This level of treatment will provide an effective step toward a fire resilient forest with limited risk to watershed and wildlife. Although fuel treatments may not decrease the risk of human or lightning caused fires starting in the Freeman Project area, they *will* decrease the risk of fire spread by modifying fire behavior and enhancing the ability of firefighters to contain, suppress, and control fires within the fuel treatments.

My recent experience with the Boulder Fire in the Antelope Lake Recreation Area on the Mt. Hough Ranger District in late June and early July, 2006, illustrated just how important these landscape level fuels treatments are in reducing the size and adverse impacts from wildfire. The DFPZ treatments that burned in this fire demonstrated that crown separation, as well as reducing ladder fuels are necessary to provide safe working conditions for firefighters. I observed that where crown separation and ladder fuel reduction occurred, stand loss was prevented. Significant wildlife and riparian habitat was lost in areas where riparian and visual retention areas were not treated. I believe this experience has direct application to the situation in the Freeman Project area. Therefore, I believe it is necessary to adopt a lower canopy cover prescription to provide an effective fuels treatment.

This decision should reduce the potential size and intensity of wildfires by creating conditions that improve fire suppression effectiveness on the westside of Lake Davis Recreation Area. Constructing DFPZs will provide firefighters with safe locations to take a stand against wildland fire. By assuring firefighter safety and the ability to gain control of a wildfire, fewer acres of forest landscape will be adversely affected by high-intensity wildland fire and the surrounding communities will benefit from a shorter duration fire with less impacts from smoke or to private property. This project will provide connectivity with the existing Humbug DFPZ while creating continuity with efforts by the Plumas Fire Safe Council's to work with the Lake Davis Highlands community. Implementation of this decision will truly help fire fighting personnel effectively protect this community by reducing the potential for spread of wildland fires into and out of the WUI.

All of the proposed fuel treatments will move the existing conditions toward the desired conditions. However, this alternative treats the most number of acres with a mechanical thinning treatment, moving away from grapple-piling, hand thinning and mastication treatments.

Although the canopy cover prescribed in the DFPZs is lower than some comment makers advocated for, I have considered the trade-off that this will have on the amount of wildlife habitat remaining following treatment. There is a marginal difference in wildlife habitat reduction between the action alternatives and the No-action Alternative (existing condition). The consequences of leaving stands in their existing condition, with high stand densities, is that crucial impacts to wildlife habitat may occur when a wildfire moves through the area. I am satisfied that the species of concern will not be adversely affected in the long run. In fact, in the long run, DFPZ treatments likely will prove to benefit wildlife habitat as described earlier with the Boulder Complex Fire.

Improve Forest Health

As the Deciding Official, I evaluated treatment approaches in the Proposed Action and the other alternatives in order to meet the desired condition for improving forest health. While more is not necessarily better, in this case, the more acres of mid-successional stands thinned the greater probability that these stands will be able to maintain adequate health and vigor. Healthier stands will decrease mortality from insects and disease. This will directly enable these stands to progress into larger size classes and provide the large tree component that is in low representation now.

As previously mentioned, Alternative 4 meets the desired canopy cover better than the other action alternatives, by using mechanical thinning to treat almost 1,000 acres more than Alternative 1 (Proposed Action), thus equating to less PM 2.5 (3-11 tons) in the air from grapple pile burning than the other action alternatives (11-65 tons). Alternative 4 leaves approximately 158 acres overstocked in the treatment units, as opposed to the other action alternatives which leave more acres overstocked (209 acres). The number of acres that depart from the regulated stand condition is slightly less than Alternative 3 and approx. 400 acres less than Alternative 1 (Proposed Action).

The increased reliance on mechanical thinning that this alternative provides allows for the harvest of trees of all sizes such that all stand types can be thinned to a desired density, while allowing for the removal of biomass materials from the site. This material can then be converted to products, reducing the number of acres of follow-up burning. This also addresses air quality concerns for decreased burn days and smoke emissions. Forest health will be improved throughout the project by a “thin from below” silvicultural prescription that reduces tree density, increases fire resilience, and provides for the removal of insect infested and diseased trees, thus preventing their spread into adjacent trees. Reducing tree density will increase crown spacing, thereby lessening the risk of crown fire. It will also substantially reduce inter-tree competition and subsequent mortality, which also contributes to higher fuel loading.

Improve Bald Eagle Habitat

In 2004, the Beckwourth Ranger District wrote the Lake Davis Bald Eagle Habitat Management Area (BEHMA) Plan with concurrence from the United States Fish and Wildlife Service. The Lake Davis BEHMA is considered optimal bald eagle habitat; except for the fact that only 21% of the potential nesting area is covered by mature timber. The Plan addressed the need to improve bald eagle habitat surrounding Lake Davis through thinning CWHR size class 3, 4 and 5 stands in order to increase the average height and dbh of the trees. The analysis shows that thinning within these stands will accelerate growth and provide for future larger diameter trees. Alternative 4 will address conifer spacing and the presence of insect and disease in the stands; so that the BEHMA will benefit from decreasing the risk of habitat loss from stand-replacing wildfire and disease/insect infestation.

As with the other area thin and DFPZ treatments, the treatments in the BEHMA stipulate a ‘thin from below’ prescription to create optimal conifer growing conditions in the BEHMA, coupled with group selection. Alternative 4 moves the most CWHR size class 4 (12-24” dbh) toward size class 5 (> 24” dbh) of any of the action alternatives. Approximately 1,528 acres will be thinned, releasing approximately 1,116 acres of CWHR size class 4, which is expected to become size class 5 in 5-50 years. Alternative 4 also has the least loss of CWHR size class 4 habitat from group selection openings and aspen extended treatment zones.

Bald eagle needs are provided for in the prescription, by emphasizing retention of the largest-limbed pine trees suitable nesting and roosting habitat (trees > 24” dbh). The thinning prescription will leave the largest dominant and co-dominant trees, focusing on removing small diameter trees and increasing conifer spacing. Approximately 52 acres of group selection will occur in the BEHMA. Creating openings in habitat within the BEHMA is considered compatible with bald eagle habitat management, due to their preference for relatively open forest structure in California (Lehman et al. 1980). The Forest has complied with Section 7 of the Endangered Species Act through concurrence of this selected alternative with the U.S. Fish & Wildlife Service (Cons. # 1-1-06-I-1410, August 1, 2006).

Contribute to the Economic Stability of the Local Community

I must evaluate all alternatives to ensure that a balance is provided between economic stability and environmental concerns in order to implement the Forest Plan direction as amended.

Although the Proposed Action provides the most timber product volume, Alternative 4 provides a better economic and environmental balance.

Alternative 4 has a sawlog volume of 4 million board feet less than the Proposed Action. As with Alternative 3, the loss of volume is attributed to the elimination of extended treatment zones that were associated with the aspen treatments. This alternative treats more biomass tonnage than the other two action alternatives. With the modification to helicopter logging, the total project value is about $300,000 more to implement than the Proposed Action would have been. This decision will contribute to economic stability by providing approximately $10.2 million in employee related income and approximately 240 full-time jobs. It is regrettable that this alternative doesn't make the same contribution to the local economy that the initial Proposed Action did, however this is due to the change in aspen treatment in the Lake Davis Recreation Area and is a fact that I'm willing to accept at this time.

Alternative 4 would implement more acreage in the form of a timber sale than Alternative 1 and Alternative 3 because it treats more volume with mechanical treatments. This ultimately results in less cost to the government, saving approximately $300,000 when compared to Alternative 3. This will enable more work to be accomplished.

Improve Aspen Stands

Alternative 4 will address public concerns regarding creating large openings surrounding aspen stands while still meeting the purpose and need to improve aspen stands by reducing conifer encroachment thereby increasing their overall health and vigor. This alternative also addresses additional public concern regarding aspen treatments outside of RHCAs, by confining aspen treatments to stands associated with RHCAs. Finally it addresses public comments regarding ecological diversity in aspen stands, by leaving some conifer within and around the stands. It also provides for an alternative specific mitigation, allowing operators to work on < 35% slopes, as opposed to the < 15% slopes that will be required in the rest of the RHCAs outside aspen treatments.

Removing conifer in and around the aspen stands will contribute to the overall health and vigor of aspen stands in the Freeman Project area by allowing sunlight to reach the ground. Sunlight will stimulate the growth of aspen seedlings. We expect to see more than 500 stems per acre in otherwise decadent stands of aspen. The Alternative 4 silvicultural prescription will leave the oldest conifer in the stands. This will be more visually appealing to recreation users until the aspen stands regain a multi-tiered canopy covering all age classes. The ratio of conifer to aspen is anticipated to be 1 conifer to nine overstory aspen and no mid-story conifer to ten aspen.

One of the priorities in the Freeman Project Area was to improve aspen stands. Aspen stands provide some of the most biologically diverse areas on our Forest. Aspen in the project area are at high risk of loss due to conifer encroachment. The aspen clones in the project area are on the western range of this species, contributing to the overall genetic diversity of the species. Without this treatment, the Freeman Project Area runs a serious risk of further aspen mortality.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

I want to ensure that the alternative that is selected will provide for reducing transportation system impacts and meet other project objectives. The road related work that is proposed for this project area was planned according to May 31, 2005—OHV Route Designation Process which applied consistent standards for determining which routes and areas will be closed as part of the Interim Forest Order and subsequent Final Forest Order.

As with all of the action alternatives, this alternative will implement road work that will result in improved forest access as well as road decommissioning. None of the action alternatives go over the threshold of concern, due in part to the ability to decommission dead end spur roads that are no longer needed for use. Road decommissioning, totaling approximately 6.0-miles, will focus on areas with resource damage or unnecessary dead end spurs. The only other roads being decommissioned are non-system roads that were specifically identified in order to reduce the Equivalent Roaded Area (ERA) values. This roadwork will restore hydrologic function by approximately 24 acres (or 8-miles of system and non-system roads). Each of the action alternatives will reduce the number of stream crossings by eight crossings. Road decommissioning will remove culverts, subsoil the roadbed, recontour the hillslope and/or seeding of the affected area. These measures will help initiate revegetation and recovery of the decommissioned road area. The 15-miles of road reconstruction will not only support project implementation, but it will have the added benefit of enhancing access for fire suppression and recreation use of the project area in and around the Lake Davis Recreation Area.

Watershed and Soil Concerns

Alternative 4 reduces the potential for watersheds approaching the threshold of concern as compared to the Proposed Action. This alternative results in ten watersheds remaining below the threshold of concern and just one approaching threshold. The percent of the project area disturbed by grapple pile burns would be less in this alternative than the other action alternatives. The percent of the project area outside of Standard for fine organic matter (0-3” size) would be equal to Alternative 1 and approximately 2% more than Alternative 3. The number of acres outside of Standard for ground cover would be the same as the Proposed Action and approximately 100 acres more than Alternative 3. The amount of soil compaction above the recommended threshold would be about the same for each of the action alternatives.

Alternative 4 will enhance the ability of fire management personnel to suppress, control and contain fires that impact or start in fuel treatment areas under 90th percentile weather conditions. This will produce long-term benefits for soil productivity and watershed values that would otherwise remain vulnerable to the damaging effects of stand-replacing fires. Alternative 4 applies mechanical fuels treatments to 747 acres of RHCA. In reducing the fuels in the RHCA, we will provide for meeting or enhancing long term Riparian Management objectives. I believe the fuels prescription for this project reasonably considers the need to protect the RHCA by providing for mitigation measures that will exclude equipment from entry into the inner RHCA, restrict the use of group selection in the RHCA, and apply canopy cover restrictions depending on whether or not the stream is perennial fish bearing. It will also apply the use of standard operating procedures (SOP), such as retaining trees that provide bank stability.

I observed the fire effects to riparian areas (Lost and Antelope Creeks) from the Mt. Hough Ranger District's Boulder Complex Fire, which showed that failing to address heavy fuel loads adversely affects riparian habitat when impacted by fire. In this fire, fuel treatments were not applied to Riparian Habitat Conservation Areas (RHCAs) when the surrounding DFPZs were completed under the Antelope Border project. The unintended result was both of these drainages experienced some of the highest vegetative and soil burn intensity in the fire area, and as a consequence, Riparian Management Objectives under the SAT guidelines were not met.

The impacts to soil cover would be less than the other action alternatives, due to less mechanical treatment within 100' of the stream channel. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

Any soil impacts that are considered detrimental compaction will be mitigated through additional subsoiling of previously used skid trails, requiring additional monitoring, and the placement of additional ground cover where standards are not met. The Freeman Project will follow the PNF LRMP and USDA Forest Service Region 5 Soil standards that will lower risk of the soil productivity being impaired.

Wildlife Concerns

I have considered the risk and uncertainty associated with project impacts, including direct, indirect and cumulative impacts to spotted owls. These impacts have been acknowledged and addressed in the FEIS. This decision is consistent with the SNFPA SEIS and ROD (2004) Standards and Guidelines that amend the Plumas National Land and Resource Management Plan (LRMP) (1988).

On May 24, 2006, the United State Fish Wildlife Service (USFWS) issued a 12-month status review based on a comprehensive study of California spotted owl populations (Federal Register Vol. 71, No. 100). They assessed the best scientific and commercial information available; reviewed comments and information received during two public-comment periods; and consulted with recognized spotted-owl experts and Federal and state resource agencies, including an interagency Science Team. They concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA. This conclusion was based in part on the best available data that indicated "most California spotted owl populations in the Sierra Nevada are stable or increasing and adult survival rates show an increasing trend" and that "Forest fuels reduction activities, notably those provided for in the Sierra Nevada Forest Plan Amendment of 2004, may have a short-term impact on owl populations, but fuels reduction will have a long-term benefit to California spotted owls by reducing the risk of catastrophic wildfires that pose a major threat to California spotted owl habitat".

I realize that this decision will involve some risk of decreasing spotted owl habitat and subsequent uncertainty with regard to owl activity; however, Alternative 4 will retain approximately 84 percent of the existing foraging habitat and 94 percent of the existing nesting habitat for the California spotted owl in the 46,039 acre wildlife analysis area. Alternative 4 creates just slightly more acres of edge habitat from group selection and aspen treatments as Alternative 3 and 60% less than Alternative 1 (Proposed Action). No treatment will occur in spotted owl Protected Activity Centers (PACs) and spotted owl habitat areas (SOHAs) and all PAC and SOHA land allocations will be maintained. Based on the information presented in the analysis and public comments, the short-term risk to owls is far outweighed by the knowledge that in the long run a significant amount of fuels reduction will have occurred, providing firefighters with the ability to better protect the existing PACs and SOHAs when a wildland fire starts in the area.

Alternative 4 retains 86% of the northern goshawk nesting habitat in the project area. Northern goshawk PACs will only be entered in some aspen treatments (approximately 25 acres). There will be an 18” dbh upper diameter limit required within these units, in order to limit the amount of canopy cover reduction within the PAC. This will maintain the added biological diversity contributed by aspen to the PAC. The risk and uncertainty associated with habitat reductions would be offset by fuel reduction treatments if a wildland fire were to occur in the area. The PACs, SOHAs, HRCAs, and old-forest habitat will be less vulnerable to loss to wildfire.

Legal and Regulatory Compliance

My decision complies with the laws, policies, and executive orders listed below and described in Chapter 3 of the 2006 FEIS.

Means to Avoid Environmental Harm

Extensive measures to avoid or minimize environmental harm are being continued in this decision. These measures have been discussed previously, and include forest-wide standards and guidelines, which at a minimum meet all requirements of applicable laws, regulations, State standards, and additional standards and guidelines for each land allocation. Mitigation measures are an integral part of the standards and guidelines. Singularly and collectively, they avoid, rectify, reduce, or eliminate potential adverse environmental impacts of forest management activities.

Findings Required by Other Laws and Regulations

This decision to implement the Freeman Vegetation Management Project is consistent with the intent of the Forest Plan's goals and objectives. The project was designed in conformance with Forest Plan standards and incorporates appropriate Forest Plan guidelines for the Plumas National

Forest LRMP (1988), as amended by the HFQLG FEIS and ROD (1999), and the 2001 SNFPA and ROD as amended by the SNFPA FSEIS and ROD (2004).

Principle Environmental Laws

I have determined that the Freeman Project meets the requirements of the following laws as described in the 2006 FEIS:

- Endangered Species Act
- Civil Rights Act
- Clean Water Act—Best Management Practices and State Water Quality Standards will be enforced
- Clean Air Act—to prevent exceeding the 24-hour PM 2.5 standard, fire managers take the precautions discussed in the Fuels, Fire and Air Quality Management Section of the Freeman FEIS.
- Healthy Forest Restoration Act
- National Historic Preservation Act
- National Forest Management Act
- National Environmental Policy Act

Executive Orders

Executive orders provide additional direction to federal agencies. I have determined that the Freeman Vegetation Management project meets the requirements of the following executive orders as described in the FEIS:

- Consultation and Coordination with Indian Tribal Governments, Executive Order 13175 of November 6, 2000.
- Indian Sacred Sites, Executive Order 13007 of May 24, 1996.
- Invasive Species, Executive Order 13112 of February 3, 1999.
- Recreational Fisheries, Executive Order 12962 of June 6, 1995.
- Migratory Birds, Executive Order 13186 of January 10, 2001.
- Floodplain Management, Executive Order 11988 of May 24, 1977, and Protection of Wetlands, Executive Order 11990 of May 24, 1977.
- Environmental Justice, Executive Order 12898 of February 11, 1994.
- Use of Off-Road Vehicles, Executive Order 11644 and 11989, amended May 25, 1977.

Special Area Designations

I have determined that the Freeman Vegetation Management project complies with laws, regulations, and policies that pertain to the following special areas:

- **Research Natural Areas**—there are no Research Natural Areas within the Freeman Project area and, therefore, no areas will be affected.
- **Inventoried Roadless Areas**—there are no Inventoried Roadless Areas within the Freeman Project area and, therefore, no areas will be affected.

- **Wilderness Areas**—there are no Wilderness Areas within the Freeman Project area and, therefore, no areas will be affected.
- **Wild and Scenic Rivers**—there are no designated wild and scenic rivers in the Freeman Project area and, therefore, no areas will be affected.
- **Special Interest Areas**—there are no Special Interest Areas within the Freeman Project area and, therefore, no areas will be affected.

Public Involvement

Notice of the pending action first appeared in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) issued April 2004 and has appeared on the SOPA ever since. The Ranger District started the NEPA public scoping process by publishing a Notice of Intent (NOI) in the Federal Register on August 25, 2005. On August 24, 2005, a legal notice of the NOI was published in the *Feather River Bulletin*, the Forest's Newspaper of Record, as well as the *Portola Reporter*. The Proposed Action, Purpose and Need was mailed to approximately 93 public agencies, non-profit organizations, Native American tribes and entities, adjacent landowners and individuals who expressed interest in the project. The advertised scoping period ended on September 26, 2005, although the District continued to receive and consider comments after this date.

During scoping, the Beckwourth Ranger District staff met with the Plumas Fire Safe Council (October 13, 2005) and the Quincy Library Group (August 25, 2005) to discuss the Freeman Project, providing copies of the Proposed Action, Purpose and Need to members in attendance.

The purpose of the scoping process was to inform the public about the Proposed Action, Purpose and Need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period. The Freeman Project received written or verbal scoping comments from one agency, five organizations, one Tribe and two individuals (Table 1.3 of the FEIS).

The Forest Service Interdisciplinary Team (IDT) reviewed public comments and data collected during the 2004-2005 field seasons to identify issues related to the Proposed Action. They separated the issues into three groups: significant issues, non-significant issues and concerns. The process the IDT went through to develop alternatives and summary of the comments received are provided in Chapter 1 of the FEIS.

Based on internal and external feedback, an additional ten alternatives were considered. Of the ten, eight were considered but not analyzed in detail. Two were developed, considered and analyzed, along with the Proposed Action and No-action alternatives.

The significant issues were:

- Aspen treatment outside RHCA's not authorized by the Standards and Guidelines (Frank Stewart).
- Aspen treatment units greater than 2 acres may be considered too big (Linda Blum).

- Aspen treatment involving the removal of larger conifers is objectionable to some, due to the loss of larger trees and their potential ecological importance (John Preschutti).
- Design cost effective and efficient fuels treatments (Sierra Pacific Industries).

The preferred alternative addresses all of these issues by restricting treatment of aspen units to areas associated with RHCAs, eliminating the extended treatment zone surrounding the aspen stand, retaining some conifer within the aspen stand units and changing treatments from grapple pile, masticate, hand thin to mechanical thin, which allows for more effective treatment with less post-treatment fuels pile and burn.

The Notice of Availability was published in the Federal Register for the Draft EIS on May 26, 2006. A summary of public comments and response to comments is provided in the FEIS (Appendix G). Six letters were received from three agencies and three organizations.

Alternatives Considered in Detail but Not Selected

In addition to the selected alternative, I considered three other alternatives in detail, which are discussed below. A more detailed comparison of these alternatives can be found in Chapter 2 of the FEIS.

Alternative 1 (Proposed Action)

Alternative 1 would implement 3,066 acres of fuel treatments by reducing the amount of surface, ladder and canopy fuels. Fuel treatments would retain 40 percent canopy cover (whenever possible) and all trees greater than 30 inches diameter at breast height (dbh) with the only exception being for operability. Group selection harvest would occur on 175 acres and area thinning would occur on 2,727 acres within the project area. Alternative 1 would implement improvements to the transportation system and provide the necessary access for the treatments. These improvements include approximately: 7.9-miles of decommissioning; 0.3-miles road relocation; 2-miles of temporary road construction and subsequent decommissioning; 15-miles of road re-construction/maintenance. Alternative 1 would have provided a timber supply of 13.3 million board feet, generated an estimated $798,000 of timber sale value, directly and indirectly created 310 full-time jobs.

Alternative 1 does not meet the desired canopy cover in the DFPZ and Area Thinning for 483 treatment unit acres; while Alternative 4 does not meet the desired canopy cover on just 168 acres. It would leave 209 acres in overstocked condition, as opposed to Alternative 4 which would leave slightly less acreage overstocked (158 acres). The removal of all trees < 30” dbh within the extended treatment zone surrounding aspen stands would have created more CWHR size class 0-2 (0-6” dbh) (611 acres) than Alternative 4 (approx. 210 acres).

Alternative 1 improves less bald eagle habitat CWHR size class 4 than Alternative 4. Fewer acres of CWHR size class 4 are lost to group selection and aspen openings as well.

This alternative would provide more sawlog volume, which in turn would have provided more full-time jobs and employee related income than Alternative 4. Alternative 4 treats more biomass volume than Alternative 1. The total project value would have been negative $1 million for Alternative 1. With the dropping of the helicopter thinning the total project value for Alternative 4 is approximately $1.2 million.

I did not choose this alternative due to public input regarding the size of the openings surrounding aspen stands in the Recreation Area. Because the project falls within the Lake Davis Recreation Area, an area known for its splendid displays of fall aspen foliage, I decided to pursue a less aggressive treatment that would meet the purpose and need for treating the aspen, while eliminating the controversial aspects of large openings surrounding the aspen stands. Watershed issues were also becoming apparent as we analyzed this action. It was determined that 40% of the project area was at the threshold of concern due primarily to the aspen unit treatments. Based on the analysis in the FEIS I did not choose this alternative. All of the action alternatives met the purpose and need for reducing hazardous fuels by reducing the number of tons of surface fuels per acre; reducing the rate of spread (chains per hour) and flame length of a potential wildfire; and increasing the canopy base height. In all cases the fire type changed from an active or passive crown fire to a surface fire. However, Alternative 1 would leave 11% more piles to burn than Alternative 4 and the number of post-treatment grapple pile acres would be 11-65 acres as opposed to 3-11 acres. This equates to PM 2.5 of 11-54 tons in Alternative 1 vs. 3-11 tons in Alternative 4.

Alternative 2 (No-action)

Under the Alternative 2 (No-action), current management plans would continue to guide management of the Freeman Project area. No fuel treatments, DFPZ construction, forest health improvement, aspen stand improvement, biomass removal, or transportation system changes would be implemented to accomplish the purpose and need.

I did not choose this alternative because it would not enhance the ability of fire management to suppress, control and contain fires impacting or starting along Grizzly Ridge or in the Lake Davis Recreation Area under 90^{th}-percentile weather conditions. This alternative would rely on disturbance such as density dependent mortality and fire occurrence, or lack thereof, to shape forest structure. This alternative would leave more than 5-7 tons/acre of surface fuels and the rate of fire spread (990-1,584 ft/hr) under 90^{th} percentile weather would preclude a direct attack with hand crews, exponentially increasing fire suppression costs. This alternative would similarly do nothing to raise canopy base heights, which are less than 5 feet tall, causing fire types to be active or passive crown fires as opposed to surface fires. This alternative would have no PM 2.5 emissions from pile and underburning; until there is a wildfire which would potentially consume far more acreage than in the action alternatives.

This alternative would not improve forest health. It would leave 4,115 acres not meeting the desired canopy cover. It would leave 2,002 acres in overstocked condition. This alternative would not create more openings. Only 36 acres would be in CWHR size class 1 as opposed to 210 in Alternative 4.

This alternative would contribute nothing to the economic stability of the communities because it would not generate any full-time jobs or employee-related income due to a lack of sawlog or biomass volume.

The opportunity to improve watershed function is foregone with Alternative 2. In the event of a future severe wildfire, affected areas may be highly susceptible to erosion and generate large pulses of sediment to stream channels. A severe wildfire would consume the organic material, leaving bare soil, thus making the soil more susceptible to erosion. Large runoff events often follow severe wildfires, resulting in increased peak flows. Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream.

This alternative would comply with the OHV route designation process.

Based on the analysis in the FEIS and for the aforementioned reasons, I did not choose Alternative 2.

Alternative 3

Alternative 3 would implement 3,009 acres of fuel treatments by reducing the amount of surface, ladder and canopy fuels. Fuel treatments would retain 40 percent canopy cover (whenever possible) and all trees greater than 30 inches diameter at breast height (dbh) with the only exception being for operability. Group selection harvest would occur on 175 acres and area thinning would occur on 2,570 acres within the project area. Alternative 3 would implement improvements to the transportation system and provide the necessary access for the treatments. These improvements include approximately: 7.9-miles of decommissioning; 0.3-miles road relocation; 2-miles of temporary road construction and subsequent decommissioning; 15-miles of road re-construction/maintenance. Alternative 3 would have provided a timber supply of 8.9 million board feet, generate an estimated $78,200 of timber sale value, directly and indirectly created 240 full-time jobs.

I did not choose this alternative because it did not treat the biomass in the stands as effectively as Alternative 4. This alternative had approximately 1,000 acres more grapple pile, mastication and hand-piles to burn than Alternative 4. The post-burning of these treatment acres would increase the level of smoke (PM 2.5, 11-65 tons) in the atmosphere, which correspondingly would have impacted the Lake Davis Recreation Area and surrounding communities of Portola. There is already a back log of burn acres and piles that need to be burned on the Plumas National Forest and burn windows are short.

Similarly, I did not choose this alternative because it did not meet the desired DFPZ (40%) and area thinning (50%) canopy cover on over 800 treatment acres; this was due to the change to mechanical treatment of over 1,000 acres. The number of acres that were left overstocked was the same as Alternative 1 (209 acres), just slightly more than Alternative 4 which leaves only 209 acres. The number of acres falling outside the regulated stand condition for CWHR size class 0-2 (0-6”dbh) were essentially the same as Alternative 4.

Bald eagle habitat improvement is similarly not as effective in this alternative as Alternative 4. This alternative releases approximately 140 acres less CWHR size class 4 than Alternative 4 and has slightly more CWHR 4 lost to group selection and aspen openings.

This alternative was not as economically feasible as Alternative 4. Alternative 4 effectively changed treatments, to create a more economic alternative that treats the biomass and removes it in the form of a product, providing for greater economic stability and the ability to reuse the biomass product in the form of electricity generation. There is more biomass volume and sawlog volume in Alternative 4 than in this alternative. The total project value is similarly higher and it provides fewer full-time jobs than Alternative 4.

Environmentally Preferable Alternative

I find Alternative 3 to be the environmentally preferable alternative. The effects to wildlife, watershed and soils are slightly decreased over the preferred alternative. For example, the number of soil compaction acres is slightly lower (210 acres) than Alternative 4 (226 acres). The percent of the project area outside of Standard for fine organic matter is slightly lower (15%) than Alternative 4 (17%).

As far as wildlife species are concerned the numbers are slightly lower than the preferred alternative as well. This action alternative maintains a slightly higher percentage of foraging and nesting habitat for the California spotted owl, 89% and 96% respectively than Alternative 4, which leaves 84% and 94% respectively. It also creates slightly less acreage of California spotted owl edge habitat (136 acres) than Alternative 4 (147 acres). It maintains a slightly higher percentage of northern goshawk and great gray owl nesting habitat, 89% and 80% respectively as opposed to 86% and 78% respectively in Alternative 4. It leaves slightly more fisher and marten denning habitat than Alternative 4, approximately 87% of the potential habitat as opposed to 83%.

The two most distinguishing differences between this alternative and Alternative 4 are the percent of the area that is considered to have a high threshold of concern and the acres that are out of Standard for ground cover. In Alternative 3 none of the watersheds are considered to have a high threshold of concern, as opposed to the preferred alternative which has one watershed approaching threshold, comprising 26% of the project area. The number of acres outside of Standard for ground cover in Alternative 3 are (766 acres), as opposed to 870 acres in Alternative 4. This is due primarily to the increased use of mechanical treatment in Alternative 4.

Implementation Date

If no appeals are filed within the 45-day appeal period, implementation of the decision may occur on, but not before, 5 business days from the close of the appeal filing period. When appeals are filed, implementation may occur on, but not before, the 15th business day following the date of the last appeal disposition.

Administrative Review or Appeal Opportunities

This decision is subject to appeal pursuant to the regulation at 36 CFR 215. Appeals, including attachments, must be filed within 45-days of the publication date of the legal notice of decision in the Feather River Bulletin, the newspaper of record. Attachments received after the 45-day period will not be considered. The publication date in the Feather River Bulletin is the exclusive means for calculating the time to file an appeal. Those wishing to appeal this decision should not rely upon dates or timeframe information provided by any other source. Individuals or organizations who submitted comments during the comment period specified at 36 CFR 215.6 may appeal this decision. The notice of appeal must meet the appeal content requirements at 36 CFR 215.14.

The appeal must be submitted (regular mail, fax, email, hand-delivery, or express delivery) to the Appeal Deciding Officer: Bernard Weingardt, Regional Forester, USDA Forest Service, Regional Office R5, 1323 Club Drive, Vallejo, CA 94592. Appeals may be submitted by FAX (707) 562-9229 or by hand delivery to the Regional Office at the address shown above. The office business hours for those submitting hand-delivered appeals are: 8:00 am to 4:00 pm Monday through Friday, excluding holidays. Electronic appeals must be submitted in a format such as an email message, plain text (.txt), rich text format (.rtf), or Word (.doc) to appeals-pacificsouthwest-regional-office@fs.fed.us [Subject: Freeman Project FEIS]. In cases where no identifiable name is attached to an electronic message, a verification of identity will be required. A scanned signature is one way to provide verification.

Contact Person

The FEIS and supporting documents are available for public review at the Plumas National Forest, Beckwourth Ranger District, 23 Mohawk Dr., PO Box 7, Blairsden, CA 96103, 530-836-2575. For further information on this decision, contact Sabrina Stadler (sstadler@fs.fed.us), Freeman Project Interdisciplinary Team Leader at 530-836-7141.

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United States
Department of
Agriculture

Forest Service
Pacific Southwest
Region

R5-MB-121
September 2006

Final Environmental Impact Statement

Freeman Project

Beckwourth Ranger District, Plumas National Forest,
Plumas County, California

Freeman Project

Final Environmental Impact Statement

Lead Agency: **USDA Forest Service**

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Abstract: The Freeman Project Final Environmental Impact Statement documents the analysis of the Proposed Action (Alternative 1) and alternatives (Alternatives 3 and 4) against the No-action Alternative (Alternative 2) for reducing hazardous fuels, improving forest health, contributing to the economic stability of the local community, improving aspen stands, improving bald eagle habitat and providing the access needed to meet other project objectives and reduce transportation system impacts. The Proposed Action proposes to treat 3,066 acres of hazardous fuels and improve forest health by thinning 2,727 acres (out of the 5,793 acres of thinning and hazardous fuels reduction being proposed 1,527 acres of that is bald eagle habitat). The Proposed Action would also remove pockets of disease by creating 175 acres of Group Selection (GS) openings (including 52 acres of group selection in bald eagle habitat). It would also remove all conifers up to 29.9” diameter breast height within aspen stands and a 150’ variable width extended treatment zone surrounding each stand, comprising 645 acres of aspen stand improvement. Road access would be provided by reconstructing 15 miles of road, constructing 2-miles of temporary road and decommissioning 7.9 miles of system roads. Alternative 3 proposes to treat the landscape similar to the Proposed Action, except that it eliminates the extended treatment zone around aspen stands, thus reducing the number of acres of aspen treatment from 645 acres to 233 acres. Alternative 4 is the preferred alternative, proposing to treat the landscape similar to Alternative 3, except that it proposes to change many of the grapple pile, masticate and hand thin units to mechanical treatment.

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Summary

The Plumas National Forest proposes to reduce hazardous fuels, improve forest health, contribute to the economic stability of the local community, improve aspen stands, improve bald eagle habitat and provide the access needed to meet other project objectives and reduce transportation system impacts. The Freeman Project is located within the Lake Davis Recreation Are, which is a major recreation destination on the Plumas National Forest. The lake and its facilities are very popular with recreation visitors and local residents. The lake is well known throughout California for its excellent fishing opportunities.

Background

This project is proposed according to management direction provided by the PNF Land and Resource Management Plan (LRMP) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD (USFS PNF 1988, USFS 1999, USFS 2003, USFS PSW 2004 a, b). The 2004 SNFPA required that land allocations and application of Standards and Guidelines embodied in the HFQLG ROD be preserved for the life of the pilot study. The pilot study provided for by the HFQLG Act was designed to test the effectiveness of certain resource management activities at meeting various ecologic, economic and fuel reduction objectives. Fuelbreak construction consisting of a strategic system of Defensible Fuel Profile Zones (DFPZ) is just one of the requirements of the Act. Other activities include GS, Area Thinning treatments (or Individual Tree Selection), as well as riparian management and restoration projects.

The Healthy Forests Initiative and Healthy Forest Restoration Act (HFRA) affirmed the need to reduce the risk of wildland fire to communities, municipal water supplies, forests, rangelands and other important landscape components. One of the primary goals of this Act was to create a National Fire Plan that would address the fuels reduction needs in the Wildland Urban/Interface (WUI). The Plumas County Fire Safe Council finalized the Plumas County Communities Wildfire Mitigation Plan. In April 2005, the Plumas County Board of Supervisors adopted the Plan.

The Wildfire Mitigation Plan was developed through a collaborative process involving participation from county, state, federal agencies and the public. As a partner in the development of this Plan, the Forest Service is committed to do its part to implement the Plan in a coordinated fashion and reduce fuels in WUI on National Forest System (NFS) land.

Purpose and Need and for the Proposed Action and Alternatives

Reduce Fuels

The first Purpose is to reduce fuels in order to do the following: provide continuity with existing DFPZ and existing fuel reduction project areas; provide continuity with Plumas Fire Safe Council’s efforts to reduce fuels inside the WUI; contribute to the larger HFQLG landscape level

DFPZ; reduce the potential size and intensity of wildfires by creating conditions that improve fire suppression effectiveness in the Lake Davis recreation area; and reduce the risk of stand-replacing fire in riparian habitat conservation areas (RHCA).

Improve Forest Health

The second Purpose is to improve forest health by reducing the amount of and susceptibility to disease infection and insect infestation; accelerate the growth of California Wildlife Habitat Relationship (CWHR) size class 4 towards size class 5; and reducing fuels and improving conifer-growing conditions in the Area Thinning forest.

Improve Bald Eagle Habitat

The third Purpose is to improve bald eagle (*Haliaeetus leucocephalus*) habitat by promoting the growth and development of CWHR size class 5 trees, which are preferred for foraging, roosting and nesting habitat.

Contribute to the Economic Stability of the Local Community

The fourth Purpose is to provide an adequate timber supply that contributes to the economic stability of rural communities.

Improve Aspen Stands

The fifth Purpose is to provide for greater biological diversity in the Freeman Project area by releasing aspen stands from conifer competition.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

The sixth Purpose is to reduce impacts of the transportation system on forest resources and provide the necessary access for the vegetation treatments.

Issues and Alternatives

Based on internal and external feedback, an additional ten alternatives were considered, developed and analyzed. Eight were developed, considered and not analyzed in detail. Two more were developed, considered and analyzed along with the Proposed Action and No-action Alternatives.

The issues that led the agency to develop alternatives to the Proposed Action include:

- Aspen treatment outside RHCA’s not authorized by the Standards and Guides.
- Aspen treatment units greater than 2 acres may be considered too big.
- Aspen treatment involving the removal of larger conifers is objectionable to some due to the loss of larger trees and their potential ecological importance.
- Design cost effective and efficient fuels treatments.

Comparison of the Alternatives

Action Alternatives Comparison

Reducing Fuels and Improving Forest Health

Alternative 1 reduces fuels on 3,066 acres, while Alternatives 3 and 4 treat slightly less acreage, 57 and 29 acres less respectively (Table S.1). Alternative 1 treats the most Area Thinning Zone, 2,727 acres while Alternative 3 treats 2,570 acres and Alternative 4 treats the least at 2,419 acres. GS in each alternative is the same except for Alternative 4 which has one less acre of groups in the Area Thinning Zone.

The acres that were dropped from treatment were due to removing the extended treatment areas surrounding aspen stands. Although Alternative 4 treats less fuels, it treats them more effectively by changing many of the acres from hand thin, masticate and grapple pile to mechanical thin. Mechanical thinning removes the biomass rather than piling it and requiring subsequent burning. The removal of biomass, while more costly does provide a product that can be utilized rather than just burning the material.

Improving Bald Eagle Habitat

The action alternatives do not vary in how much bald eagle habitat they treat, or in the number of GS openings that would be created.

Improving Aspen Stands

In Alternative 1, 645 acres of aspen stands including extended treatment zones would be treated. While in Alternative 3 and 4 there would be no extended treatment zone around the stands, reducing the aspen treatment acres to 233 acres. Subsequently the number of acres of Aspen PAC is diminished from 25 acres in Alternative 1 to 11 acres in Alternative 3 and 4.

Transportation System

All of the action alternatives treat the same number of road miles under decommissioning, relocation, reconstruction and temporary roads.

Table S.1 Actions by alternative for each Purpose and Need for the Freeman Project area.

	Alternative 1 (Proposed Action	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Silvicultural Treatment Acres for Reducing Hazardous Fuels				
DFPZ Burn Only (acres)	40	0	40	18
DFPZ Grapple Pile (acres)	450	0	451	153
DFPZ Hand Thin (acres)	35	0	34	23
DFPZ Masticate (acres)	150	0	149	133
DFPZ Mechanical Thin (incl. GS) (acres)	1,255	0	1,336	1,743
DFPZ Mechanical-Aspen (acres)	178	0	77	76
Total DFPZ Treatment (acres)	**2,108**	**0**	**2,087**	**2,146**
DFPZ/WUI Aspen-Grapple (acres)	6	0	0	0
DFPZ/WUI Eagle Selection (incl. GS) (acres)	71	0	80	124
DFPZ/WUI Grapple Pile (acres)	101	0	108	53
DFPZ/WUI Hand Thin (acres)	20	0	20	20
DFPZ/WUI Mechanical Thin (incl. GS) (acres)	166	0	201	181
DFPZ/WUI Mechanical-Aspen (acres)	110	0	55	55
Total DFPZ/WUI Treatment (acres)	**474**	**0**	**464**	**433**
WUI Masticate (acres)	0	0	0	40
WUI Grapple Pile (acres)	124	0	131	0
WUI Groups Only (acres)	183	0	191	191
WUI Mechanical Thin (incl. GS) (acres)	110	0	120	211
WUI Mechanical-Aspen (acres)	67	0	16	16
Total WUI Treatment (acres)	**484**	**0**	**458**	**458**
Total Fuels Reduction Acres (acres)	**3,066**	**0**	**3,009**	**3,037**
Silvicultural Treatment Acres for Improving Forest Health				
Area Thinning Helicopter (acres)	186	0	186	186
Area Thinning Mechanical Thin (incl. GS) (acres)	1,545	0	1,563	1,831
Area Thinning Mechanical-Aspen (acres)	255	0	73	73
Area Thinning Aspen PAC (acres)	25	0	11	11
Area Thinning Grapple Pile (acres)	329	0	350	73
Area Thinning Handthin-Aspen (acres)	3	0	0	0

	Alternative 1 (Proposed Action	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Silvicultural Treatment Acres for Improving Forest Health (Continued)				
Area Thinning Masticate (acres)	384	0	387	245
Total Area Thinning (acres)	2,727	0	2,570	2,419
DFPZ GS (acres)	60	0	60	60
DFPZ/WUI GS (acres)	4	0	4	4
WUI GS (acres)	16	0	16	16
Area Thinning GS (acres)	95	0	95	94
Total GS (acres)	175	0	175	174
Improve Bald Eagle Habitat				
Bald Eagle Habitat Treatment (acres)	1,528	0	1,528	1,528
GS (acres)	52	0	52	52
Improve Aspen Stands				
Aspen Treatment (acres)	645	0	233	233
Aspen Treatment in Goshawk PAC (acres)	25	0	11	11
Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts				
Road Decommissioning (miles)	7.9	0	7.9	7.9
Road Relocation (miles)	0.3	0	0.3	0.3
Road Reconstruction (miles)	15	0	15	15
Temporary Road Construction (miles)	2	0	2	2

Purpose and Need and Issue Indicators for Meeting Project Objectives

The following table compares how the values for each Purpose and Need and issue indicator measures vary for each alternative (Table S.2). The action alternatives, when compared against the No-action Alternative, convey the magnitude of need that surrounds this project.

Reducing Hazardous Fuels

Measurable elements are the amount of surface fuels, rate of spread, flame length, fire type and canopy base height (Table S.2). The action alternatives substantially decrease the number of tons of fuels per acre, decrease rate of spread, decrease flame lengths, increase the canopy base height and changes the overall fire type from an active or passive crown fire to a surface fire. This is in contrast to the No-action Alternative, which has greater surface fuels, a faster rate of spread, higher flame lengths, lower canopy base heights and an overall fire type which would be an active or passive crown fire. The amount of PM 2.5 that would be emitted into the atmosphere is much less in Alternative 4 than the other two alternatives.

Improve Forest Health

The measures identified for improving forest health were those units meeting the desired condition depending on which zone they fell under (i.e., DFPZ (40% canopy cover) and Area Thinning Zone (50% canopy cover)), overstocked conditions after treatment and the departure from the regulated stand condition in CWHR 0-2 (0-6” dbh). Alternative 1 leaves the most number of acres not meeting the desired condition and the most number of acres that depart from the regulated stand condition. Alternative 4 leaves the least number of acres not meeting the desired condition and the least number of acres departing from the regulated stand for CWHR size class 0-2 (0-6” dbh). Alternative 1 has more mastication and grapple pile than Alternative 4. By changing many of these units to mechanical treatment, more of the sawlogs will be removed and the biomass can be removed as a product, rather than simply burned in piles, as would be the case with the grapple pile and burn treatments.

Improve Bald Eagle Habitat

Currently, there are 255 acres of suitable bald eagle nesting habitat (CWHR Size 5) in the Bald Eagle Habitat Management Area within the Wildlife Analysis Area. No Size 5 will be treated within the Bald Eagle Habitat Management Area. Size 5 is considered suitable bald eagle nesting habitat. Nesting habitat is critical to the survival of this threatened bird species. The action alternatives release overstocked 12-24” dbh trees (CWHR Size 4) using a thin from below prescription, which will help the stands grow more quickly, becoming >24” dbh trees (CWHR Size 5), thus becoming nesting habitat. Size 4 becomes Size 5 in 5-50 years in the action alternatives, as opposed to in 25-100 years in the No-action Alternative. There are a total of 3,537 acres of CWHR Size 4 in the wildlife analysis area (Table S.2). Alternative 4 releases the most number of Size 4 habitat and has the least amount of loss of Size 4 from GS or Aspen Treatments.

Contribute to and Support of Local Communities and Their Economy

Sawlog volume, project value and total full-time jobs are the measure of success that we use to determine whether a project is both cost effective and provides employment and products to the local community (Table S.2). Alternative 1 contributes the most to the local economy, providing approximately 70 more jobs than Alternative 3 and 62 more jobs than Alternative 4. The difference in volume is coming from the extended aspen treatment areas surrounding aspen stands. By removing these extended treatment proposed in Alternative 1, we removed 5 million board feet (mmbf) less volume from the project area.

Alternative 4 was developed due to an issue that surfaced around the need for more cost effective treatments. This alternative takes another look at the original units and by changing many of the grapple pile, mastication and handthin units to mechanical treatments, allows for more volume to be removed with a subsequent benefit of fewer piles to burn post-treatment.

Improve Aspen Stands

Many of the stands in the project area are decadent with little to no understory regeneration of aspen occurring. Thinning the < 29.9” dbh conifer from the aspen stands would release them and allow more aspen stems to sprout, thus increasing the number of regenerating aspen stands in the project area.

In the Proposed Action there would be no conifer (except conifer > 29.9 dbh, sugar pine and those needed for bank stability) left in the aspen stands, leaving a ratio of zero percent conifer to 100 percent aspen (0:10) for both overstory and mid-story conifer cover. The No-action Alternative illustrates the need for this work, showing that the majority of stands are either dominated by overstory conifer with no aspen overstory (10:0), or the mid-story conifer are dominate with an 8:2 ratio. In both Alternative 3 and 4, aspen would be treated the same way. In these two alternatives, some overstory conifer would be retained; leaving a 1:9 ratio of conifer to aspen, with no mid-story conifer retention. As more aspen reach maturity and more than 500 stems of 5-15’ tall regeneration occur in the stands we may conclude that the risk of aspen loss has substantially decreased. Ideally, we would like to see this desired condition reached in 3-5 years.

The majority of aspen stands in the project area range from highest to moderate risk of loss due to conifer encroachment. Alternative 1 does the most to improve aspen stands by treating the number of acres of aspen stands. Alternative 3 and 4 treat the same number of acres for each risk rating. The action alternatives treat from 80-85% of the highest, high and moderate risk of loss stands in the project area.

The main issue addressed in the action alternatives was the effect of creating a variable width buffer around the aspen stands. The extended treatment zone in the Proposed Action was 402 acres. The action alternatives treat approximately ten less acres of aspen than the Proposed Action. This is due to dropping treatments that are not within the RHCA as defined by the SAT guidelines.

Table S.2 The Freeman Project Purpose and Need and Issues Objectives comparing each alternative and the Proposed Action.

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Purpose & Need				
Reduce Hazardous Fuels				
Surface Fuels (tons/acre)	< 5-7	> 5-7	< 5-7	< 5-7
Rate of Spread (chains per hour)	2-10 (132-660 ft/hr)	15-24 (990-1,584 ft/hr)	2-10 (132-660 ft/hr)	2-10 (132-660 ft/hr)
Flame Length (feet)	< 4	> 8	< 4	< 4
Canopy Base Height (feet)	> 12	< 5	> 12	> 12
Fire Type	Surface	Active to Passive Crown	Surface	Surface
PM 2.5 (tons)	11-54	0	11-65	3-11
Improve Forest Health				
The number of acres within units not meeting desired canopy cover for DFPZ & Area Thinning Zone (acres)	483	4,115	504	168
The number of acres within units that remain overstocked (> 70% of normal) (acres)	209	2,002	209	158
The amount of the project area that departs from a regulated stand condition in CWHR 0-2 (0-6" dbh) (acres)	+611	+36	+211	+210
Improve Bald Eagle Habitat				
CWHR Size 4 released (becoming CWHR Size 5 in 5-50 years) (acres)	923	3,537 (occurring in the wildlife analysis area)	977	1,116
CWHR Size 4 lost to GS or Aspen within the BEHMA (acres)	89	0	27	23
Cost Effectiveness and Support of Local Communities				
Sawlog Volume (mmbf)	13.9	0	8.9	9.9
Biomass (mtons)	57.3	0	51.7	63.2
Total Project Value (millions of dollars)	-$1.0	Unquantifiable fire suppression costs.	-$1.8	-$1.5
Employee Related Income (millions of dollars)	$13.3	0	$10.3	$10.6
Total Full-time Jobs	310	0	240	248

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Improve Aspen Stands				
Overstory Conifer to Aspen Ratio	0:10	10:0	1:9	1:9
Mid-story Conifer to Aspen Ratio	0:10	8:2	0:10	0:10
Aspen (stems/acre)	> 500	< 500	> 500	> 500
project area Aspen Risk Rating				
Aspen treated in the project with the Highest Risk Rating (acres)	26	27 (project area amount not treated)	25	25
Aspen treated in the project with the High Risk Rating (acres)	87	107 (project area amount not treated)	80	80
Aspen treated in the project with the Moderate Risk Rating (acres)	74	86 (project area amount not treated	71	71
Aspen treated in the project with the Low Risk Rating (acres)	56	70 (project area amount not treated	56	56
Total Aspen treatment (acres)	243	300 (project area amount not treated	232	232
Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts				
Threshold of Concern (%)	35-96	7-46	33-96	39-96
Reduced number of Stream Crossings	8	9	8	8
Restored Hydrologic Function (acres)	24	0	24	24
Issues				
Improve Aspen Stands				
Aspen treated out of the 300 acres available (acres)	243	N/A	233	233
Extended Treatment Zone (acres)	402	N/A	0	0
RHCA Mechanical-Aspen Treatment Slope Limitation (%)	>15	N/A	> 35	> 35
Area not treated by Mechanical-Aspen treatment (acres)	53	N/A	0	0
Mechanical-Aspen treatment (acres)	592 (incl. Extended treatment zone)	N/A	233	233

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Cost Effectiveness and Support of Local Communities				
Biomass (acres)	3,808	0	3,561	4,302
Biomass (mtons)	57.3	0	51.7	63.2
Mastication (acres)	534	0	536	448
Cost to Masticate ($)	$240,000	0	$241,000	$202,000
Grapple Pile and Burn (acres)	1,011	0	1,040	279
Cost to Grapple Pile and Burn ($)	$556,000	0	$572,000	$153,000
Number of Grapple Piles to Burn	1,848-6,160	0	2,439-4,065	537-895
Area Thinning Service Contract	-1,007,000	0	-1,030,000	-$784,600
DFPZ Service Contract	-$840,600	0	-$863,500	-$778,600
Timber Sale Value to Government	$798,000	0	$78,200	$46,700
Total Project Value ($) (million)	-$1	Unquantifiable fire suppression costs.	-$1.8	-$1.5

*Calculated under 90th% weather conditions—high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically have occurred on 10,% of days in fire seasons, creating the potential for severe wildfire behavior. During a typical fire season, 90% of the days have less severe conditions and 10% of days have more severe conditions.

Other Effected Resources

Heritage

The programmatic agreement with the State Historic Preservation Office requires that sites in the project are evaluated. Most of the resources are flagged and avoided. The net effect of the project must have no effect to heritage resources by following the SOPs (Table S.3).

Botany

Botany effects cover several areas: threatened and endangered plant species, sensitive plant species, special interest plant species, special habitat and biological diversity areas and noxious weeds. There are no known occurrences of threatened and endangered species in the project area. There are five “may affect” sensitive plants, which are flagged and avoided in the project area. The two known special interest plants are flagged and avoided. Known occurrences of List A and B noxious weed species are flagged and avoided (Table S.3).

Wildlife

California Spotted Owl

Potential California spotted owl foraging and nesting habitat may be affected by the action alternatives. Alternative 4 would have the most loss of both nesting and foraging habitat, while Alternative 3 would have the least loss to both (Table S.3). However, all of the action alternatives leave from 84-89% of the foraging habitat and 94-96% of the nesting habitat. Alternative 1 creates the most edge habitat for spotted owls in the area, while Alternative 3 creates the least amount of edge habitat in the wildlife analysis area.

Northern Goshawk

Potential northern goshawk nesting may be affected by the action alternatives. Alternative 4 would have the most loss of nesting habitat, while Alternative 3 would have the least loss (Table S.3). However, all of the action alternatives leave 86-89% of the nesting habitat in the wildlife analysis area.

Great Gray Owl

Potential great gray owl nesting may be affected by the action alternatives. Alternative 4 would have the most loss of nesting habitat, while Alternative 3 would have the least loss (Table S.3). However, all of the action alternatives leave 78-80% of the nesting habitat in the wildlife analysis area.

Watershed and Soils

Soil Effects

Grapple and hand thinning treatments are not removed from the site and require post-treatment pile burning. The burn piles have an affect on soils. Alternative 4 would result in the least number of piles to burn, while Alternative 1 and 3 create a similar number of piles to burn (Table S.3). The number of acres outside of standard for ground cover would be the least in Alternative 3. Alternative 3 would also leave the least soil compacted above recommended thresholds.

Threshold of Concern (TOC)

Currently, the watersheds in the project area have a low to very low threshold of concern (TOC) (No-action). The Proposed Action will bump two of the watersheds close to threshold, giving them a high TOC rating (Table S.3). Alternative 4, takes only one of the watersheds into the high threshold category, representing approximately 26% of the project area, while Alternative 3 would result in no watersheds with a high TOC rating.

Table S.3 Other effected resources in the Freeman Project area.

Other Resource Indicators	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Heritage				
Cultural Resources	No effect through use of SOPs	No Effect	No effect through use of SOPs	No effect through use of SOPs
Botany				
T & E Species	No known occurrences	No known occurrences	No known occurrences	No known occurrences
Sensitive Plants	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.	No Effect	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.
Special Interest Plants	2 species in the project area, both flagged and avoided.	No Effect	2 species in the project area, both flagged and avoided.	2 species in the project area, both flagged and avoided.
Special Habitats and Biological Areas	Aspen will be effected, all others will be flagged and avoided.	No Effect	Aspen will be effected, all others will be flagged and avoided.	Aspen will be effected, all others will be flagged and avoided.
Noxious Weeds	1 A-listed and 2 B-listed all flagged & avoided	No Effect	1 A-listed and 2 B-listed all flagged & avoided	1 A-listed and 2 B-listed all flagged & avoided
Wildlife				
California Spotted Owl Foraging Habitat Loss (acres) (% remain)	2,760 (85)	0 (100)	2,610 (89)	3,037 (84)
California Spotted Owl Nesting Habitat Loss (acres) (% remain)	246 (9`6)	0 (100)	243 (96)	379 (94)
GS and Aspen Edge Habitat Created in California Spotted Owl Habitat (acres)	390	0 (100)	136	147
Northern Goshawk Nesting Habitat Loss (acres) (% remain)	2,760 (88)	0 (100)	2,853 (89)	3,416 (86)
Great Gray Owl Nesting Habitat Loss (acres) (% remain)	1,817 (79)	0 (100)	1,697 (80)	1,882 (78)
Fisher & Marten Denning Habitat Loss (acres) (% remain)	1,261 (86)	0 (100)	1,201 (87)	1,549 (83)

Other Resource Indicators	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Watershed and Soils				
Percent of project area disturbed by burn piles (incl. Both grapple and hand piles)	0.1-0.5	0	0.1-0.6	.03-0.1
Percent of project area outside of Standard for Fine Organic Matter (0-3” size range)	17	9	15	17
Outside of Standard for Ground Cover (acres)	870	414	766	870
Soil Compaction Above Recommended Threshold (acres)	217	92	210	226
Threshold of Concern				
Percent of the project area at threshold (12%), considered High TOC (9% in sensitive and 12% in upland) (# of watersheds)	40 (2)	0	0	26 (1)
Percent of the project area with a Moderate High TOC (6% in sensitive and 9% in upland)	14 (3)	0	48 (4)	27 (4)
Percent of the project area with a Moderate TOC (>6%-9% in upland)	34 (4)	0	33 (4)	34 (4)
Percent of the project area with a Low TOC (>3%-6% upland)	13 (2)	76 (9)	19 (3)	13 (2)
Percent of the project area with a Very Low TOC (<3% upland)	0	24 (2)	0	0
The range of Thresholds of Concern (%) values for upland and sensitive areas.	35-96	7-46	33-96	39-96

Decision Framework

The responsible official will decide whether to implement this project as proposed, implement the project based on an alternative to this proposal that is formulated to resolve identified issues or not implement this project at this time. The responsible official will be the PNF Forest Supervisor.

Glossary and Acronyms

Glossary

90th percentile weather conditions—high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically have occurred on 10% of days in fire seasons. A 90th percentile weather day creates the potential for severe wildfire behavior. During a typical fire season, 90% of the days have less severe conditions and 10% of days have more severe conditions.

A-listed noxious weed—invasive plant species for which eradication or containment is required at the state or county level.

active crown fire: "A crown fire in which the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fire for continued spread" (Reinhardt and Scott 2001).

Area Thinning Zone —the area outside of the Defensible Fuels Profile Zone or Wildland Urban Interface.

B-listed noxious weed—invasive plant species for which eradication or containment is at the discretion of the county agricultural commissioner.

basal area—the cross-sectional total area of all tree stems at breast height over a given area, usually an acre.

best management practices (BMP)—management practices that minimize degradation of surface waters from pollutants, including sediment from soil erosion. Refers specifically to the set of such practices developed jointly by the California State Water Resources Control Board and USFS Region 5 for application to forest land management in California.

C-listed noxious weed—invasive plant species for which eradication or containment is necessary only when found in a nursery or at the discretion of the county agricultural commissioner.

canopy base height (feet)—"The lowest height above the ground at which there is a sufficient amount of canopy fuel to propagate fire vertically into the canopy" (Reinhardt and Scott 2001). Canopy base height incorporates ladder fuels including brush, shrubs and understory trees. An increase in canopy base height results in decreased crown fire potential.

canopy cover—the degree to which forest canopy (forest layers above one's head) blocks sunlight or obscure the sky.

Chain—66 feet

Condition Class 1—Fire regime is within historic range and risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within the historic range

Condition Class 2—Fire regime has been moderately altered from the historic range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historic ranges by one or two return intervals. This would result in moderate changes to one of the following: fire size, intensity and severity and landscape patterns. Vegetation attributes have been moderately altered from the historic range.

Condition Class 3—Fire regime has been significantly altered from the historic range. The risk of losing key ecosystem components is high. Fire frequencies have departed from their historic range by multiple return intervals. This results in dramatic changes to one of the following: fire size, intensity and severity and landscape patterns. Vegetation attributes have been significantly altered from the historic range (RMRS GTR-87-2002).

crown base height—the height of the lowermost branches of the forest canopy above the ground.

crowning index (mph)—the 20 foot wind speed at which active crown fire is possible. An increase in the crowning index would indicate a reduced likelihood of an active crown fire moving through or into a stand.

cut-to-length system—as opposed to skidding whole trees or logs to a landing, a system of cutting logs to particular lengths (e.g. 20') and moving them to a landing on a wheeled forwarder. Reduces impacts to soils, requires less road construction and smaller landings and causes less damage to residual trees.

California Wildlife Habitat Relationships (CWHR)—a system developed jointly by the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes and tree densities and rates the resulting classes in regard to habitat value for various wildlife species or guilds.

CWHR Conifer Size and Canopy Closure definitions:

CWHR Tree Size			CWHR Canopy Cover		
CWHR	**Conifer Crown**	**dbh**	**CWHR**	**WHR Closure Class**	**Ground Cover**
1	Seedling Tree	<1"	S	Sparse Cover	10-24%
2	Sapling Tree	1-6"	P	Open Cover	25-39%
3	Pole Tree	6-11"	M	Moderate Cover	40-59%
4	Small Tree	12-24"	D	Dense Cover	60-100%
5	Medium/Large Tree	>24"			
6	Multi-layered Tree	Size class 5 over size class 4 or 3 trees w/ a 60% CC			

The crosswalk between CWHR and timber strata is as follows:

CWHR Timber Strata	CWHR Vegetation Type	Size Class (dbh)	Canopy Cover (%)
SMC4M	mixed conifer (SMC/MCH/DFR)	11-23.9"	40-59%
SMC5P	mixed conifer (SMC/MCH/D)	24-39.9"	20-39%
SMC5M	mixed conifer (SMC/MCH/DFR)	24-39.9"	40-59%
PPN4S	pine (EPN/PPN)	11-23.9"	< 20%
PPN4P	pine (EPN/PPN)	11-23.9"	20-39%
PPN4M	pine (EPN/PPN)	11-23.9"	40-59%
PPN5P	pine (EPN/PPN)	24-39.9"	20-39%
RFR4P	red fir (RFR)	11-23.9"	20-39%
RFR4D	red fir (RFR)	11-23.9"	60%+
RFR5M	red fir (RFR)	24-39.9"	40-59%
RFR5D	red fir (RFR)	24-39.9"	60%+
WFR3D	white fir (WFR)	6-10.9"	60%+
WFR4D	white fir (WFR)	11-23.9"	60%+
WFR5M	white fir (WFR)	24-39.9"	40-59%

defense zone—a buffer zone within the wildland-urban intermix generally ¼-mile wide around human habitation (residences, commercial buildings, administrative sites) in adjacent areas of flammable wildland vegetation. The desired condition for these zones is vegetation that makes ignition of crown fire highly unlikely and allows staging of fire suppression equipment and personnel to directly attack an approaching wildland fire. Stands should be fairly open and dominated primarily by larger, fire tolerant trees

defensible fuel profile zone (DFPZ)—zones approximately ¼-mile wide where fuel has been reduced. They usually are constructed along roads or ridgetops. They are intended to break up fuel continuity across the landscape and provide a defensible zone for suppression forces. Design criteria are described in the HFQLG EIS, appendix J, tables 1 and 2.

eastside—forest types growing on drier east side of the Sierra Nevada comprised of open stands of drought-resistant conifer species, most commonly Jeffrey pine, mixed with a brushy understory.

end lining—extending a cable from a tractor and pulling a log to the tractor, rather than driving the tractor to each log in a harvest area.

equivalent roaded acres (ERA)—the area of roads in a watershed that would produce the same rate of runoff and channel instability that the sum of all disturbances in a watershed cause. Thus, acreages of different types of land disturbances are weighted according to the rate of runoff they cause relative to runoff caused by a native-surface road and the sum is the equivalent roaded area of the watershed.

fire regime—a combination of fire frequency and severity.

fire safe council—a local council (e.g. Plumas County) under authority of the California Department of Forestry and Fire Protection comprised of public officials and private interests formed for purposes of initiating and reviewing proposals for fuels reduction programs that may involve public and private land ownerships.

fireline—a zone in wildland vegetation types cleared of flammable material to inhibit or prevent the spread of fire.

fireline intensity (BTU/ft./sec.)—The measure of heat released per second from a one-foot wide section of the fuelbed extending from the front to the rear of the flaming front. Fireline intensity is a function of rate of spread and is related to flame length. It is used as an indicator of heat felt by a person standing next to the flame.

flame length (feet)—The distance measured from the tip of the flame to the middle of the flaming zone at the base of the fire. It is measured on a slant when the flames are tilted due to effects of wind and slope.

fuel moisture—The amount of water in a fuel, expressed as a percentage of the ovendry weight of that fuel. Fuel moisture content is often related to the size of the fuel, commonly referred to as 1-hour, 10-hour, 100-hour and 1,000-hour fuels. One hour fuels are < ¼” diameter. Ten hour fuels are ¼” to 1” diameter. One hundred hour fuels are 1”-3” diameter. One thousand hour fuels are 3”-8” diameter. For example, a one hour fuel will take one hour to lose two-thirds of its moisture.

grapple piling—moving and piling logging slash (for burning) using mechanize equipment (a grapple).

hydrophobic soil—a soil that resists the infiltration of water. Intense fires often cause or increase the “hydrophobicity” of soils.

ladder fuels—fuels that provide a pathway for fire in ground fuels to ascend to the canopy of a forest stand. They comprise tall brush, small trees and lower branches of larger trees.

level 2 road—NFS roads intended for use by high-clearance vehicles, such as pickup trucks. User comfort is not usually a consideration. User safety is the minimum required for the safe operation of the design vehicle and roads are often subject to at least seasonal closure. Also called “maintenance level 2 road:.

level 3, 4 and 5 roads—roads designed and maintained to accommodate passenger car use. High levels provide increasing levels of user comfort and safety.

lithic scatter—a prehistorical heritage resource exhibiting flake stone artifacts.

management indicator species—species whose populations are believed to respond to management activities. They are chosen to represent specific habitat types.

mast production—acorns.

mechanical thinning—use of tractors, cable systems or helicopters to remove trees that have been cut by chainsaws or the use of feller-bunchers—wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site.

off-base and deferred lands—federal Lands identified in the HFQLG Act as off-base or “deferred”. The act excludes timber harvest and road construction from off-base and deferred lands during the term of the pilot project.

operability—the ability to conduct vegetation management operations, which include construction of access roads and log landings, use of cable logging systems, clearing of central skid trails for tractor logging and removal of trees that pose hazards to forest workers.\

over-stocked—condition of a forest stand where excessive number of trees has reduced total stand growth from the maximum possible amount. Trees are competing with one another for soil moisture and sunlight to the degree that growth of stand volume is suppressed.

partial retention—a visual quality objective of providing a natural-appearing landscape where management activities may be evident but must remain visually subordinate to the characteristic landscape.

passive crown fire—A crown fire in which individual or groups of trees torch out. Passive crown fire can vary in behavior from isolated torching to a nearly active crown fire.

piling and burning—piling harvest or thinning residues (branches and limbs) and burning when moisture content has been reduced through evaporation, wildfire hazard is low and atmospheric conditions are favorable for dispersal of smoke.

prescribed burning—fire purposefully ignited to achieve a beneficial purpose, such as reducing fuels on the forest floor or fuels generated by logging or thinning forest trees.

rate of spread (chains/hour)—The rate at which fire moves through surface fuels. High rates of spread increase resistance to control for fire crews.

regeneration—tree seedlings and saplings that have the potential to develop into mature forest trees.

retention—a visual quality objective of providing a natural-appearing landscape where management activities are not visually evident to the casual forest visitor.

return interval—the average time period for the recurrence of a type of event (wildfire, flood, intense rainfall, etc.). Actual intervals been events vary.

riparian habitat conservation areas (RHCA)—zones of specified widths along streams and watercourses and around lakes and wetlands which vary in width according to stream or feature type, as described the SAT guidelines.

road decommissioning—culvert removal and removal of stream-crossing fills and regrading of the road prism to restore natural slope, natural contours and watercourse morphology.

sensitive area (for cumulative watershed effects analysis)—areas within 200' of perennial streams.

sensitive species—species listed as such by the regional forester of the USFS' Pacific Southwest Region because their populations are such that National Forest management actions could contribute to a trend toward eventual listing by USFWS/NMFS as threatened or endangered.

seral stage—a life stage of a plant community. Usually a transitional stage that succeeds to a later stage until a climax stage is reach.

shade intolerant—species that require full, open sunlight on the forest floor to establish and grow (e.g. ponderosa pine).

shelterwood—a regeneration method under an even-aged silvicultural system wherein a portion of a mature stand is retained as a source of see and/or protection during the period of regeneration.

site-potential trees—trees that growing at the maximum rate that the environmental conditions of a given site will allow. Trees on a site whose growth is not inhibited by competition from other trees.

slash—vegetative residue after a logging operation. Includes branches and tops of logged trees, broken branches of residual trees and broken residual trees.

snag—a dead standing tree.

special habitats—habitat types that are monitored if they are determined to be limited in distribution, particularly valuable as habitat for rare plants or wildlife or of concern for other reasons

spotting—the process of ignitions ahead of an advancing fire due to wind-borne firebrands.

standard operating procedures (SOP)—a set of environmental-protection requirements for the conduct of vegetation management activities that are imposed upon USFS contractors through contract provisions.

streamside management zone (SMZ)—buffer zones along streams in timber harvest zones designated and managed in accordance with the 1988 PNF Forest Plan. Predate RHCAs and SAT guidelines.

subsoiling—any treatment to fracture and/or shatter soil with narrow tools below the depth of normal tillage without inversion and with a minimum mixing of the soil.

surface fire—A fire spreading in surface fuels.

thinning from below—a process of removing trees from a stand beginning with the smallest trees under desired conditions for crown base height and/or canopy cover is attained.

threat zone—a land-use allocation of SNFPA within the wildland-urban intermix generally extending about 1¼-mile beyond defense zones where vegetation should be treated to reduce the rate of wildfire spread and wildfire intensity.

threatened and endangered species—a species listed in either category by the USFWS or NMFS under provisions of the federal Endangered Species Act, as amended.

timber strata—vegetative areas with similar species composition, tree size and density.

torching—ignition of an entire tree, isolated sufficiently from other trees so that a crown fire is not initiated with a stand.

treatment units—forest stands where vegetation management activities are proposed, including both DFPZ construction and GS timber harvest (about 6,400 acres). Areas subjected to road system actions can also be thought of as treatment units.

threshold of concern (TOC)—an estimate of the value of equivalent roaded area (ERA) in a particular watershed above which land disturbances begin to substantially impact downstream channel stability and water quality.

torching index (mph)—The 20 foot wind speed at which crown fire is expected to initiate. An increased torching index would indicate a reduced likelihood of torching in a stand, with a resultant reduction in crown fire potential.

underburning—prescribed fire in fuels on the forest floor that is intended to generally remain on the forest floor without consuming significant portions of the forest canopy.

westside—forest types growing on wetter, more humid west side of the Sierra Nevada, usually comprised of mixed conifer stands, most commonly ponderosa pine, Douglas fir, white fir, incense cedar, sugar pine and black oak or higher-elevation communities

wildland/urban interface (WUI)—an area where human habitation is mixed with areas of flammable wildland vegetation. It generally extends outward from the edge of develop private land into federal, private or state jurisdictions.

Acronyms

AOC	Area of Concern
AT	Area Thinning Zone
BA/BE	Biological Assessment/Biological Evaluation
BBS	Breeding Bird Survey
BEHMA	Bald Eagle Habitat Management Area
BMP	Best Management Practices (for protection of water quality)
CDFG	California Dept. of Fish and Game
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Cfs	Cubic Feet per Second
CWE	Cumulative Watershed Effects
CWHR	California Wildlife Habitats Relationships
DEIS	Draft Environmental Impact Statement
DFPZ	Defensible Fuel Profile Zone
dbh	diameter at breast height
DOQ	Digital Orthophotoquad
EA	Environmental Assessment
EIS	Environmental Impact Statement
ERA	Equivalent Roaded Area
ETZ	Extended Treatment Zones
FEIS	Final Environmental Impact Statement
FIA	Forest Inventory Analysis
FOFEM	First Order Fire Effects Model
FONSI	Finding of No Significant Issues
FM	Fuel Model
FRLC	Feather River Lumber Company
FVS	Forest Vegetation Simulator
GIS	Geographical Information Systems
GPS	Global Positioning System
GS	Group Selection
Hef	Habitat Effectiveness
HFI	Healthy Forest Inititiative
HFRA	Healthy Forest Restoration Act
HFQLG	Herger-Feinstein Quincy Library Group
HFQLG FRA	Herger-Feinstein Quincy Library Group Forest Recovery Act
HRCA	Home Range Core Area (for spotted owls)
HSI	Habitat Suitability Index
HUC	Hydrologic Unit Codes
IDT	Interdisciplinary Team
ITS	Individual Tree Selection
KV	Knutson-Vanderberg Act

LOP	Limited Operating Period
LRMP	Plumas National Forest Land and Resource Management Plan, as amended
LS/OG	Late Seral/Old Growth
LWD	Large Woody Debris
mbf	Thousand Board Feet (1 board feet = 12’x12’x1”)
mmbf	Million Board Feet (1 board feet = 12’x12’x1”)
MFFR	Middle Fork Feather River
MIS	Management Indicator Species
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NSAQMD	Northern Sierra Air Quality Management District
NTMB	Neotropical Migratory Bird
OHV	Off-highway Vehicle
PA	Proposed Action
PAC	Protected Activity Center
PFSC	Plumas Fire Safe Council
PLAS	Plumas Lassen Administrative Study
PNF	Plumas National Forest
PM	Particulate Matter
Psi	Pounds per square inch
PSW	Pacific Southwest Research Station
QMD	Quadratic Mean Diameter
RAC	Resource Advisory Committee
RAWS	Remote Automated Weather Station
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objectives
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SAT	Scientific Analysis Team
SHPO	State Historic Preservation Officer
SMC	Sierra Mixed Conifer
SMZ	Streamside Management Zone
SNEP	Sierra Nevada Ecosystem Project
SNFPA	Sierra Nevada Forest Plan Amendment (both 1991 and 1994 amendments)
SOHA	Spotted Owl Habitat Area
SOP	Standard Operating Procedures
SOPA	Schedule of Proposed Actions

SQS	Soil Quality Standards
TOC	Threshold of Concern
UDL	Upper Diameter Limit
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFS PSW	U.S. Forest Service Pacific Southwest Region
USFWS	U.S. Fish and Wildlife Service
VQO	Visual Quality Objectives
WEPP	Watershed Erosion Prediction Project
WIFL	Willow Flycatcher
WNV	West Nile Virus
WPT	Western Pond Turtle
WUI	Wildland/Urban Interface
YFL	Yellow Legged Frog
%	Percent
“	Inches
‘	Feet

Chapter 1 Purpose and Need

1.1 Introduction

The USDA Forest Service, Plumas National Forest (PNF), will prepare an Environmental Impact Statement (EIS) to reduce hazardous fuels, improve forest health, improve bald eagle habitat, support the local communities, improve aspen stands, provide access needed to meet other project objectives and reduce transportation system impacts on the west side of Lake Davis near Portola, California. The Freeman Project area is 14,967 acres. This project was originally scoped in September 2004 with the intention of completing an Environmental Assessment (EA). After evaluating responses to the initial scoping effort, the PNF decided to prepare an Environmental Impact Statement (EIS).

Chapter 1 briefly describes the Forest Service proposal for the Freeman Project, the reasons why the Forest Service is proposing action at this time and the desired conditions for the project area. This chapter discusses the management direction background on the PNF. This chapter also describes how the Forest Service informed the public of the Proposed Action and addressed the issues that prompted the formation of alternatives. This chapter describes the Proposed Action and the Purpose of and Need for the Proposed Action. It has been prepared consistent with guidelines of the Council of Environmental Quality for compliance with the National Environmental Policy Act (NEPA) (40 Code of Federal Regulations [CFR] 500 et seq.).

This chapter is organized as follows:

- Background
- Purpose of and Need for action
- Project location
- Project schedule
- Decision to be made and responsible official
- Public Involvement and Scoping Issues
- Document Structure

The Standards and Guidelines applicable to all activities occurring in the project area may be found in Appendix C (USFS PSW 2004b, Table 2). In addition to all of the specific design features and resource specific mitigation measures listed in the Proposed Action and at the end of Chapter 2, the District would implement its Standard Operating Procedures (SOP) (Appendix D). This project may be implemented using stewardship contracting authority, which allows for the exchange of goods for services and which requires community collaboration.

1.2 Background

This project is proposed according to management direction provided by the PNF Land and Resource Management Plan (LRMP) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD (USFS PNF 1988, USFS 1999, USFS 2003, USFS PSW 2004 a, b). The 2004 SNFPA required that land allocations and application of Standards and Guidelines embodied in the HFQLG ROD be preserved for the life of the pilot study. The pilot study provided for by the HFQLG Act was designed to test the effectiveness of certain resource management activities at meeting various ecologic, economic and fuel reduction objectives. Fuelbreak construction consisting of a strategic system of Defensible Fuel Profile Zones (DFPZ) is just one of the requirements of the Act. Other activities include GS, Area Thinning Zone treatments (or Individual Tree Selection), as well as riparian management and restoration projects.

The Healthy Forest Initiative (HFI) and Healthy Forest Restoration Act (HFRA) affirmed the need to reduce the risk of wildland fire to communities, municipal water supplies, forests, rangelands and other important landscape components. One of the primary goals of this Act was to create a National Fire Plan that would address the fuels reduction needs in the Wildland Urban/Interface (WUI). The Plumas County Fire Safe Council finalized the Plumas County Communities Wildfire Mitigation Plan. In April 2005, the Plumas County Board of Supervisors adopted the Plan.

The Wildfire Mitigation Plan was developed through a collaborative process involving participation from county, state, federal agencies and the public. As a partner in the development of this Plan, the Forest Service is committed to do its part to implement the Plan in a coordinated fashion and reduce fuels in WUI on National Forest System (NFS) lands.

1.3 Project Purpose and Need

1.3.1 Reduce Hazardous Fuels

Purpose 1: Reduce fuels in order to do the following: a) provide continuity with existing DFPZ and existing fuel reduction project areas, b) provide continuity with Plumas Fire Safe Council's efforts to reduce fuels inside the WUI, c) contribute to the larger HFQLG landscape level DFPZ network, d) reduce the potential size and intensity of wildfires by creating conditions that improve fire suppression effectiveness in the Lake Davis Recreation Area and e) reduce the risk of stand-replacing fire in riparian habitat conservation areas.

Fuel treatments are identified under two distinct zones, WUI and a strategic network of DFPZs. Under the HFRA, the Forest Service is required to work with the Plumas Fire Safe Council to reduce hazardous fuels around local communities. These areas are referred to as the WUI. Fuel treatments within the WUI are designed to create a fire buffer zone between developed areas and the wildland to increase the effectiveness of firefighting efforts and to reduce risks to firefighters, the public, facilities, structures and natural resources. The WUI is broken-up into three areas in the 2005 Plumas County Communities Wildfire Mitigation Plan: the Urban Core, which is surrounds private land in and around communities, the A*djacent WUI*, which stretches 0.5-miles around communities; and the *Extended WUI*, which stretches another 1-mile around the Adjacent WUI. This makes the overall size of the WUI approximately 1.5-miles around communities.

The principle behind a strategic network of DFPZs is to reduce the potential for large-scale, high-intensity fire by creating a network of linear fuel treatments across the landscape, over seven Ranger Districts, where wildfire behavior would be modified to allow safer and more effective fire suppression. The DFPZs would generally be ¼-mile to ½-mile in width, although width would be adjusted to take advantage of naturally fire resistant landscape features such as roads, ridgelines, rocky slopes, wet valley bottoms and boundaries between PNF and private property.

Riparian habitat conservation areas (RHCA) and upland forested areas within the Freeman Project are currently overstocked, contain ladder fuels consisting of small trees and brush and have excessive fuel loads. Insect infestations, drought, disease and fire exclusion have increased the susceptibility of the project area to intense fire. Nearly 60% of the stands are in high-risk condition with a rating of *Condition Class* 3, 26% are in Condition Class 2 and 14% are in Condition Class 1. Condition Classes are a descriptive term to describe the degree of departure from historic *fire regimes*. Having so much of the area in Condition Class 3 is an indication that fire regimes have been significantly altered by past management practices and fire suppression. With current surface fuel conditions and live-crown-base heights, wildfires during 90^{th}-percentile fire weather conditions are likely to move from the ground surface to the forest canopy, leading to a high intensity fire that is difficult to control.

The desired conditions for fuels in the area are open upland and RHCA stands that are mostly dominated by larger, fire tolerant trees. The openness of crown fuels creates a network of intermingled openings between the clumps of large trees. The absence of most small diameter trees and the low amount of surface fuel would increase fire suppression capabilities and produce a very low probability of active crown fire under the weather conditions that most large fires occur on the PNF. The principles for fire-resilient forests (reduced surface fuel, increased *canopy base height*, decreased crown density and retention of large trees) are all inter-related when describing fire behavior potential. Measurable elements of fire resistant forests are surface fuels, canopy base height, *rate of spread*, *flame length* and overall fire type.

1.3.2 Improve Forest Health

> Purpose 2: To improve forest health by a) reducing the amount of and susceptibility to disease infection and insect infestation b) accelerate the growth of California Wildlife Habitat Relationship (CWHR) size class 4 towards size class 5 and c) reducing fuels and improving conifer-growing conditions in the Area Thinning zone.

Many stands in the project area are infected with small pockets of insects and disease. Overstocked stands are at greater risk to insect and disease due to a weakened ability to resist attack.

Trees are most susceptible to insect mortality and damage when they are stressed due to overcrowded (over-stocked) stands. Although current bark beetle mortality pockets are small, there exists potential for bark beetle epidemic due to the large number of stands that are overstocked in the project area.

The diseases include mistletoe (*Arceuthobium* spp.), white pine blister rust (*Cronartium ribicola*) and annosus root rot (*Heterobasidion annosum*). White pine blister rust, a non-native disease, infects sugar pine (*Pinus lambertiana*). Dwarf mistletoe, annosus disease and white pine blister rust all damage infected trees and predispose them to mortality from beetles or other factors. Mistletoe infected trees have reduced growth rates, develop deformities and are susceptible to bark beetle attack and mortality. Annosus root rots occurs in two different strains. One attacks pine trees and the other, fir. The fir type infects trees primarily through basal wounds and root grafts and rarely kills trees outright. Cut stumps are the primary route of infection in the pine type and will kill pine trees quickly and spread to other pines in an ever-widening circle.

The area proposed for treatment outside the DFPZ and WUI are referred to as the Area Thinning Zone. The Area Thinning Zone units are also in need of fuels reduction and a reduction in the number of trees. Some of the areas are under-stocked due to shrub competition, preventing conifer growth. In over-stocked areas, a decrease in the number of trees will ultimately increase the health of the stands by making them less disease prone and less subject to stand-replacing fire. The amount of down fuels in the project area is high, as are the amount of ladder fuels, creating a high risk of stand-replacing fire.

Table 1.1. Displaying the preferred regulated stand size class distribution vs. the existing CWHR size class distribution under a regulated condition.

CWHR Size Class (dbh)	Existing (%)	Existing (Acres)	Regulated Stand (%)	Regulated Stand (Acres)	Difference (Acres)
0-2 (0-6")	10	1,220	10	1,185	35
3 (6-11")	19	2,192	10	1,185	1,007
4 (11-24")	62	7,354	30	3,554	3,800
>5 (>24")	9	1,082	50	5,924	-4,842
Total	**100**	**11,848**	**100**	**11,848**	

The desired condition is to have vigorous conifer stands that are resilient to insects and have low levels of mistletoe and annosus infection.

The Herger-Feinstein Quincy Library Group Act (HFQLG FRA) endorses GS un-even aged management as the way to achieve an all-aged, fire resilient forest. The average rotation length is 175 years, which translates to a harvest of .57% of the land base annually. Table 1.1 displays the approximate area in each size class under the 175 year rotation. Through an analysis of the desired distribution of size classes vs. existing size classes, it was determined that the Freeman Project area had too many acres in CWHR size classes 3 and 4 and too few in size classes 5 and 6 (Table 1.1).

1.3.3 Improve Bald Eagle Habitat

Purpose 3: To improve bald eagle (Haliaeetus leucocephalus) habitat by promoting the growth and development of CWHR size class 5 trees, which are preferred for foraging, roosting and nesting habitat.

Stands in the Lake Davis Bald Eagle Habitat Management Area (BEHMA) in the Freeman Project area are overstocked, largely unable to recruit nesting structure and at risk of loss from wildfire and disease/insect infestation. Bald Eagle habitat in the project area is displayed in Appendix I, Figure I.1. Currently, the size class distribution of eagle habitat is disproportionately heavy in CWHR size class 4 (Table 1.2). The desired condition of the BEHMA stands is to increase the quantity of potential bald eagle habitat and lower the risk of loss to stand-replacing fires. The Lake Davis BEHMA Plan and LRMP directs us to accelerate tree growth in order to enhance bald eagle nesting, roosting and foraging habitat, through a combination of uneven-age and even-age systems (USFS PNF 1988 and USFS PNF BRD 2004).

1.3.4 Contribute to the Economic Stability of the Local Community

Purpose 4: To provide an adequate timber supply that contributes to the economic stability of rural communities.

There are several communities highly dependent upon the forest products industry within reasonable haul distance from the project area, without the forest products industry-related jobs and revenues, some communities may not survive. Timely timber sales within the Portola and Quincy community areas contribute a proportional supply of timber to these communities that are highly dependent on the forest products industry.

Table 1.2. The CWHR size class distribution for forested Bald Eagle Habitat Management Area (BEHMA) in the Freeman Project. There are 3,819 total acres of BEHMA in the Freeman Project area.

CWHR Size Class	Acres
2	121
3	201
4	2,511
5	9
Total	**2,842**

1.3.5 Improve Aspen Stands

Purpose 5: To provide for greater biological diversity in the Freeman Project area by releasing aspen stands from conifer competition.

Aspen stand improvement work follows the general forest management intent provided in the SNFPA by actively managing the general forest areas to maintain and enhance a variety of vegetative conditions (USFS PSW 2004b, Table 1). It also follows the HFQLG EIS Riparian Management Objectives that provide for the maintenance or restoration of 1) diverse and productive native plant communities in the riparian zone as well as 2) to support populations of well-distributed native plant, vertebrate and invertebrate populations that contribute to the viability of riparian plant communities (USFS 1999). There are approximately 300 acres of aspen in the project area, with stands ranging in size between 0.1-29.5 acres. Aspen is a critical component in the biodiversity of forests that also provides aesthetic qualities for recreation users. Functioning aspen ecosystems have plant community diversity and productivity second only to riparian areas on the PNF landscape. This work will assist the Forest in maintaining this genetic lineage of aspen clones, as well as promoting biological diversity in the project area. Higher plant diversity, greater plant productivity and elevated plant density is maintained because of the contribution of aspen litter fall and plant matter decomposition upon soil characteristics and nutrient availability. The organic matter provided to the soil maintains near-neutral pH levels and increases water-holding capacity of the surface soils allowing diverse plant communities to proliferate. Many aspen communities within the project area are located adjacent to riparian areas and stream channels. Project implementation and associated enhancement of plant community diversity and density would therefore provide greater vegetative cover in these riparian areas. This would effectively result in improved water quality through increased sediment filtration and increased streambank protection during flood events, ultimately yielding greater watershed protection. Soil stability is provided through the rooting habit of aspen clones; approximately 95% of the root system is within 6” of the soil surface. Increased root density in shallow soil horizons reduces the potential for surface erosion during flashy storm events.

Aspen stands in the project area are low in productivity and health and most are not successfully regenerating. This may be due to one or more of the following factors: past fire suppression or natural succession that favors conifers in the competition for sunlight and moisture; climate change; past grazing pressure or human-caused changes to the local hydrologic regime (e.g. roads). Field evaluation indicates that, regardless of the relative contribution of these various factors, at present, competition by conifers is a major factor in aspen decline. A risk rating assessment of the project area shows that the majority of the stands are at moderate to very high risk of loss. Each aspen clone has a unique genetic lineage, making the loss of even one clone significant. The stands in the project area have been rated as having 59% at high/highest risk of loss, 30% are at moderate risk of loss and 11% are other. Aspen stands that are rated at moderate or higher risk of loss have one or more risk factors: decadent overstory aspen; conifer canopy cover greater than 25%; overstory trees not being replaced by sprouting; and aspen cover less than 40%.

The removal of conifers, surrounding an aspen stand, is frequently recommended to allow for aspen community expansion, reduce shading effects from adjacent conifers and reduce nearby conifer seed sources. Aspen stands need to be released from conifer competition to create a more stable aspen community and restore the stands to a healthier condition. Improved functioning of these systems would maintain favorable water quality and flow and reduce the likelihood that these communities could be severely damaged or lost because of wildfire. The objectives of this project are to maintain or improve habitat for plant, vertebrate and invertebrate populations that contribute to the viability of aspen stands. The outcome of releasing the aspen should result in increased aspen sprouting, a multi-layered canopy of aspen and increased health and vigor of the stands.

1.3.6 Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

Purpose 6: To reduce impacts of the transportation system on forest resources and provide the necessary access for the vegetation treatments.

The proposed road relocation and decommissioning work is needed to achieve desired riparian conditions and to reduce the total area of compacted soil. As directed by the HFQLG, the Riparian Management Objectives (RMO) set forth many goals for water quality in the project area. These RMOs provide much of the justification for the roadwork that is being proposed. The roads identified for decommissioning are currently in poor locations or in a condition which adversely affects channel stability, peak flows, water quality and aquatic habitat. Decisions regarding the transportation system are being coordinated with ongoing planning for designation of off-highway vehicle routes. Appendix B, Table B.4 provides a description of the road number, type of work being proposed and what the justification for closing or decommissioning certain roads before the completion of the forestwide Off-highway vehicle (OHV) analysis process. Measures of successful implementation will lead to reduced equivalent roaded acres, lowered road density and less soil compaction in the project area.

The Freeman Project area recently had two hazard tree sales, in 2004 the Deek Hazard Tree Sale and in 2005 the Smitty Hazard Tree Sale. These two sales removed most of the hazard trees in the project area; however there are already new hazard trees in the project area and more hazard trees are likely to arise before the project area is finished being treated. These trees will need to be removed in order to create safe operating conditions for timber operators. Hazard trees are by definition, unstable and capable of falling and injuring people or damaging property. Removing these trees would restore both transportation and recreation safety.

1.3.7 Project Location

The project area is located north of Portola and west of Lake Davis in Plumas County, California, within the Beckwourth Ranger District of the PNF. It is within all or parts of T23N, R12E; T23N, R13E; T24N, R12E; and T24N, R13E (Figure 1.1). The project area is within portions of PNF's Mt. Ingalls Management Area #31, Penman Peak Management Area #32 and Lake Davis Management Area #37. Management direction and land allocations for these areas were amended by the 1999 HFQLG ROD and the 2004 SNFPA ROD. As shown in the original LRMP, the area visible from road 24N10 on the west side of Lake Davis has a visual retention prescription (Rx 10). The area east of road 24N10 has a Recreation Area prescription (Rx 5). Much of this same area also has a bald eagle prescription (Rx11). DFPZ and WUI land allocations in the project area are shown on Appendix I, Figure I.1.

1.3.8 Project Schedule

The responsible official expects to make a decision on this project as early as the summer of 2006. Implementation could begin as early as the fall of 2006.

1.3.9 Decision to be Made

The responsible official will decide whether to implement this project as proposed, implement the project based on an alternative to this proposal that is formulated to resolve identified issues or not implement this project at this time. The responsible official will be the PNF Forest Supervisor.

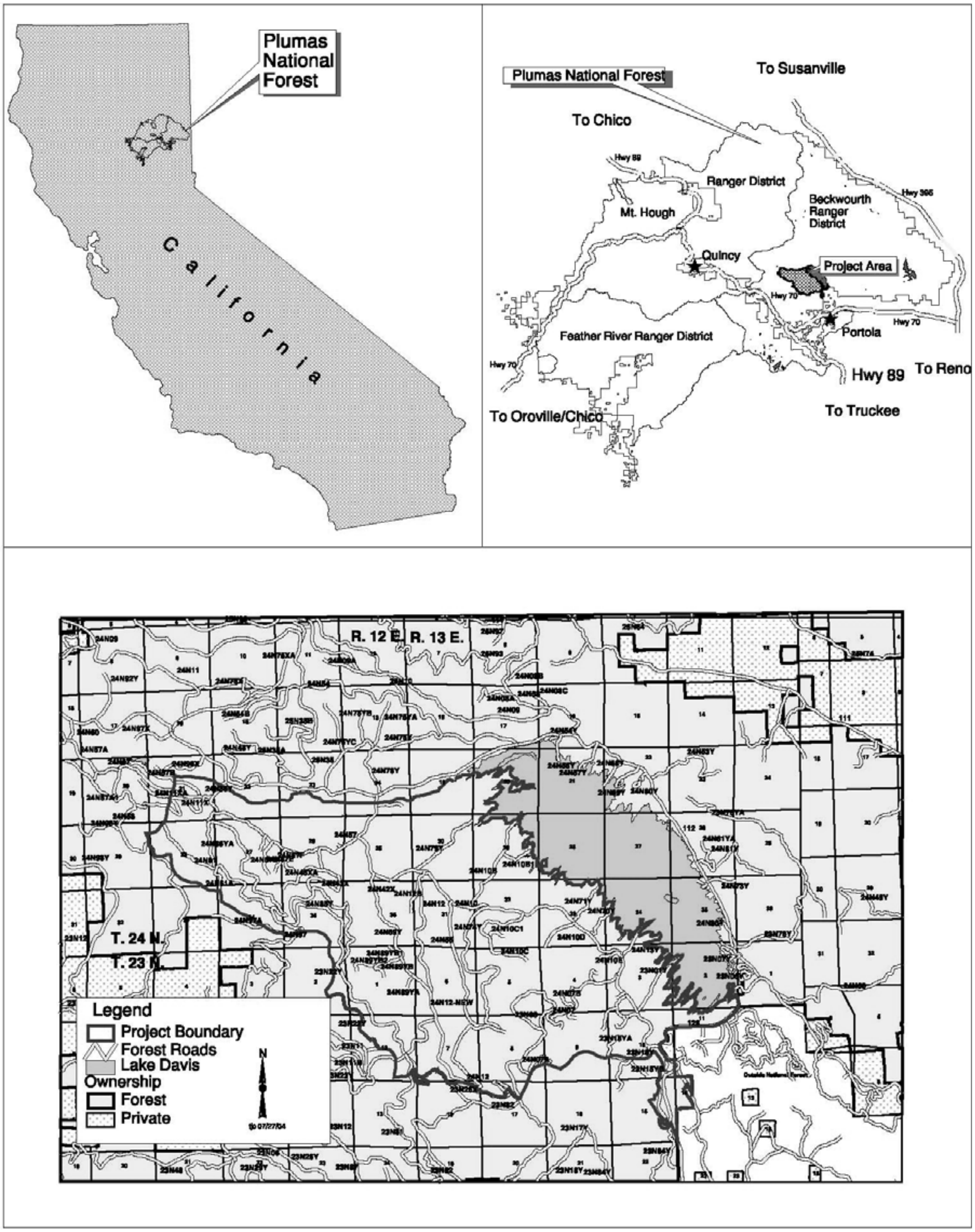

Figure 1.1. Vicinity Map for the Freeman Project.

1.4 Public Involvement and Scoping Issues

1.4.1 Public Involvement Process

Notice of the pending action first appeared in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) issued April 2004 (It also appeared in July 2004, October 2004, January 2005, April 2005, July 2005 and October 2005). The Ranger District started the NEPA public scoping process by publishing a Notice of Intent (NOI) in the Federal Register on August 25, 2005. On August 24, 2005, a legal notice of the NOI was published in the *Feather River Bulletin*, the Forest's Newspaper of Record. The Proposed Action, Purpose and Need was mailed to approximately 93 public agencies, non-profit organizations, Native American entities, adjacent landowners and individuals who expressed interest in the project. The advertised scoping period ended on September 26, 2005, although the District continued to receive and consider comments after this date.

During scoping, the Beckwourth Ranger District, staff met with the Plumas Fire Safe Council (October 13, 2005) and the Quincy Library Group (August 25, 2005) to discuss the Freeman Project, providing copies of the Proposed Action, Purpose and Need to all of the members in attendance.

The purpose of the scoping process was to inform the public about the Proposed Action, Purpose and Need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period. The Freeman Project received written or verbal scoping comments from one agency, five organizations, one Tribe and two individuals (Table 1.3).

1.4.2 Scoping Issue Development

The Forest Service Interdisciplinary Team (IDT) reviewed public comments and data collected during the 2004-2005 field seasons to identify issues related to the Proposed Action. They separated the issues into three groups: significant issues, non-significant issues and concerns.

Those comments that applied to the Purpose and Need and indicated an effect caused by the Proposed Action were determined to be significant issues. These issues became the basis for developing and analyzing additional alternatives to the Proposed Action (Alternative 1) and the required No-action Alternative (Alternative 2) described in more detail in Chapter 2. Significant issues were further divided into minor and major significant issues (referred to as minor issues and major issues, respectively). We identified key topics that covered the major themes in the comments and these were carried forward as significant issues that caused us to consider, develop and analyze additional alternatives to the Proposed Action. Minor issues were identified as those that were not substantial enough to require a new alternative to be developed but that could be addressed through adjustments to the Proposed Action. Major issues generally resulted in a new alternative being formed. Suggested alternatives were generally in relation to aspen treatments, goshawk PAC avoidance and upper diameter limits to tree removal for forest health and fuels treatments. The IDT, in conjunction with the Responsible Official, developed the alternatives to the Proposed Action.

Table 1.3. People and organizations that provided comments on the scope of the Freeman Project and the date the comments were received.

Code	Entity	Representative	City	Date
Agencies				
AQ	Northern Sierra Air Quality Management District	Sam Longmire	Grass Valley, CA	September 2, 2005
Organizations				
SNFPC	Sierra Nevada Forest Protection Campaign	David G. Graves, Conservation and Communications Director and others	Sacramento, CA	September 26, 2005
CQF	Counties' QLG Forester	Frank Stewart	Chico, CA	September 16, 2005
CATS	Californians for Alternatives to Toxics	Pete Harrison, Forestry and Public Lands Associate	Eureka, CA	September 23, 2005
OCTA	Oregon-California Trails Association	Andrew Hammond	Chico, CA	September 18, 2005
PFP	Plumas Forest Project	John Preschutti	Blairsden, CA	September 26, 2005
Tribes				
SRI	Susanville Indian Rancheria	Stacy Dixon	Susanville, CA	September 18, 2005
Individuals				
LB	Linda Blum		Quincy, CA	September 28, 2005
JP	B. Sachau		Florham Park, NJ	August 25, 2005

Non-significant issues (referred to as non-issues) were identified as those that are:

- outside the scope of the Proposed Action;
- already decided by law, regulation, Forest Plan, or other higher level decision;
- irrelevant to the decision to be made; or
- the cause and effect relationship are not valid; or
- the effects are small relative to the decision to be made; or
- conjectural and not supported by scientific or factual evidence.

Comments identified as "concerns" were evaluated to determine those that could be addressed through further explanation of the Proposed Action or could be addressed through the effects analysis in Chapter 3. Some concerns were determined to be "outside the scope" of the project and/or did not fit within the Purpose and Need of this project. If the information was deemed necessary for the deciding officer to make a decision, that information was provided in this environmental document. In other instances, the information was already provided in the Proposed Action document.

In the following chapter, each of these alternatives is first described, followed by the reason(s) for considering them in detail or elimination from detailed study and consideration. Based on internal and external feedback, an additional ten alternatives were considered, developed and analyzed. Of the ten, eight were developed, considered and not analyzed in detail. Two were developed, considered and analyzed along with the Proposed Action and No-action Alternatives.

The significant issues were:

- Aspen treatment outside RHCA’s not authorized by the Standards and Guidelines.
- Aspen treatment units greater than 2 acres may be considered too big.
- Aspen treatment involving the removal of larger conifers is objectionable to some, due to the loss of larger trees and their potential ecological importance.
- Design cost effective and efficient fuels treatments.

1.5 Document Structure

This *Freeman Project Draft Environmental Impact Statement* (DEIS) has been prepared according to the Council on Environmental Quality (CEQ) regulations that implement the NEPA (40 Code of Federal Regulations [CFR] 1500-1508).

- **Chapter 1: Purpose and Need—**this chapter provides readers with an explanation of the project background, Purpose and Need, the project location and schedule for implementation. It also explains the public scoping and issue identification processes that were used. It provides a table of the names and affiliations of each comment we received during the scoping of the Proposed Action, Purpose and Need. At the very beginning of this chapter is a glossary and list of acronyms designed to assist the reader with understanding some of the scientific jargon used by some of the resource specialists.
- **Chapter 2: Alternatives, Including the Proposed Action—**this chapter provides an introduction to the chapter that explains how we are meeting the intent of the CEQ guidelines by developing both the No-action Alternative and action alternatives to the Proposed Action. It describes the Proposed Action, No-action Alternative and each action alternative in detail and provides a comparison table of how each action alternative addresses the Purpose and Need and the issues that were generated during scoping. At the end of Chapter 2 there is a section on Specific Design Criteria to assist with fulfilling the Purpose and Need for this project, as well as any Resource Specific Mitigations, such as Limited Operating Periods (LOP) for wildlife or recreation and units with botanical issues such as sensitive plants, special habitats or noxious weeds.
- **Chapter 3: Affected Environment and Environmental Consequences—**this chapter provides the reader with the affected environment and environmental consequences of the Proposed Action, No-action and two other alternatives for each resource. Each resource has a brief introduction. A summary of the effects of the Proposed Action and each alternative are provided at the beginning of each section. The scope of the analysis is provided, disclosing the analysis geographic area and timeframe that were used. As required by the 40 CFR 1502.14, the resource specialist provides an explanation of the analysis methodology that was used in drawing their effects analysis. The Affected Environment is discussed by resource, rather than in its own chapter, in order to facilitate the readers understanding of the context of the environmental consequences that follow. The Environmental Consequences section is grouped by each alternative or by the action alternatives versus the No-action Alternative. This chapter touches on a variety of resources. The organization is loosely structured around the Purpose and Need. Since one of the main Purposes of this project is to reduce fuels, the Fire, Fuels and Air Quality Section are covered first. The next Purpose and Need to improve forest health, naturally follows having the Forest Resources discussed. In this section the silviculturist discusses the insects and disease, stand growth over a series of time periods as well as DFPZ

maintenance. A very important Purpose and Need in this project area and one that led to the development of an alternative is the need for aspen stand improvement. This special habitat is discussed along with other biodiversity areas, especially highlighting the effect of the Proposed Action on aspen, among other types of special habitats. The Wildlife Effects follows the special habitats section, with a discussion of the positive effects to bald eagle habitat that the Proposed Action should have, as well as discussion of other threatened, endangered and sensitive wildlife species and management indicator wildlife species. As required by 40 CFR 1502.23, the Economic Effects section, provides a basis for the cost-benefit analysis of this work towards contributing to local economic stability. Watershed and Soil Resources are discussed together in one section, followed by the Transportation System Effects. Threatened, Endangered and Sensitive Plants have their own section, followed by Special Interest Plants and then Noxious Weed Effects. Visual Quality is followed by Recreation Effects, since this project is in a designated Recreation Area, just outside of Lake Davis. One of the largest range allotments on our Forest is located in and adjacent to the project area, so a detailed Range Effects discussion is provided in the Range Effects section. The Heritage Resources provide a firm understanding of the affected resource and assurance that the area has been well documented and heritage resources will be appropriately protected from damage during implementation. The end of Chapter 3 provides the legal regulatory compliance and consultation that has gone into writing and planning the implementation of this EIS.

- **Chapter 4: Preparers and Contributors—**This chapter provides the names of the resource specialists and planners that worked on this document as well as a brief biography about the individuals.
- **Chapter 5: Distribution List—**This chapter provides the readers with a list of federal, state, county and local agencies that the DEIS will be sent to, as well as the Tribes and individuals.
- **Appendices—** The appendices provide supporting documentation to the DEIS. Appendix A is a list of citations used in each specialist report, organized by resource. Appendix B provides a unit description for each action alternative and a list of the proposed road work. Appendix C provides a list of the Standards and Guidelines for vegetation projects. Appendix D provides a copy of our SOPs, sometimes referred to as Standard Management Requirements. Appendix E provides a list of our cumulative effects, the names of the projects and a brief description of what they entail. Appendix F is our monitoring chapter for this project. Appendix G covers our Response to Comments from the public regarding the draft Freeman EIS. Appendix H lists the Riparian Management Objectives (RMO) that guide activities associated with riparian areas. Appendix I provides maps of the project area and its associated activities.

Chapter 2 Alternatives, Including the Proposed Action

2.1 Introduction

This chapter describes and compares the alternatives considered for the Freeman Project and those eliminated from detailed study. The first section describes the Alternatives Considered in Detail including: Alternative 1, the Proposed Action; Alternative 2, the No-action Alternative; and Alternatives 3 and 4. That section is followed by the Specific Design Features/Resource Specific Mitigation Section, which is designed to facilitate the project specific requirements needed to implement the project, while protecting resources. This is information that is in addition to the SOPs or that fall outside the SOPs, allowed by the Proposed Action and the Alternatives. The following section is designed to present the alternatives in a comparative format, defining the differences between each alternative and providing a clear basis for choice among options by the decision maker. Comparative tables are provided showing how the Purpose and Need Indicators and Outputs differ for each alternative and an Issue Indicator table of comparison for each alternative. Some of the information used to compare the alternatives is based upon the Purpose and Need (i.e., Total Project Value for each alternative) and others are designed around the issues (i.e., extended treatment zones vs. no extended treatment zones for improving aspen stands). The next section is about the Alternatives Considered but Eliminated from Detailed Study, providing the reader with insight into comments that were received from the public but eventually dropped from consideration and an associated explanation for why they were dropped.

A unit-by-unit description of the Proposed Action and action alternatives are provided in Appendix B, Table B.1 thru Table B.3. Maps showing the Proposed Action and action alternatives are provided as well (Appendix I, Figure I.2, I.3. and I.4). Road decommissioning, closure and reconstruction will be the same for each alternative (Appendix B, Table B.4)

There were three different action alternatives identified and one No-action Alternative. Alternative 1 is the Proposed Action. The Forest Service is required to analyze a No-action Alternative, identified in this document as Alternative 2, according to 40 CFR 1502.14(d). An analysis of a No-action Alternative, allows for a contrast between the issue driven alternatives and the Proposed Action. Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14). The Forest Service followed these regulations by developing two action alternatives to the Proposed Action based on issues identified during the project public scoping process. Alternative 3 makes changes to the aspen treatments. Alternative 4 keeps the changes made in Alternative 3 and alters the silvicultural treatment in several units.

2.1.1 Alternatives Considered in Detail

2.1.1.1 Alternative 1 (Proposed Action)

How the Alternative Was Developed

Alternative 1 is the original Action proposed to the public for scoping in September 2004, which was scoped again in August 2005 once it was decided that an EIS should be written, instead of an Environmental Assessment (EA). The Proposed Action would implement provisions of the HFQLG Act and National Fire Plan on this part of the Plumas National Forest. It is designed to:

- Reduce Hazardous Fuels
- Improve Forest Health
- Improve Bald Eagle Habitat
- Cost Effectively Support the Local Communities
- Improve Aspen Stands
- Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

The Freeman Project area is approximately 14,967 acres in size. The Proposed Action would treat 5,792 acres, approximately 39% of the project area (Figure G.2).

Minor Changes to the Proposed Action

On August 24, 2005, the document titled "Freeman Project—Proposed Action, Purpose and Need" was mailed to the public. Since that time there has been a change in management direction based on the impending Travel Management Plan, as well as issues identified by the public that were considered minor issues that could be addressed through a change to the Proposed Action. Lastly, there were database calculation errors, due to incorrectly attributing the Proposed Action. The following lists the errors and the corresponding corrections. These corrections are embodied in the Proposed Action (Alternative 1) that follows.

- Drop unit number 45, because there is no way to access it without tremendous cost to protect the Beckwourth Trail. This issue was brought about by the Oregon Trails Association.
- Table 4 titled "Acres of Defensible Fuel Profile Zone (DFPZ) and Wildland/Urban Interface (WUI) fuels treatment in the Freeman Project area. DFPZ/WUI treatments represent where there is an overlap between the two fuels treatment designations.", had an attribute error that has since been corrected to show that there will be 2,108 acres of DFPZ treated and 474 acres of DFPZ/WUI treated in the project area. This information is now available in a comparative table, Table 2.4. Some of the acreage figures have changed up or down due to rounding by one acre.

- Table 5 titled "A summary of the number of acres of each silvicultural treatment occurring in each zone for the Freeman Project area.", had a similar problem as the previous table, in that there should be 178 acres of DFPZ Mechanical-Aspen treatment and 110 acres of DFPZ/WUI Mechanical-Aspen treatment. This information is now available in Table 2.4.
- Stream Management Zones should state that the equipment exclusion zone is 25' rather than 15' wide.
- The original number of aspen acres existing in the project area was calculated as 860 acres. The actual number of acres that have been documented in the project area is 300 acres. The buffered aspen acres were accidentally used to calculate this value, instead of the actual aspen stand acres. There are approximately 300 acres (changed from 860) of aspen in the project area, with stands ranging in size between 0.1-29.5 acres (changed from 0.5-84). These changes are reflected in the Purpose and Need description for improving aspen in Chapter 1.
- In light of the pending Travel Management Plan, the Forest reassessed the roads proposed for decommissioning, relocation and reconstruction and made these changes to Appendix B Table B.4 of the Proposed Action. There would be 9.3-miles of existing system roads decommissioned with this decision as well as 1.8-miles of decommissioning from a previous decision, instead of 12.5-miles. Instead of 0.2-mile of relocation, there would be 0.3-mile of system road relocated. Approximately sixteen-miles of system roads would be reconstructed rather than 1.9-miles of system road reconstruction. Instead of 0.7-miles of road closure there would be 1.1-miles of road closure. This information is now available in Appendix B, Table B.4.
- Deleted the words "and trees greater than 8" would be left untreated" from the Improving Aspen Stands section third paragraph which discusses hand piling up to 8" dbh. The original wording made it appear as though the remaining stand would be left untreated, when the intent was to state that hand piles would be made with $\leq$ 8" dbh material and the rest would be treated mechanically with a long-reach boom, to the greatest extent possible, from outside the equipment exclusion zones.

Reducing Fuels

- The Proposed Action will treat fuels on approximately 13-miles of DFPZ and WUI zones (Table 2.4 and Figure 2.1). Areas of overlap are referred to as DFPZ/WUI. Treatments in the WUI include both adjacent and extended WUI. The fuel treatments proposed would provide continuity with 700 acres under contract (Knutson-Vanderberg (KV) projects) and 1,388 acres that are currently in an acceptable condition or have been administratively removed for treatment within the DFPZ (Table G.2). Treatments will reduce surface, ladder and canopy fuels. Treatments are specifically designed to cause advancing wildfire to drop to the ground and burn with reduced intensity.

Fuels would be reduced by generally thinning from below (removing trees starting with the smallest diameter). Where mechanical, ground-based harvest equipment is used, trees will be removed using whole tree yarding, effectively removing most limbs and tree tops from the stand, thereby reducing the need for post-project slash pile fuels treatments. Area Thinning Standard and Guidelines will be applied to the WUI, while DFPZ Standard and Guidelines will be applied to the DFPZ (Appendix C). The Area Thinning standard and guidelines emphasize that Westside vegetative treatments in CWHR 4D, 4M, 5D, 5M and 6 should be designed to retain 50% canopy cover wherever possible. Where a 50% canopy cover is not possible, a minimum of 40% canopy cover will be retained. In eastside stands, 30% of the existing basal area comprised of the largest trees will be retained. In the DFPZ red fir (*Abies magnifica*) and white fir stands, canopy cover would be reduced to between 40-50%. In pine stands, canopy cover would be reduced to between 30-40%. For an explanation of other Standards and Guidelines that apply to these two treatment areas, see Appendix C.

Table 2.1 The acres of Defensible Fuel Profile Zone (DFPZ) and Wildland/Urban Interface (WUI) and DFPZ/WUI in the Freeman Project area. Not all of the area will be treated at this time, because some of the areas are already under contract and others are currently in an acceptable condition or have been administratively removed for treatment.

Fuels Treatment Areas	Total Acres in project area
DFPZ	3,301
DFPZ/WUI	669
WUI	1,301
Total	5,271

Note: Acres may vary up to 10% during the final layout due to topography, stand condition, etc. Mechanical treatment acres will be less than those displayed due to the no equipment rules applied to slopes > 15% in RHCAs and > 35% in upland areas. See the Cumulative Watershed and Soil Effects Report for more details (USFS PNF BRD 2006f).

Clumps of the largest fire-tolerant, healthy trees would be retained within a network of intermingled openings, rather than employing uniform spacing between the residual trees. A thinning from below prescription would be utilized in most cases, except for trees that are at high risk of mortality due to insects or diseases, keeping those needed for wildlife snag recruitment and in the case of aspen stand improvements. No trees over 29.9” dbh will be removed, except for operability (e.g., new skid trails, landings, temporary roads). Forest Service Representatives must approve such removal of larger diameter trees and will do their best to avoid having to do so whenever possible. New skid trails may be necessary due to the use of whole tree yarding techniques in some stands. Although whole tree yarding enables less slash to be dealt with, it also requires that skid trails are straighter than those used in the past since full length trees with all of their branches are hard to maneuver through the forest without damaging the residual stand. Mechanical felling would be restricted to slopes having a gradient of less than 35%. Exceptions may be made for short (less than 100’) pitches within the interior of units where slope exceeds this limit. Mastication, grapple pile and/or underburning may follow thinning, if needed to meet ladder and ground fuel-reduction objectives. Mastication and grapple piling have similar effects to soil resources and therefore may be interchanged during layout. For treatments in aspen stands within the DFPZ, see the section on aspen stand improvement.

Fuels occurring in plantations, natural stands of young trees and prior shelterwood regeneration harvest areas, would be reduced through a combination of hand-thinning, grapple piling and mastication (Table 2.4). Follow-up treatment may consist of underburning and/or pile burning, unless damage to regeneration is predicted.

Fuels in some units and within RHCA buffers may be reduced by hand-thinning, piling and burning of trees up to 8” dbh. In other units, fuels may be reduced using underburning without any additional treatment.

Riparian Habitat Conservation Areas

RHCAs and streamside management zones (SMZ) within the treatment units total approximately 1,301 acres. Treatments in these areas would include hand-thinning, mechanical thinning, underburning, pile burning and/or a combination thereof. No GS would be permitted within RHCAs. RHCAs vary in width, depending on whether they are along fish bearing streams and lakes (300’), or intermittent and ephemeral channels with scour and deposition, seeps, springs and bogs (150’).

In DFPZs, WUI and Area Thinning (areas outside DFPZ and WUI) units, RHCA treatment would be as follows:

- Within units to be mechanically thinned, masticated, or grapple piled, equipment would be restricted from entering within 50’ (for 150’-wide RHCAs) and 100’ (for 300’-wide RHCAs) of the high water mark of streams and springs. Low ground pressure equipment (under 8.0 psi) would be permitted to extend booms into these inner zones to remove material, but would not be allowed to considerably damage residual stands or disturb soils. Areas beyond the reach of booms would be hand thinned, piled and burned.
- Low ground pressure equipment would be allowed to travel into the outer RHCA zone; harvest trees and bring them to skid trails. Skid trails would be spaced approximately every 80-120’, generally perpendicular to streams and skidders would be allowed to enter the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs.
- Where side slopes within RHCAs exceed 15%, only hand-thinning would be allowed.
- Canopy cover ≥ 40% would be retained in general and within the inner zones of the perennial, fish-bearing stream RHCAs, canopy would remain ≥ 60%, where available (canopy cover in RHCAs will be less in aspen treatment units).Within RHCAs in units proposed for underburning or hand-thinning, conifers up to 8” dbh would be removed. Slash would be piled and burned. Hand piles would be situated away from riparian vegetation to prevent scorching.

Streamside management zones (SMZs) are channels that have flow only after storms or during snowmelt, generally exhibit no annual scour or deposition and are found in the upper reaches of a drainage. A 25'-wide equipment exclusion zone would protect these areas. The harvest prescription for adjacent land would apply to these areas. There are approximately 57 acres of mapped SMZs within the proposed treatment units.

Along the perimeter of units adjacent to meadows, scattered conifers possessing one or more of the following characteristics would be retained to provide nesting and roosting habitat for raptors: large limbs extending into the meadow; mistletoe brooms higher than 20' from the ground; multiple tops; bole sweep; and snags.

Where conifers with the above characteristics are not present adjacent to meadows, dense pockets of conifers ¼ acre in size, spaced approximately every 200 yards around the perimeter of the meadow, would be retained.

Improving Forest Health

In addition to fuels reduction, the Purpose and Need focuses on the need to treat stands for forest health reasons. This will involve treating the DFPZ, DFPZ/WUI and WUI and the areas outside, referred to here as Area Thinning stands (Figure G.2) As discussed in the Purpose and Need, treatments would focus on areas where disease and insect infestations have occurred. GS would be the primary tool utilized to treat these areas.

Group Selection

GS would range in size from ½-2 acres and would be predominately located in stands containing sawlog-sized conifers, generally ranging from 11-29.9" dbh. GS, consisting of harvesting trees to create openings up to 2 acres in size totaling 175 acres, would be implemented over approximately 2,700 acres (Table 2.2). GS patches will be identified during layout of the project, which will not occur until just before implementation; therefore, the exact locations have not yet been identified.

If not removed as part of a timber sale, non-saw log material (biomass) would be piled and burned or decked and sold as firewood. GS will be replanted as necessary to insure adequate restocking. Healthy, advanced regeneration of appropriate species would be retained during harvest, where practical. Areas with mistletoe or root disease infestation would be planted with alternative non-susceptible native species. Fuels objectives would be met by underburning, grapple piling or masticating post-treatment. Each GS area would be site specifically evaluated.

Group Selection within the DFPZ and WUI Zones

WUI treatments would be adjacent to the Grizzly Road-Lake Davis communities of Portola, California, which have been identified as one of the communities at risk to wildfire in the Plumas County Communities Wildfire Mitigation Plan (PFSC 2005). Fuel treatments in these areas are adjacent to the strategic network of DFPZs. Area Thinning standard and guidelines will be applied to the areas within the WUI (Appendix C), while DFPZ standard and guidelines will be applied to the DFPZ.

These two Standards and Guidelines differ in the way they factor GS into the post-treatment canopy cover calculations. As directed by the HFQLG Steering Committee (April 20, 2005), in the WUI, GS will be factored into the remaining canopy cover for the overall stand. When calculating canopy cover for the DFPZ, GS treatments are not factored into the overall canopy cover. Further canopy cover may be lost due to post-treatment underburning. GS areas in the DFPZ and WUI treatment areas will be evaluated after treatment; those units not meeting desired surface fuel conditions would be underburned, grapple piled and burned, or masticated.

Group Selection within Area Thinning Zone Stands

GS would be implemented on 95 acres within acres of Area Thinning Zone silvicultural treatments (Table 2.2). Of the units being treated with GS in the Area Thinning, 4% of the land base will be treated. Emphasis will be placed on improving stand health by cutting diseased and insect infected trees or trees otherwise in poor health.

The project area has both Eastside and Westside forest conditions (Appendix B). Stocking levels in eastside pine stands would retain at least 30% of the existing basal area, generally comprised of the largest trees. In Westside stands, where vegetative conditions permit, at least 50% canopy cover will be retained where possible, with a minimum of 40% canopy cover. Canopy cover calculations in Area Thinning treatments will factor in the canopy cover of the entire treatment area including GS treatments.

Table 2.2 Acres of Group Selection (GS) treatment within Defensible Fuel Profile Zone (DFPZ), Wildland/Urban Interface and Area Thinning fuel treatments in the Freeman Project area Proposed Action. DFPZ/WUI treatments represent where there is an overlap between the two fuels treatment designations.

Zones	GS (Acres)	Total Acres of Units with GS
DFPZ	60	958
DFPZ/WUI	4	86
WUI	16	232
Area Thinning	95	1,424
Total	175	2,700

Note: Acres may vary up to 10% during the final layout due to topography, stand condition, etc. Mechanical treatment acres will be less than those displayed due to the no equipment rules applied to slopes > 15% in RHCAs and > 35% in upland areas. See the Cumulative Watershed and Soil Effects Report for more details (USFS PNF BRD 2006?).

Area Thinning Zone

Areas outside the DFPZ and WUI are considered Area Thinning Zone treatment stands; all Standards and Guidelines to Area Thinning apply (Appendix C). Area Thinning treatments include both non-commercial and commercial treatments and will occur on approximately 2,727 acres. Non-commercial treatments consist of hand thinning, grapple piling and mastication of non-saw log material (Table 2.4). Commercial treatments consist of mechanical thinning and helicopter thinning. In Area Thinning treatments, thinning from below will strive to achieve an uneven-aged condition, to achieve stocking levels appropriate for the forest type. Larger trees, < 30" dbh, may be removed due to insect and disease infections.

Units 87 and 93, totaling 186 acres, are too steep to be logged with ground-based equipment and would be harvested using a helicopter or other aerial method.

As with fuels treatments in the DFPZ and WUI, clumps of the largest fire-tolerant, healthy trees would be retained within a network of intermingled openings, rather than employing uniform spacing between the residual trees. A thinning from below prescription would be utilized in most cases, except for trees that are at high risk of mortality due to insects or diseases, keeping those needed for wildlife snag recruitment and in the case of aspen stand improvements. No trees over 29.9" dbh will be removed, except for operability. Forest Service Sale Representatives must approve such removal and will be avoided where possible. Mechanical felling would be restricted to slopes having a gradient of less than 35%. Exceptions may be made for short (less than 100') pitches within the interior of units where slope exceeds this limit. Mastication, grapple pile and/or underburning may follow thinning, if needed to meet ladder and ground fuel-reduction objectives. Mastication and grapple piling have similar effects to soil resources and therefore may be interchanged during layout.

Improving Bald Eagle Habitat

As mentioned in the Purpose and Need, the project area contains bald eagle habitat that would be treated with prescriptions from the Lake Davis BEHMA Plan (USFS PNF BRD 2004). Several of the units in the project area fall within the BEHMA and are considered bald eagle habitat (Appendix B). Over half of the eagle habitat within the project area would receive some kind of treatment, consisting of mechanical thinning, hand thinning, underburn only, GS and mechanical aspen treatments. The overall emphasis will be similar to that found in the Forest Health except that more mistletoe infected trees would remain. As with most of the bald eagle habitat within the project area, bald eagle treatment units have a disproportionate amount of CWHR Size Class 4 (Table 2.3). Mechanical treatments would focus on thinning CWHR Size Class 4 in order to accelerate the stands growth to CWHR Size Class 5.

Table 2.3 CWHR size class distribution of forested vegetation within bald eagle treatment units in the Freeman Project.

CWHR Size Class	Acres
2	96
3	129
4	1,243
5	9
Other	51
Total	**1,528**

Units identified as eagle special prescription (Appendix B, Tables B.1-B.3) will receive special treatment due to its adjacency to bald eagle winter roosting habitat. The prescription for Unit 063 will be to retain the largest pines, including those with mistletoe infections, in order to maintain trees suitable for bald eagle nesting. Throughout the remaining bald eagle territories, treatments will be designed to enhance habitat attributes while meeting other project objectives to the extent possible.

GS treatments within the BEHMA would continue to focus on diseased and insect-infested pockets of trees (as discussed in Purpose 2), to reduce tree mortality and improve stand health. The units designated as bald eagle treatment units contain approximately 1,528 acres of designated bald eagle habitat and 436 acres of undesignated habitat, for a total of 1,964 acres of eagle treatment units. A total of 52 acres out of 1,964 acres will be treated with GS. In areas where GS treatments are conducted, tree planting will focus on disease resistant strains of native tree species, for future nesting and roosting trees.

Improving Aspen Stands

Aspen stands would be treated to remove conifers to enhance aspen health and growth. Aspen would be released from conifer competition in 40 units totaling approximately 645 acres, ranging in size between 1-85 acres. Conifers to be removed are within the existing aspen stand (i.e., those trees actively suppressing aspen community productivity and function) or trees bordering a stand, which directly affect the health of the stand. Conifers up to 29.9” dbh would also be removed, with an exception of all sugar pines retained, within a variable-width extended treatment zone (ETZ) extending up to 150’ beyond the outer boundary of the aspen stands. Aspen release would involve whole-tree removal of all conifers, except sugar pine, up to 29.9” dbh through a combination of hand and mechanical treatments. No canopy cover or spacing guidelines would restrict removal of conifer. Trees providing bank stability in stream corridors would be retained. The width of the zones would be dependent on aspen stand condition, visual integrity as viewed from Road 24N10, wildlife habitat considerations and the ability of the aspen to expand into adjacent soils.

For northern goshawk habitat enhancement, aspen stands in 4 units (25 acres total) would be treated within 2 goshawk protected activity centers (PACs). PACs are designed to minimize land disturbance within delineated areas around habitat for a specific animal. The 2004 SNFPA provides for mechanical treatment in up to 5% of northern goshawk PACs per year and 10% per decade of the northern goshawk PAC acreage. Aspen treatments within goshawk PACs will be very limited in extent and focus on enhancing the ecological diversity of the PACs and improving the quality of habitat for goshawk by maintaining or restoring native plant communities in the riparian zone. Aspen would be released from conifer competition by a combination of hand and mechanical treatment, involving whole-tree removal of conifers up to 17.9” dbh. All snags would be retained, with exceptions made for safety and operability. Skid trails and landings would be pre-designated, as described above.

A no-equipment buffer zone (25' wide) would be established along each side of stream channels to ensure no disturbance to streambanks. These areas would be hand piled up to 8" upper diameter limit. Equipment may be positioned outside of the buffer to harvest/gather material via an extendable boom. Crossing stream channels with mechanical equipment would be allowed only under special circumstances and with permission from the sale administrator and hydrologist. If a crossing were deemed necessary for effective harvest and aspen release, returning the channel banks to their natural contour by the contractor would be required. This may require the use of an excavator or backhoe to slope the channel banks. Unless deemed necessary by resource specialists following post-harvest review, aspen units would not be underburned or subsoiled. Landings would be located outside of the aspen stand perimeters and RHCAs, whenever possible, to minimize disturbance to the aspen communities as well as the RHCAs. A Forest Representative will coordinate with the District Hydrologist to minimize resource damage if placing a landing in the RHCA is deemed necessary.

Improving the Transportation System

The following is a summary of the proposed improvements to the PNF transportation system needed to access the vegetation/fuels treatment units and to mitigate existing adverse effects on heritage resources, soils and water quality:

- Approximately 17 temporary roads would be built, totaling 2-miles, are needed to implement planned activities. Most are less than 100' in length and are needed to place landings beyond visually sensitive locations. These roads would be decommissioned upon completion of the project.
- Approximately 7.9-miles of existing system roads would be decommissioned (Appendix B.4). Decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover and/or blocking access. Decommissioning of roads would reduce equivalent roaded acres (ERA) values, thereby lowering cumulative watershed impacts and soil compaction. None of the roads proposed for decommissioning are needed for the long-term transportation system. Portions of roads are in poor locations within RHCAs and are causing direct stream impacts.
- 1.1-miles of system roads would be closed. Closing roads consists of blocking access for a temporary period, allowing re-opening for future use.
- 1.9-miles of non-system roads would be decommissioned.
- 0.3-mile of system road would be relocated.
- 15-miles of system roads would be reconstructed. Reconstruction would consist of brushing, blading the road surface, improving drainage and replacing/upgrading culverts where needed.
- 0.7-mile of system road would be reduced to single-track, in order to provide for recreational opportunities near Lake Davis.

- Hazard trees would be removed from along Maintenance Level 3, 4 and 5 roads (generally, surfaced roads) and high-use Maintenance Level 2 roads (generally native-surface roads). Identification of hazard trees would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003).

2.1.1.2 Alternative 2 (No-action)

This alternative takes no action at this time to implement provisions of the HFQLG Act or National Fire Plan on this part of the Plumas National Forest. On-going activities such as routine road maintenance, fire suppression and recreation would still occur in this area. This alternative serves as a baseline against which to compare the action alternatives.

2.1.1.3 Alternative 3—Aspen Stand Treatment Changes

How the Alternative Was Developed

This alternative was developed in response to the following issues:

- Aspen treatment outside RHCA's not authorized by the Standards and Guides.
- Aspen treatment units greater than 2 acres may be considered too big.
- Aspen treatment involving the removal of larger conifers is objectionable to some due to the loss of larger trees and their potential ecological importance.

Alternative 3 does away with the variable-width extended treatment zone surrounding the actual aspen stand, by absorbing them into the adjacent treatment unit, if one exists, or where there is no adjacent treatment unit, the extended treatment zone is eliminated. It also, expands the RHCA to the extent of the riparian vegetation.

The Proposed Action would treat 5,792 acres, approximately 39% of the project area. Alternative 3 treats 5,579 acres, approximately 37% of the project area (Appendix I, Figure I.2.).

Reducing Fuel

In the Proposed Action, aspen stands were surrounded by extended treatment areas. In these areas all conifers < 30" dbh would be removed. Alternative 3 proposes to thin rather than remove conifers surrounding the aspen stands. In the DFPZ, DFPZ/WUI and WUI Zones, where units are adjacent to aspen stands, this extended treatment area has been absorbed into the adjacent unit, whenever one exists. When there is not an adjacent unit, the surrounding stand will not be treated and was therefore eliminated. This accounts for the change from 3,029 acres of fuels treatment in the Proposed Action to 2,943 acres of treatment in Alternative 3. The result is a decrease in 86 acres of fuels treatment proposed in the project area (Table 2.4). The number of acres of each treatment changed accordingly (Table 2.4). Most of the changes were to the mechanical-aspen treatment extended areas changed to mechanical thin. The aspen-grapple pile was absorbed into the surrounding unit, since it was not mapped as falling in the RHCA.

Riparian Habitat Conservation Areas

In the Proposed Action, RHCAs would be defined by 150' buffers and 300' buffers depending on whether the riparian environment is along fish-bearing streams. Through extensive field work, gathering site specific data on aspen stand locations, it was realized that we would actually have to widen our RHCAs to the extent of riparian vegetation in this project location. Past projects on this Ranger District have been higher up in the watershed, therefore using the site potential trees was the widest width, however the Freeman Project area contains a lot of wide valley bottoms and meadows leading to Lake Davis, requiring that we use other indicators for RHCAs that involve riparian vegetation. RHCAs would still receive the same protections as provided for in the Proposed Action; however, there may be more RHCA acres due to the use of riparian vegetation indicators as opposed to a strict buffer width around the RHCAs. The RHCAs would be defined at the time of layout. RHCAs would follow the SAT guidelines which state that RHCAs should be defined by:

- the top of the inner gorge, or
- to the outer edges of the 100-year floodplain, or
- to the outer edges of riparian vegetation, or
- to a distance equal to the height of two site-potential trees or 300' horizontal distance if the stream is fish bearing; or one site-potential trees or 150' horizontal distance if the stream is perennial, which ever is greatest.

Improving Forest Health

This alternative would not change the amount of GS acres anticipated in the Proposed Action within the project area. In the Area Thinning Zone, where units are adjacent to aspen stands, the ETZs outside the aspen stand, incorporated into the Proposed Action, have been removed and are now part of the adjacent unit. The result is a small decrease in the amount of Area Thinning in the project area (Table 2.4).

Improving Bald Eagle Habitat

The Proposed Action proposes to treat the units designated as bald eagle treatment units contain approximately 1,528 acres of designated bald eagle habitat and 436 acres of undesignated habitat, for a total of 1,964 acres of eagle treatment units. A total of 52 acres out of 1,964 acres of eagle treatment units with GS. A total of 52 acres out of 1,964 acres will be treated with GS.

Alternative 3 treats 1,948 acres of bald eagle treatment units with no change to the number of acres of GS. This change is due to the change in aspen treatment acres.

Improving Aspen Stands

The Proposed Action proposes to treat declining aspen stands within the Freeman Project boundary. This amounts to a total of 645 acres with units ranging in size from 1-85 acres.

Mechanical equipment would be restricted to slopes <15% slope and RHCA widths would be defined by a 150' buffer on nonfish-bearing and 300' on fish-bearing streams.

Alternative 3 addresses the above-mentioned issues by developing actions that reflect reduced treatment in aspen improvement units. These revised treatment options are viable alternatives to aspen stand improvement. The aspen stand improvements would remove all of the extended treatment zones around aspen stands, treat the entire aspen clone associated with RHCAs and define the RHCA by the riparian vegetation, as described in the SAT guidelines (see the RHCA discussion under Reducing Fuels for this alternative). This amounts to a total of 233 acres with units ranging in size from 1-31 acres.

Aspen stands in Alternative 3 will lift RHCA slope restrictions in the RHCA for the purpose of removing conifer from aspen stands. Leaving the slope restrictions in place for aspen treatments was an oversight in the original Proposed Action that upon further analysis and review by resource specialists was identified as being too restrictive and would not allow us to meet the Purpose and Need of clearing encroaching conifer from the aspen stands as effectively. In Alternative 3, mechanical equipment would be allowed to operate up to 35% slope, rather than limiting mechanical equipment to < 15% slopes, as would be the case in non-aspen treatment units. By changing this slope limitation, approximately 53 acres more aspen would receive mechanical treatment than with the Proposed Action, where a 15% slope restriction would be applied. Mechanical aspen treatment allows for the most effective removal of encroaching conifer to the aspen stands.

Additionally, Alternative 3 would evaluate the upper diameter limit of conifer retention, based on whether the conifers were there previous to the aspen occurrence or grew up at the same time as the aspen stand, thereby leaving some conifer < 30" dbh in the stand particularly if very few > 30" dbh conifers would remain. This would allow for some conifer retention in the stands, more closely mirroring the ecological conditions that exist naturally. The criteria used to identify trees that would remain in the stand would be written into the tree marking guidelines. The guidelines would emphasize retention of the largest conifers in the stand, particularly those that would have been alive previous to the stand-replacing event that stimulated the aspen stands most recent growth, or those trees that would have grown simultaneously with the aspen stand.

2.1.1.4 Alternative 4—Aspen Changes and Silvicultural Treatment Changes

How the Alternative Was Developed

This alternative was developed in response to the following issue:

- Design cost effective and efficient fuels treatments.

The Proposed Action would treat 5,792 acres, approximately 39% of the project area. Alternative 4 treats 5,456 acres, approximately 36% of the project area (Appendix I, Figure I.2.).

Reducing Fuel

In the Proposed Action, aspen stands were surrounded by an ETZ. In these areas all conifers < 30” dbh would be removed. Alternative 4 treats aspen the same way that Alternative 3 would. RHCAs would be treated the same as in Alternative 3 as well. Another difference in fuels treatments between the Proposed Action and this alternative is that Alternative 4 proposes to do more mechanical fuels treatments as opposed to grapple pile or mastication. This change in treatments removes more of the fuels from the site. The mechanical fuels treatments have a majority of the remaining fuel removed from the site, while grapple pile requires post-treatment pile burning. This is a more efficient fuels treatment. This change also provides an opportunity to remove material that are >11” dbh and utilize them as sawlogs, making better use of this material. There is a 20 acre decrease in fuels treatments between Alternative 4 and the Proposed Action. The magnitude of difference in fuels treatment between Alternative 3 and 4 is explained by a merging of units. In Alternative 4 where adjacent units had essentially the same treatment, they were merged.

Group Selection

Alternative 4 has one fewer GS acre than the other action alternatives. This change was due to watershed concerns that this Alternative was going over threshold. Watersheds over threshold are required to have costly monitoring conducted on them.

Improving Bald Eagle Habitat

The Proposed Action proposes to treat bald eagle treatment units, which total approximately 1,528 acres of designated bald eagle habitat and 436 acres of undesignated habitat, for a total of 1,964 acres of eagle treatment units. A total of 52 acres out of 1,964 acres will be treated with GS.

Alternative 4 treats 2,114 acres of bald eagle treatment units with no change to the number of acres of GS. This change is due to the change in aspen treatment acres as well as the merging of adjacent units with the same or similar treatments.

Improving Aspen Stands

The Proposed Action proposes treating all impaired aspen units within the entire Freeman Project boundary. This amounts to a total of 645 acres with units ranging in size from 1-85 acres.

Alternative 4 addresses the issues in the same way as Alternative 3, by treating 233 acres of aspen.

2.1.1.5 Comparison of the Alternatives

Action Alternatives Comparison

Reducing Fuels and Improving Forest Health

Alternative 1 reduces fuels on 3,066 acres, while Alternatives 3 and 4 treat slightly less acreage, 57 and 29 acres less respectively (Table 2.4). Alternative 1 treats the most Area Thinning Zone, 2,727 acres while Alternative 3 treats 2,570 acres and Alternative 4 treats the least at 2,419 acres. GS in each alternative is the same except for Alternative 4 which has one less acre of groups in the Area Thinning Zone.

The acres that were dropped from treatment were due to removing the extended treatment areas surrounding aspen stands. Although Alternative 4 treats less fuels, it treats them more effectively by changing many of the acres from hand thin, masticate and grapple pile to mechanical thin. Mechanical thinning removes the biomass rather than piling it and requiring subsequent burning. The removal of biomass, while more costly does provide a product that can be utilized rather than just burning the material.

Improving Bald Eagle Habitat

The action alternatives do not vary in how much bald eagle habitat they treat, or in the number of GS openings that would be created.

Improving Aspen Stands

In the Proposed Action, 645 acres of aspen stands including extended treatment zones would be treated. While in Alternative 3 and 4 there would be no extended treatment zone around the stands, reducing the aspen treatment acres to 233 acres. Subsequently the number of acres of Aspen PAC is diminished from 25 acres in Alternative 1 to 11 acres in Alternative 3 and 4.

Transportation System

All of the action alternatives treat the same number of road miles under decommissioning, relocation, reconstruction and temporary roads.

Table 2.4 Actions by alternative for each Purpose and Need for the Freeman Project area.

	Alternative 1 (Proposed Action	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Silvicultural Treatment Acres for Reducing Hazardous Fuels				
DFPZ Burn Only (acres)	40	0	40	18
DFPZ Grapple Pile (acres)	450	0	451	153
DFPZ Hand Thin (acres)	35	0	34	23
DFPZ Masticate (acres)	150	0	149	133
DFPZ Mechanical Thin (incl. GS) (acres)	1,255	0	1,336	1,743
DFPZ Mechanical-Aspen (acres)	180	0	77	77
Total DFPZ Treatment	**2,108**	**0**	**2,087**	**2,146**
DFPZ/WUI Aspen-Grapple (acres)	6	0	0	0
DFPZ/WUI Eagle Selection (incl. GS) (acres)	71	0	80	124
DFPZ/WUI Grapple Pile (acres)	101	0	108	53
DFPZ/WUI Hand Thin (acres)	20	0	20	20
DFPZ/WUI Mechanical Thin (incl. GS) (acres)	166	0	201	181
DFPZ/WUI Mechanical-Aspen (acres)	109	0	55	55
Total DFPZ/WUI Treatment	**474**	**0**	**464**	**433**
WUI Masticate (acres)	0	0	0	40
WUI Grapple Pile (acres)	124	0	131	0
WUI Groups Only (acres)	183	0	191	191
WUI Mechanical Thin (incl. GS) (acres)	110	0	120	211
WUI Mechanical-Aspen (acres)	67	0	16	16
Total WUI Treatment	**484**	**0**	**458**	**458**
Total Fuels Reduction Acres	**3,066**	**0**	**3,009**	**3,037**
Silvicultural Treatment Acres for Improving Forest Health				
Area Thinning Helicopter (acres)	186	0	186	186
Area Thinning Mechanical Thin (incl. GS)	1,545	0	1,563	1,831
Area Thinning Mechanical-Aspen (acres)	254	0	73	73
Area Thinning Aspen PAC (acres)	25	0	11	11
Area Thinning Grapple Pile (acres)	329	0	350	73
Area Thinning Handthin-Aspen (acres)	3	0	0	0
Area Thinning Masticate (acres)	384	0	387	245
Total Area Thinning	**2,727**	**0**	**2,570**	**2,419**

	Alternative 1 (Proposed Action	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Silvicultural Treatment Acres for Improving Forest Health (Continued)				
DFPZ GS (acres)	60	0	60	60
DFPZ/WUI GS (acres)	4	0	4	3
WUI GS (acres)	16	0	16	16
Area Thinning GS (acres)	95	0	95	95
Total GS	175	0	175	174
Improve Bald Eagle Habitat				
Bald Eagle Habitat Treatment (acres)	1,528	0	1,528	1,528
GS (acres)	52	0	52	52
Improve Aspen Stands (See Reducing Hazardous Fuels and Improving Forest Health for Treatment Types)				
Aspen Treatment (acres)	645 (includes ETZ)	0	233 (no ETZ)	233 (no ETZ)
Aspen Treatment in Goshawk PAC (acres)	25	0	11	11
Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts				
Road Decommissioning (miles)	7.9	0	7.9	7.9
Road Relocation (miles)	0.3	0	0.3	0.3
Road Reconstruction (miles)	15	0	15	15
Temporary Road Construction (miles)	2	0	2	2

Purpose and Need and Issue Indicators for Meeting Project Objectives

The following table compares how the values for each Purpose and Need and issue indicator measures vary for each alternative (Table 2.5). The action alternatives, when compared against the No-action Alternative, convey the magnitude of need that surrounds this project.

Reducing Hazardous Fuels

Measurable elements are the amount of surface fuels, rate of spread, flame length, fire type and canopy base height (Table 2.5). The action alternatives substantially decrease the number of tons of fuels per acre, decrease rate of spread, decrease flame lengths, increase the canopy base height and changes the overall fire type from an active or passive crown fire to a surface fire. This is in contrast to the No-action Alternative, which has greater surface fuels, a faster rate of spread, higher flame lengths, lower canopy base heights and an overall fire type which would be an active or passive crown fire. The amount of PM 2.5 that would be emitted into the atmosphere is much less in Alternative 4 than the other two alternatives.

Improve Forest Health

The measures identified for improving forest health were those units meeting the desired condition depending on which zone they fell under (i.e., DFPZ (40% canopy cover) and Area Thinning Zone (50% canopy cover)), overstocked conditions after treatment and the departure from the regulated stand condition in CWHR 0-2 (0-6” dbh). Alternative 1 leaves the most number of acres not meeting the desired condition and the most number of acres that depart from the regulated stand condition. Alternative 4 leaves the least number of acres not meeting the desired condition and the least number of acres departing from the regulated stand for CWHR size class 0-2 (0-6” dbh). Alternative 1 has more mastication and grapple pile than Alternative 4. By changing many of these units to mechanical treatment, more of the sawlogs will be removed and the biomass can be removed as a product, rather than simply burned in piles, as would be the case with the grapple pile and burn treatments.

Improve Bald Eagle Habitat

Currently, there are 255 acres of suitable bald eagle nesting habitat (CWHR Size 5) in the Bald Eagle Habitat Management Area within the Wildlife Analysis Area. No Size 5 will be treated within the Bald Eagle Habitat Management Area. Size 5 is considered suitable bald eagle nesting habitat. Nesting habitat is critical to the survival of this threatened bird species. The action alternatives release overstocked 12-24” dbh trees (CWHR Size 4) using a thin from below prescription, which will help the stands grow more quickly, becoming >24” dbh trees (CWHR Size 5), thus becoming nesting habitat. Size 4 becomes Size 5 in 5-50 years in the action alternatives, as opposed to 25-100 years in the No-action Alternative. There are a total of 3,537 acres of CWHR Size 4 in the wildlife analysis area (Table 2.5). Alternative 4 releases the most number of Size 4 habitat and has the least amount of loss of Size 4 from GS or Aspen Treatments.

Cost Effectiveness and Support of Local Communities

Sawlog volume, project value and total full-time jobs are the measure of success that we use to determine whether a project is both cost effective and provides employment and products to the local community (Table 2.5). Alternative 1 is by far the more cost effective alternative, providing approximately 70 more jobs than Alternative 3 and 62 more jobs than Alternative 4. The difference in volume is coming from the extended aspen treatment areas surrounding aspen stands. By removing these extended treatment areas alone, we removed 5 million board feet (mmbf) less volume from the project area.

Alternative 4 was developed due to an issue that surfaced around the need for more cost effective treatments. This alternative takes another look at the original units and by changing many of the grapple pile, mastication and handthin units to mechanical treatments, allows for more volume to be removed with a subsequent benefit of fewer piles to burn post-treatment.

Improve Aspen Stands

Many of the stands in the project area are decadent with little to no understory regeneration of aspen occurring. Thinning the < 29.9” dbh conifer from the aspen stands would release them and allow more aspen stems to sprout, thus increasing the number of regenerating aspen stands in the project area.

In the Proposed Action, theoretically there would be no conifer (except conifer > 29.9 dbh, sugar pine and those needed for bank stability) left in the aspen stands, leaving a ratio of zero percent conifer to 100 percent aspen (0:10) for both overstory and mid-story conifer cover. The No-action Alternative illustrates the need for this work, showing that the majority of stands are dominated by overstory conifer with no aspen overstory (10:0), or by the mid-story conifer with an 8:2 ratio. In both Alternative 3 and 4, aspen would be treated the same way. In these two alternatives, some overstory conifer would be retained; leaving a 1:9 ratio of conifer to aspen, with no mid-story conifer retention. As more aspen reach maturity and a more than 500 stems of 5-15’ tall regeneration occur in the stands, it can be concluded that the risk of aspen loss has substantially decreased. Ideally, this desired condition would be reached in 3-5 years.

The majority of aspen stands in the project area are at highest, high and moderate risk of loss due to conifer encroachment. Alternative 1 does the most to improve aspen stands by treating the number of acres of aspen stands. Alternative 3 and 4 treat the same number of acres for each risk rating. The action alternatives treat from 80-85% of the highest, high and moderate risk of loss stands in the project area.

The main issue addressed in the action alternatives was the effect of creating an ETZ around the aspen stands. The extended treatment zone in the Proposed Action was 402 acres. The action alternatives treat approximately ten less acres of aspen than the Proposed Action. This is due to dropping treatments that are not within the RHCA as defined by the SAT guidelines.

Table 2.5 The Freeman Project Purpose and Need and Issues Objectives comparing each alternative and the Proposed Action.

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alt.)
Purpose & Need				
Reduce Hazardous Fuels				
Surface Fuels	< 5-7 tons/acre	> 5-7 tons/acre	< 5-7 tons/acre	< 5-7 tons/acre
Rate of Spread (chains per hour)	2-10 (132-660 ft/hr)	15-24 (990-1,584 ft/hr)	2-10 (132-660 ft/hr)	2-10 (132-660 ft/hr)
Flame Length (feet)	< 4	> 8	< 4	< 4
Canopy Base Height (feet)	> 12	< 5	> 12	> 12
Fire Type	Surface	Active to Passive Crown	Surface	Surface
PM 2.5 (tons)	11-54	0	11-65	3-11
Improve Forest Health				
The number of acres within units not meeting desired canopy cover for DFPZ & Area Thinning Zone (acres)	483	4,115	504	168
The number of acres within units that remain overstocked (> 70% of normal).	209	2,002	209	158
The amount of the project area that departs from a regulated stand condition in CWHR 0-2 (0-6” dbh) (acres)	+611	+36	+211	+210
Improve Bald Eagle Habitat				
Acres of CWHR Size 4 released (becoming CWHR Size 5 in 5-50 years)	923	3,537 (occurring in the wildlife analysis area)	977	1,116
Acres of CWHR Size 4 lost to GS or Aspen within the BEHMA	89	0	27	23
Cost Effectiveness and Support of Local Communities				
Sawlog Volume (mmbf)	13.9	0	8.9	9.9
Biomass (mtons)	57.3	0	51.7	63.2
Total Project Value (million)	-$1.0	Unquantified fire suppression costs.	-$1.8 million	-$1.5 million

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Cost Effectiveness and Support of Local Communities (Continued)				
Employee Related Income (million)	$13.3	0	$10.3	$10.6
Total Full-time Jobs	310	0	240	248
Improve Aspen Stands				
Overstory Conifer to Aspen Ratio	0:10	10:0	1:9	1:9
Mid-story Conifer to Aspen Ratio	0:10	8:2	0:10	0:10
Aspen stems/acre	> 500	< 500	> 500	> 500
project area Aspen Risk Rating				
Acres of Aspen treated in the project with the Highest Risk Rating	26	27 (project area amount not treated)	25	25
Acres of Aspen treated in the project with the High Risk Rating	87	107 (project area amount not treated)	80	80
Acres of Aspen treated in the project with the Moderate Risk Rating	74	86 (project area amount not treated	71	71
Acres of Aspen treated in the project with the Low Risk Rating	56	70 (project area amount not treated	56	56
Total Aspen treatment (no ETZ surrounding the aspen units) (acres)	243	300 (project area amount not treated	232	232
Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts				
Threshold of Concern (%)	35-96	7-46	33-96	39-96
Reduced number of Stream Crossings	8	9	8	8
Restored Hydrologic Function (Acres)	24	0	24	24
Issues				
Improve Aspen Stands				
Aspen treated out of the 300 acres available (acres)	243	N/A	233	233
Extended Treatment Zone (acres)	402	N/A	0	0

RHCA Mechanical-Aspen Treatment Slope Limitation (%)	>15	N/A	> 35	> 35
Area not treated by Mechanical-Aspen treatment (acres)	53	N/A	0	0
Mechanical-Aspen treatment (acres)	592 (incl. ETZ)	N/A	233	233
	Alternative 1 (Proposed Action)	**Alternative 2 (No-action)**	**Alternative 3**	**Alternative 4 (Preferred Alternative)**
Cost Effectiveness and Support of Local Communities				
Biomass (acres)	3,808	0	3,561	4,302
Biomass (mtons)	57.3	0	51.7	63.2
Mastication (acres)	534	0	536	448
Cost to Masticate ($)	$240,000	0	$241,000	$202,000
Grapple Pile and Burn (acres)	1,011	0	1,040	279
Cost to Grapple Pile and Burn ($)	$556,000	0	$572,000	$153,000
Number of Grapple Piles to Burn	1,848-6,160	0	2,439-4,065	537-895
Area Thinning Service Contract	-1,007,000	0	-1,030,000	-$784,600
DFPZ Service Contract	-$840,600	0	-$863,500	-$778,600
Timber Sale Value	$798,000	0	$78,200	$46,700
Total Project Value ($)	-$1 million	Unquantifiable fire suppression costs.	-$1.8 million	-$1.5 million

*Calculated under 90th% weather conditions—high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically have occurred on 10,% of days in fire seasons, creating the potential for severe wildfire behavior. During a typical fire season, 90% of the days have less severe conditions and 10% of days have more severe conditions.

Other Effected Resources

Heritage

The programmatic agreement with the State Historic Preservation Office requires that sites in the project are evaluated. Most of the resources are flagged and avoided. The net effect of the project will have no effect by following the SOPs.

Botany

Botany effects cover several areas: threatened and endangered plant species, sensitive plant species, special interest plant species, special habitat and biological diversity areas and noxious weeds. There are no known occurrences of threatened and endangered species in the project area. There are five "may affect" sensitive plants, which are flagged and avoided in the project area. The two known special interest plants are flagged and avoided. Known occurrences of List A and B noxious weed species are flagged and avoided.

Wildlife

California Spotted Owl

Potential California spotted owl foraging and nesting habitat may be affected by the action alternatives. Alternative 4 would have the most loss of both nesting and foraging habitat, while Alternative 3 would have the least loss to both. However, all of the action alternatives leave from 84-89% of the foraging habitat and 94-96% of the nesting habitat. Alternative 1 creates the most edge habitat for spotted owls in the area, while Alternative 3 creates the least amount of edge habitat in the wildlife analysis area.

Northern Goshawk

Potential northern goshawk nesting may be affected by the action alternatives. Alternative 4 would have the most loss of nesting habitat, while Alternative 3 would have the least loss. However, all of the action alternatives leave 86-89% of the nesting habitat in the wildlife analysis area.

Great Gray Owl

Potential great gray owl nesting may be affected by the action alternatives. Alternative 4 would have the most loss of nesting habitat, while Alternative 3 would have the least loss. However, all of the action alternatives leave 78-80% of the nesting habitat in the wildlife analysis area.

Watershed and Soils

Soil Effects

Grapple and hand thinning treatments are not removed from the site and require post-treatment pile burning. The burn piles have an affect on soils. Alternative 4 would result in the least number of piles to burn, while Alternative 1 and 3 create a similar number of piles to burn (Table 2.6). The number of acres outside of standard for ground cover would be the least in Alternative 3. Alternative 3 would also leave the least soil compacted above recommended thresholds.

Threshold of Concern (TOC)

Currently, the watersheds in the project area have a low to very low threshold of concern (TOC) (No-action). The Proposed Action will bump two of the watersheds close to threshold, giving them a high TOC rating. Alternative 4, takes only one of the watersheds into the high threshold category, representing approximately 26% of the project area, while Alternative 3 would result in no watersheds with a high TOC rating.

Table 2.6 Other effected resources in the Freeman Project area.

Other Resource Indicators	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Heritage				
Cultural Resources	No effect through use of SOPs	No Effect	No effect through use of SOPs	No effect through use of SOPs
Botany				
T & E Species	No known occurrences	No known occurrences	No known occurrences	No known occurrences
Sensitive Plants	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.	No Effect	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.	5 "May Affect Species" known to occur in the project area, all flagged and/or avoided.
Special Interest Plants	2 species in the project area, both flagged and avoided.	No Effect	2 species in the project area, both flagged and avoided.	2 species in the project area, both flagged and avoided.
Special Habitats and Biological Areas	Aspen will be affected; all others will be flagged and avoided.	No Effect	Aspen will be affected; all others will be flagged and avoided.	Aspen will be affected; all others will be flagged and avoided.
Noxious Weeds	1 A-listed and 2 B-listed all flagged & avoided	No Effect	1 A-listed and 2 B-listed all flagged & avoided	1 A-listed and 2 B-listed all flagged & avoided
Wildlife				
California Spotted Owl Foraging Habitat Loss (acres) (% remain)	2,760 (85)	0	2,610 (89)	3,037 (84)
California Spotted Owl Nesting Habitat Loss (acres) (% remain)	246 (9`6)	0	243 (96)	379 (94)
GS and Aspen Edge Habitat Created in California Spotted Owl Habitat	390	0	136	147
Northern Goshawk Nesting Habitat Loss (acres) (% remain)	2,760 (88)	0	2,853 (89)	3,416 (86)
Great Gray Owl Nesting Habitat Loss (acres) (% remain)	1,817 (79)	0	1,697 (80)	1,882 (78)
Fisher & Marten Denning Habitat Loss (acres) (% remain)	1,261 (86)	0	1,201 (87)	1,549 (83)

Other Resource Indicators	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Watershed and Soils				
Percent of project area disturbed by burn piles (incl. Both grapple and hand piles)	0.1-0.5	0	.1-0.6	.03-0.1
Percent of project area outside of Standard for Fine Organic Matter (0-3” size range)	17	9	15	17
Outside of Standard for Ground Cover (acres)	870	414	766	870
Soil Compaction Above Recommended Threshold (acres)	217	92	210	226
Threshold of Concern				
Percent of the project area at threshold (12%), considered High TOC (9% in sensitive and 12% in upland) (# of watersheds)	40 (2)	0	0	26 (1)
Percent of the project area with a Moderate High TOC (6% in sensitive and 9% in upland)	14 (3)	0	48 (4)	27 (4)
Percent of the project area with a Moderate TOC (>6%-9% in upland)	34 (4)	0	33 (4)	34 (4)
Percent of the project area with a Low TOC (>3%-6% upland)	13 (2)	76 (9)	19 (3)	13 (2)
Percent of the project area with a Very Low TOC (<3% upland)	0	24 (2)	0	0
The range of Thresholds of Concern (%) values for upland and sensitive areas.	35-96	7-46	33-96	39-96

2.1.2 Specific Design Features/Resource Specific Mitigations

The following section provides information about the specific design features for the Freeman Project and any resource specific mitigations. These are design features and mitigations that are specific to the Freeman Project, which are not in our Standard Operating Procedures or our Standards and Guidelines. Certain mitigations are common to all of the action alternatives, while others may change by alternative.

2.1.2.1 Design Features Specific to the Purpose and Need

General Design Features for All Action Alternatives

Reducing Hazardous Fuels and Improving Forest Health

Thinning

- Whole tree yarding will be used whenever possible in order to avoid the need for post-project slash pile fuels treatments.
- Mechanical felling would be restricted to slopes having a gradient of less than 35%. Exceptions may be made for short (less than 100’) pitches within the interior of units where slope exceeds this limit.
- Clumps of the largest fire tolerant healthy trees should be retained within a network of intermingled openings, rather than employing uniform spacing between residual trees.
- Where conifers with the desireable eagle habitat characteristics (See Improving Bald Eagle Habitat, Secion 2.1.1.1) are not present adjacent to meadows, dense pockets of conifers ¼ acre in size, spaced approximately every 200 yards around the perimeter of the meadow, would be retained.
- Emphasis will be placed on improving stand health by cutting diseased and insect infected trees or trees otherwise in poor health.

Post-Treatment

- Hand-thinning, grapple piling, mastication and/or underburning may follow treatment if needed to meet ladder and ground fuel-reduction objectives.

RHCA Treatments

- Units adjacent to meadows should retain conifers possessing one or more of the following characteristics in order to provide nesting and roosting habitat for raptors:
  - large limbs extending into the meadow;
  - mistletoe brooms higher than 20’ from the ground;
  - multiple tops;
  - bole sweep;

- and snags.

- Within RHCAs in units proposed for underburning or hand-thinning, conifers up to 8” dbh would be removed. Slash would be piled and burned. Hand piles would be situated away from riparian vegetation to prevent scorching.
- No GS would be permitted in RHCAs.

Equipment exclusion zones

- A 25’-wide equipment exclusion zone would protect SMZs.
- Low ground pressure equipment would be allowed to travel into the outer RHCA zone; harvest trees and bring them to skid trails. Skid trails would be spaced approximately every 80 - 120’, generally perpendicular to streams and skidders would be allowed to enter the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs.

Canopy Cover Restrictions

- Canopy cover ≥ 40% would be retained in general and within the inner zones of the perennial, fish-bearing stream RHCAs, canopy would remain ≥ 60%, where available (canopy cover in RHCAs will be less in aspen treatment units).

Group Selection

- In the WUI, GS will be factored into the remaining canopy cover for the overall stand.
- When calculating canopy cover for the DFPZ, GS treatments are not factored into the overall canopy cover.
- Further canopy cover may be lost due to post-treatment underburning.
- GS areas will be evaluated after treatment; those units not meeting desired surface fuel and silvicultural site preparation conditions would be underburned, grapple piled and burned, or masticated.
- If not removed as part of a timber sale, non-saw log material (biomass) would be piled and burned or decked and sold as firewood.
- Emphasis will be placed on improving stand health by cutting diseased and insect infected trees or trees otherwise in poor health.
- Canopy cover calculations in Area Thinning treatments will factor in the canopy cover of the entire treatment area including GS treatments.
- Mechanical felling would be restricted to slopes having a gradient of less than 35%. Exceptions may be made for short (less than 100’) pitches within the interior of units where slope exceeds this limit.

Reforestation of Group Selection

- Group Selection will be replanted as necessary to insure adequate restocking. Healthy, advanced regeneration of appropriate species would be retained during harvest, where practical. Areas with mistletoe or root disease infestation would be planted with alternative non-susceptible native species. GS areas will be site specifically evaluated to receive underburning, grapple piling or mastication post-treatment.

Improve Bald Eagle Habitat

- The overall emphasis will be similar to that found in the Forest Health except that more mistletoe infected trees would remain.
- Units identified as eagle special prescription (Appendix B, Tables B.1-B.3) will receive special treatment. The prescription for these units will be to retain the largest pines, including those with mistletoe infections, in order to maintain trees suitable for bald eagle nesting. Treatments will be designed to enhance habitat attributes while meeting other project objectives to the extent possible.
- GS treatments within the BEHMA would continue to focus on diseased and insect-infested pockets of trees (as discussed in Purpose 2), to reduce tree mortality and improve stand health.
- In areas where GS treatments are conducted, tree planting will focus on disease resistant strains of native tree species, for future nesting and roosting trees.

Improve Aspen Stands

- Unlike the majority of the treatments, thinning in aspen stands would not be a thinning from below. The objectives for aspen stand thinning are to remove conifer to reduce competition for water and light.
- Aspen release would involve whole-tree removal of all conifers up to 29.9” dbh (except in the case of sugar pine, which would be left to maintain the species genetic diversity) through a combination of hand and mechanical treatments.
- No canopy cover or spacing guidelines would restrict removal of conifer.
- Trees providing bank stability in stream corridors would be retained.
- The width of the zones would be dependent on aspen stand condition, visual integrity as viewed from Road 24N10, wildlife habitat considerations and the ability of the aspen to expand into adjacent soils.
- A no-equipment buffer zone (25’ wide) would be established along each side of stream channels to ensure no disturbance to streambanks. These areas would be hand piled up to

8” upper diameter limit. Equipment may be positioned outside of the buffer to harvest/gather material via an extendable boom.

- Crossing stream channels with mechanical equipment would be allowed only under special circumstances and with permission from the sale administrator and hydrologist. If a crossing is deemed necessary for effective harvest and aspen release, the contractor would be required to return the channel banks to their natural contour. This may require the use of an excavator or backhoe to slope the channel banks.
- Unless deemed necessary by resource specialists following post-harvest review, aspen units would not be underburned or subsoiled.
- Landings would be located outside of the aspen stand perimeters and RHCAs, to minimize disturbance to the aspen communities as well as the RHCAs.

Goshawk PAC

- Aspen treatments within goshawk PACs will be very limited in extent and focus on enhancing the ecological diversity of the PACs and improving the quality of habitat for goshawk by maintaining or restoring native plant communities in the riparian zone.
- Aspen would be released from conifer competition by a combination of hand and mechanical treatment, involving whole-tree removal of conifers up to 17.9” dbh.
- All snags would be retained, with exceptions made for safety and operability.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

In the summer of 2006, 23N10Y will be chip sealed to enhance recreation use of the Camp 5 boat launch facilities. The anticipated chip seal will require road use restrictions in winter, that would preclude the ability to plow that road in winter. The chip seal is not designed to be plowed and will break up the surface of the road.

Design Features for Each Alternative

Alternative 1 (Proposed Action)

Equipment Exclusion and Slope Restrictions

- Within units to be mechanically thinned, masticated, or grapple piled, equipment would be restricted from entering within 50’ (for 150’-wide RHCAs) and 100’ (for 300’-wide RHCAs) of the high water mark of streams and springs. Where side slopes within RHCAs exceed 15%, only hand-thinning would be allowed. Low ground pressure equipment (under 8.0 psi) would be permitted to extend booms into these inner zones to remove material, but would not be allowed to considerably damage residual stands or disturb soils. Areas beyond the reach of booms would be hand thinned, piled and burned.

Improve Aspen Stands

- Conifers to be removed are within the existing aspen stand (i.e., those trees actively suppressing aspen community productivity and function) or trees bordering a stand, which directly affect the health of the stand. Conifers up to 29.9" dbh would also be removed within a variable-width treatment zone extending up to 150' beyond the outer boundary of the aspen stands. Sugar pine would be left in the stand to preserve genetic diversity of this species, which is threatened by the disease blister rust.

Alternative 3 and 4

Equipment Exclusion and Slope Restrictions

- The RHCAs would be defined at the time of layout. RHCAs would follow the SAT guidelines which state that RHCAs should be defined by:
  - the top of the inner gorge, or
  - to the outer edges of the 100-year floodplain, or
  - to the outer edges of riparian vegetation, or
  - to a distance equal to the height of two site-potential trees or 300' horizontal distance if the stream is fish bearing; or one site-potential trees or 150' horizontal distance if the stream is perennial, which ever is greatest.
- Within units to be mechanically thinned, masticated, or grapple piled, equipment would be restricted from entering within 50' (non-fish-bearing streams) and 100' (fish-bearing streams) of the high water mark of streams and springs. Where side slopes within RHCAs exceed 15%, only hand-thinning would be allowed, except in aspen treatment units, where equipment would be allowed to operate on slopes up to 35%. This is allowed in order to maximize removal of encroaching conifer in aspen stands. Low ground pressure equipment (under 8.0 psi) would be permitted to extend booms into these inner zones to remove material, but would not be allowed to considerably damage residual stands or disturb soils. Areas beyond the reach of booms would be hand thinned, piled and burned.

Improve Aspen Stands

- The aspen stand improvements would remove all of the extended treatment zones around aspen stands, treat only aspen within RHCAs and define the RHCA by the riparian vegetation, as described in the SAT guidelines.
- Aspen stands will have the same mechanical treatment restrictions as the upland areas, because mechanical equipment would be allowed to operate up to 35% slope, rather than limiting mechanical equipment to < 15% slopes, as would be the case in non-aspen treatments. Removing this restriction was felt to be important to meeting the Purpose and Need for aspen stand improvement.

- Conifers to be removed are within the existing aspen stand (i.e., those trees actively suppressing aspen community productivity and function). Conifers up to 29.9” dbh would be removed within the aspen stand units. Leave conifers that were there previous to the aspen occurrence or grew up at the same time as the aspen stand, thereby leaving some conifer < 30” dbh in the stand particularly if very few > 30” dbh conifers would remain. This would allow for some conifer retention in the stands, more closely mirroring the ecological conditions that exist naturally.
- The criteria used to identify trees that would remain in the stand would be written into the tree marking guidelines. The guidelines would emphasize retention of the largest conifers in the stand, particularly those that would have been alive previous to the stand-replacing event that stimulated the aspen stands most recent growth, or those trees that would have grown simultaneously with the aspen stand.

2.1.2.2 Resource Specific Mitigations

Air Quality

Specific air quality mitigations for prescribed burning would include number of acres burned daily, preferred wind directions for smoke dispersal and desired weather conditions. These mitigations will be agreed upon with the Northern Sierra Air Quality Management District (NSAQMD) and addressed in the Smoke Management portion of those burn plans developed for the Freeman Project.

Botany

The Freeman Project could potentially impact sensitive and special interest plant species, as well as unique and unusual botanical habitats. Implementation of the following mitigations greatly reduces the impact to botanical resources (Table 2.7 and Table 2.8). Occurrences protected by flagging and avoiding as a control area will be flagged prior to implementation. The success of this plan is dependent upon the sale administrator knowing the location of control areas and communicating that knowledge to contractors.

Range

Protecting Aspen Regeneration from Grazing

It is assumed livestock use on aspen is currently within the 20% incidence of use allowed in the Sierra Nevada Forest Plan Amendment. The theory in treating a large area is that livestock use on aspen will be diffused further among the aspen seedlings. The monitoring plan will monitor deer use before livestock are turned into the pasture and after cows are removed from the pasture. If livestock use is shown to increase above the 20% standard then timing, season, frequency or intensity of livestock use may be adjusted through adaptive management (FSH 2209.13.92.23b).

Table 2.7 Botany Protections by unit for the Freeman Project action alternatives.

Unit Number	Prescription	Species	Occurrence Number	Mitigation
53	Mechanical thin	*Astragalus lentiformis*	ASLE 11-054	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036B	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036C	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036D	Control Area
None	none	*Meesia uliginosa*	MEUL 11-001	Control Area
113	Mechanical thin	*Botrychium minganense*	BOMI 11-002	Control Area
114	Grapple pile	*Botrychium minganense*	BOMI 11-002A	Control Area
114	Grapple pile	*Botrychium minganense*	BOMI 11-002B	Control Area
94	Mechanical thin	*Botrychium minganense*	BOMI 11-003	Control Area
94	Mechanical thin	*Botrychium minganense*	BOMI 11-003A	Control Area
93	Helicopter ITS	*Botrychium minganense*	BOMI 11-003B	Control Area
006	Grapple Pile	*Botrychium minganense*	BOMI 11-004	Control Area
25	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010B	Control Area
25	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010O	Control Area
83	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010P	Control Area

Table 2.8 Special habitats protections for the Freeman Project action alternatives.

Unit Number	Prescription	Habitat	Occurrence Number	Mitigation
06	Grapple Pile	Spring	SPECHAB90MR2	Control Area
46	Mechanical thin	Spring	SPECHAB90MR2	Control Area
20	Mechanical thin	Seep	SPECHAB35GJ1	Control Area
94	Mechanical thin	Spring	SPECHAB39CS1	Control Area
94	Mechanical thin	Spring	SPECHAB39GJ3	Control Area
93	Helicopter ITS	Spring	SPECHAB39GJ1	Control Area
81	Mechanical thin/ Aspen	Spring	SPECHAB49JM1	Control Area
31	Masticate	Seep	SPECHAB61MR1	Control Area
31	Masticate	Spring	SPECHAB71GJ1	Control Area
04	Mechanical thin	Spring	SPECHAB73GJ1	Control Area
20	Mechanical thin	Seep	SPECHAB35MR1	Control Area

Table 2.9 Freeman Project noxious weed occurrences within 1-mile of the project boundary.

Occurrence	Species	Location	Treatment
CEMA4_003	spotted knapweed	forest road 175	flag and avoid
CEMA4_010	spotted knapweed	County road 126	flag and avoid
CIAR4_051_001	Canada thistle	west shore of Lake Davis	None
CIAR4_051_002	Canada thistle	west shore of Lake Davis	None
CIAR4_051_003	Canada thistle	west shore of Lake Davis	None
CIAR4_052	Canada thistle	west shore of Lake Davis	None
CIAR4_054_001	Canada thistle	Unit 62	flag and avoid
CIAR4_054_002	Canada thistle	west shore of Lake Davis	None
COAR4_001	field bindweed	forest road 24N10	None
COAR4_002	field bindweed	forest road 24N10	None
LELA2_004	tall whitetop	forest road 175	flag and avoid
LELA2_005	tall whitetop	forest road 175	flag and avoid
LELA2_014_001	tall whitetop	forest road 175	flag and avoid

Noxious Weeds

A list of noxious weed occurrences, species, locations and associated treatments may be found in Table 2.9.

Heritage Resources

Detailed heritage resource information about the location, character, or ownership of a historic resource is withheld from disclosure because sharing this information may cause an invasion of privacy, may risk harm to the historic resources or may impede the use of a traditional religious site by practitioners [Section 304 of National Historic Preservation Act, 16 U.S.C. 470w-3(b)]. Therefore specific mitigations for heritage resources are not publicly documented.

Recreation

The following concerns: noise, smoke, traffic, increasing off road travel and road degradation can be minimized.

One of the direct effects of burning will be reducing air quality within the Recreation Area. To minimize the effects of this burning it would be best if it did not occur on weekends or after Memorial Day. In the fall the burning will be late enough to not have as much impact.

Noise will likely have an impact within the Recreation Area. Limiting early morning starts and weekend logging would reduce the number of people impacted.

Traffic associated with this project will impact the Recreation Area. Signage is important to warn the public about the trucks. Limiting road closures will reduce the impacts to the public. Only close roads when absolutely necessary and reopen all roads for weekend use. Signing about road closures at the beginning of the 24N10 road would help the public make decisions on where to go.

The density of the trees along the fishing access roads prevents the public from driving off road. Opening these stands up along the road could increase off road travel. Leaving a buffer of trees along the roads could prevent this illegal activity.

The 24N10 road is scheduled for chip sealing sometime within the next five years. Requiring a surface replacement clause in the loggings contract will ensure that this road will be repaired if damaged. Not logging in wet conditions will protect this road from the logging equipment damage. All other fishing access roads should be fixed if they are damaged by logging.

Winter-logging should be implemented to minimize conflicts with winter recreation activities around Lake Davis.

The busiest times for camping are June and July so having the logging activity occur in August and through the fall will benefit recreation users.

Soil

Additional subsoiling will be required in units 1, 9, 48, 74, 57 and 78. The first four units are more comapacted than the R5 soil standard in their existing condition. The action alternatives would make the last two rise above of standard. The units will be subsoiled and receive implementation monitoring post treatment (See Monitoring, Appendix F).

Visual Quality

Areas just beyond the visual retention zone are classified as visual partial retention where activities must remain visually subordinate to the characteristic landscape.

The types of treatments proposed in all of the alternatives are not likely to affect visual quality, provided landing and skid trail layout is designed to move material away from the visually sensitive road, stumps are cut low and burn piles are situated outside the immediate view.

Wildlife

All of the action alternatives would be implemented in compliance with all rules and regulations governing land management activities, including the use of the appropriate Limited Operating Periods (LOP) identified in Table 2.10.

Table 2.10 Wildlife Limited Operating Periods (LOP's) for the Freeman Project.

Species	Location	Limited Operating Period
Bald Eagle	Within designated territories (1/2 mile around nest)	November 1 through August 31
Bald Eagle	Winter roosts	November 1 through March 1
California Spotted Owl	Within 1/4 mile of a protected activity center boundary	March 1 through August 31
Great Gray Owl	Within 1/2 mile of nesting sites	March 1 through August 31
Goshawk	Within 1/4 mile of territory or active nest site	February 15 thru September 15
Willow Flycatcher	Within occupied willow flycatcher sites	Breeding Period (June 1 through August 15)

*Herger-Feinstein Quincy Library Group Forest Recovery Act—Final Environmental Impact Statement (USFS 1999), Page 2-8, Table 2.3.

**Sierra Nevada Forest Plan Amendment—Final Supplemental Environmental Impact Statement (SNFPA FSEIS)—Record of Decision (ROD) (2004) , page A-54, A-58, A-60, A-61 and A-62.

2.1.3 Alternatives Not Analyzed In Detail

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14).

2.1.3.1 Alternative 5—Limit reduction of canopy cover and basal area in Northern Goshawk areas

This alternative was developed in response to the following issue:

- Regarding the negative impacts that vegetation treatment activities would have on northern goshawk habitat.

Alternative 5 was eliminated from further study because Alternative 1, the Proposed Action, already addresses northern goshawk habitat concerns, thereby rendering this comment a minor issue, because the effects relative to the decision being made weren't enough to craft and analyze a new alternative. The Proposed Action established that northern goshawk protected activity centers (PACs) are designed to minimize land disturbance within delineated areas around habitat for a specific animal. In the Proposed Action, vegetation treatments in goshawk PAC's would be limited to aspen treatments which would consist of a combination of hand and mechanical treatments, involving whole-tree removal of conifers up to 17.9" dbh. The Proposed Action would treat approximately 26 acres of northern goshawk PAC. The Freeman ID Team felt that this limited silvicultural prescription should have a minimal impact on northern goshawks and their PACs.

2.1.3.2 Alternative 6—Hazard trees should be felled and left in place to provide down large woody debris

This alternative was developed in response to the following issue:

- Removing hazard trees along roads would lead to a decrease in large woody debris and instead should be felled and left on the ground.

The Proposed Action discloses that there may be a need to remove hazard trees along project designated roads to reduce hazards and maintain road use efficiency. The term 'hazard tree' applies to trees within 150' of Forest Service system roads that pose a safety risk to road users. Alternative 6 was developed to address concerns from public comments regarding the potential lack of large woody debris for wildlife habitat needs thereby leaving hazardous trees in place in areas that lacked large woody debris.

This was considered a non-issue, because the cause and effect relationship was not there, since there is not a lack of large woody debris in the project area. In addition, firewood cutters would likely gather felled hazard trees left by the road, due to the proximity of the project area to Portola and the popularity of the Lake Davis area, it is most likely that any large, down wood near roads would be removed by recreational and commercial woodcutters.

2.1.3.3 Alternative 7—The Forest Service should not use borate compounds to mitigate and treat annosum root rot

This alternative was developed in response to the following issue:

- The use of borax to treat annosus root rot has the potential to cause detrimental human health and ecological damage and should be eliminated or replaced with alternative methods.

Currently, the SOPs require that all pine stumps greater than 14” dbh be treated with a borate compound to prevent the spread of Heterobasidion annosum, the fungal pathogen that causes annosus root rot. Alternative 7 would eliminate the use of borate compounds to treat Heterobasidion annosum. This alternative was developed to address the potential pesticide hazards of borate compounds, which would require the Forest Service to forego the use of borate compounds and instead develop other non-pesticide methods to control the root rot.

Upon additional review, Alternative 7 was dropped from further analysis because the cause and effect relationship is not valid based on scientific evidence. The Happy Jack DFPZ/GS Project (USFS PNF BRD 2006) researched the effects. Borate compounds were considered to be highly effective at preventing and mitigating the spread of annosus root rot, used sparingly throughout the project area and would have very low to no human health and ecological risks. That analysis also determined that alternatives to borate compounds were ineffective and/or impractical.

2.1.3.4 Alternative 8—Reduce the upper diameter limit across all treatments from 30” dbh to 20” dbh

This alternative was developed in response to the following issue:

- Without a 20” dbh upper diameter limit in DFPZs, canopy cover and fuel reduction objectives will be met by unnecessarily removing mostly 20” to 30” dbh trees therefore adversely impacting wildlife habitat.

Currently, the Proposed Action states that fuels would be reduced by generally thinning from below, and that all conifers greater than 29.9” dbh would be retained except for special circumstances where a Forest Service Sale Representative approves the removal for reasons of operability.

Alternative 8 would reduce the upper diameter limit for conifer removal from 29.9” dbh to 19.9” dbh within the fuel treatment zones (i.e., DFPZ, DFPZ/WUI). All other treatments would remain the same as in the Proposed Action. Area Thinning Zone treatments would retain a 30” dbh UDL following the standards and guides (Appendix C).

This alternative of a 20” upper diameter limit has been previously analyzed in the Happy Jack EA (USFS BRD 2006) and is also reflected in the 2001 SNFPA alternative of the Mabie EA (USFS BRD 2004), both on the Beckwourth Ranger District. Because these projects involved DFPZs under the HFQLG and Wildland Urban Interfaces, they had similar fuels reduction objectives. In neither case was the 20” diameter alternative selected for implementation, due largely to the high economic cost.

Because prescriptions include “thinning from below”, larger trees are not specifically targeted for removal, but may be removed for reasons such as crown separation or forest health. Although the larger trees are relatively few in comparison to smaller trees, they have much greater value and can significantly affect the economics of a project. A comparison of two previous projects demonstrates the economic effectiveness of removing some of the larger trees. The Humbug Project (USFS BRD 2003), immediately adjacent to the Freeman Project, was designed and implemented under the 2001 SNFPA and generally had a 20” upper diameter limit. The Mabie Project (USFS BRD 2004), also near the Freeman project and just across Highway 70 from the Humbug Project, was implemented under a 2004 SNFPA alternative and generally had a 30” upper diameter limit. Because of low value associated with small trees, 100% of the Humbug mechanical thinning acres were offered under a service contract, for which the government paid $430/acre. In contrast, the Mabie project resulted in only 25% of the mechanical thinning being service contract (at $542 per acre), with 75% of the mechanical treatment being a commercial timber sale, contributing to the local timber industry and returning money to the treasury. Assuming similar percentages apply to the Freeman project and that mechanical thinning in DFPZ/WUI would be around 2,000 acres, then under a 20” diameter alternative all 2,000 acres would be service contract, while under a 30” diameter alternative only 500 acres would be service contract. If the service contract cost $500/acre, the additional cost associated with a 20” diameter limit would be $750,000.

These previous analyses have also shown a small difference in fuel treatment effectiveness, with the 20” alternative increasing the probability of sustained crown fires. The analyses have also shown little difference in the quality of the residual wildlife habitat, so the basic premise behind this proposed alternative –that the 30” diameter limit is more adverse to wildlife than the 20” limit – is not supported by the previous analyses. For this reason, in addition to the economic considerations discussed above, this altrernative was not analyzed in any further detail.

2.1.3.5 Alternative 9—Fully Implement the 2001 SNFPA ROD

This alternative was developed in response to the following issue:

- That management direction consistent with the 2001 SNFPA ROD instead of the 2004 SNFPA ROD should be considered as an alternative.

One of the major components of the 2001 SNFPA was the 20 “ upper diameter limit over the majority of the forest, with higher limits in places like Urban Wildland Intermix Defense Zones and lower diameters in places such as Old Forest Emphasis areas. It also includes a number of other requirements such as higher canopy covers in certain areas, and no mechanical treatment in 25% of each stand in order to enhance stand heterogeneity.

The Crystal Adams Project (USFS BRD 2001) and Humbug Project (USFS BRD 2003), both on the Beckwourth Ranger District, were planned and implemented under the 2001 SNFPA.

While the NEPA fuels modeling showed that many of the DFPZ fuels objectives could be met, field observations of these implemented projects have shown that the treatments yielded poor results in many areas (Crystal Adams HFQLG Project Evaluation Form, August 2006). Canopy cover is not reduced to the desired 40% and many ladder fuels remain, making the areas ineffective as DFPZs. In addition, the denser canopy cover and fuel ladders have resulted in higher mortality rates to the residual overstory during subsequent underburning or pile burning. The requirement to leave 25% of each stand without mechanical treatment has resulted in some illogical gaps in the DFPZ network and patches of heavy fuel loading, not meeting the Purpose and Need for fuel reduction in the DFPZ.

The 2001 Framework alternative has an economic impact greater than or equal to that discussed under Alternative 8. For this reason, in addition to the fact that recent field experience has demonstrated that 2001 SNFPA guidelines do not meet DFPZ objectives, this alternative was not analyzed in depth.

2.1.4 Preferred Alternative

Alternative 4 is the preferred alternative.

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the physical, biological, social and economic environments of the Freeman Project area and the effects on that environment that would result from implementation of any of the alternatives. This chapter also presents the scientific and analytical basis for comparison of the alternatives presented in "Chapter 2: Alternatives."

Each resource section in this chapter provides a summary of the project-specific reports, assessments and input prepared by Forest Service specialists, which are incorporated by reference in this draft environmental impact statement (EIS). The following reports and memoranda are incorporated by reference: Botanical Biological Evaluation, Botany Report and Noxious Weed Risk Assessment; Biological Assessment / Biological Evaluation (BE/BA) for Fish and Wildlife; Watershed and Soil Report; Forest Resources Effects Report; Fire and Fuels Report; Recreation, Visuals and the Heritage Resources Report. These reports or memoranda are part of the project record on file at the Beckwourth Ranger District in Blairsden, California. Printed copies of the DEIS are available upon request by contacting Sabrina Stadler, Project Leader, at (530) 836-2575.

3.2 Fire, Fuels and Air Quality Effects

3.2.1 Introduction

The following assessment is summarized from the fire, fuels and air quality report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006d). This section addresses direct, indirect and cumulative effects to forest fuels, fire suppression efficiency and safety and air quality.

Fuels consist of live and dead wildland vegetation. Wildland fuels are described by size and shape, loading and horizontal continuity and vertical arrangement. Light fuels consist of shrubs, grasses and pine needles. These fuels ignite easily and burn rapidly. Wildfires in light fuels react quickly to changes in relative humidity and wind. Heavy fuels larger (greater than 1 inch in diameter) are limbs, logs and stumps that ignite and burn more slowly. Wildfires in heavy fuels are less influenced by wind and moisture changes, but are more difficult to control as they burn longer and with greater heat production. Fuel loading is the quantity of live and dead fuel in any given area, usually measured in tons per acre. Horizontal continuity is the manner in which fuels are arranged over an area. Patchy fuels have uneven distribution, with barriers to fire spread such as rock or bare ground present. Uniform fuels are arranged throughout an area providing a continuous path for fire spread. Vertical arrangement is the distribution of fuels from the ground up. Ground fuels include deep duff, roots and organic material beneath the surface. Surface fuels consist of needles, leaves, downed logs, stumps, limbs and low shrubs lying on or immediately above the ground. Aerial fuels are live and dead tree branches and crowns and tall shrubs above the ground.

Reducing surface fuel loading and changing vertical fuel arrangement is two of the most effective means to reduce wildfire severity and enhance firefighter safety and efficiency. Removing surface fuels reduces fire intensity (Table 3.1) and increases the speed in which fireline can be constructed, as less fuel would need to be removed. Thinning aerial fuels removes the fuel “ladder” that can enable a surface fire to move into the canopy. In general, treating surface and aerial fuels enhances firefighting efficiency and firefighter and public safety by creating an environment where wildfires would be more likely to be caught at the initial attack stage.

Air quality in the context of this document refers to the amount and type of emissions contained in smoke produced by prescribed burning and wildfires. Particulate matter is of the greatest concern as particulate emissions in smoke can affect both visibility and human health.

3.2.2 Summary of the Effects to Fire, Fuels and Air Quality

3.2.2.1 Alternative 1 (Proposed Action)

- Surface, ladder and crown fuels are reduced. Flame length is reduced to less than 4 feet and rate of spread and *fireline intensity* are also reduced (Table 3.1). Crown base height is raised and torching and crowning indices increased under 90th percentile weather conditions. The potential for crown fire is reduced. Mortality is reduced to less than 10 % of the residual stand.

- Fire fighter and public safety are enhanced. Fireline production rates (Table 3.2) are increased and fires are less likely to escape initial attack. Effectiveness of other projects and treatments on private land is enhanced.
- Approximaterly 15-75 acres of grapple piles to burn, equaling 11-54 tons of PM 2.5 in the air.

3.2.2.2 Alternative 2 (No-action)

- No reduction in surface, ladder and crown fuels occurs. Flame length exceeds 8 feet and rate of spread and fireline intensity remain high under 90th percentile weather conditions. Successful direct attack on wildfires is less likely, torching and crowning indices decrease over time as ladder fuels accumulate and canopy base height remains low, resulting in a greater potential for crown fires when compared to the Action Alternatives. Mortality exceeds 60% in most stands.
- Fireline production rates will degrade over time as surface and ladder fuels accumulate (Table 3.2). There is no improvement in firefighter or public safety. There is no connectivity with other projects or treatments on private lands.

3.2.2.3 Alternative 3

- The effects are similar to the Proposed Action. 86 fewer acres of fuels treatment would occur. RHCA boundaries would expand to the extent of riparian vegetation. The change in fire behavior from the Proposed Action is slight as the effects are dispersed over the project area.
- The amount of grapple pile acres that would need to be burned post treatment would equate to approximately 15-90 acres, which would equal 11-65 tons of PM 2.5.

3.2.2.4 Alternative 4 (Preferred Alternative)

- The effects of this alternative are similar to the Proposed Action. Approximately 1,000 acres change treatment type from grapple pile and mastication to mechanical thinning. Less surface fuel is left (in mastication units) and ladder and crown fuels are treated more extensively. A greater portion of the Freeman Project would meet desired conditions for post-treatment fire behavior. The least amount of PM 2.5, 3-11 tons.

3.2.3 Scope of the Analysis

Geographic Analysis Area: The boundary of the Freeman Project area forms the analysis area for pre- and post-treatment fire behavior and fire regime condition class. Cumulative effects were analyzed within the Freeman Project boundary, with the inclusion of DFPZs that connect to the Project. The Freeman Project boundary was used for analysis due to the project area’s relative isolation from outside fire activity. Grizzly Ridge on the west and Lake Davis to the east act as barriers to fire spread into and out of the project area.

Timeframe of Analysis: Only projects from the past 25 years were considered, as it is difficult to detect evidence of older treatments in the project area. A complete list of all past treatments in the Freeman Project area is impractical to collect and would be too complex to analyze with existing tools. The existing fuel bed reflects the cumulative effects of past human and natural events. A summary of these events is included below to provide some context for the existing condition

3.2.4 Analysis Methodology

Post-treatment fire behavior as modeled reflects conditions immediately after all treatments are completed, including underburning. Fire behavior outputs are flame length, rate of spread, fireline intensity, *torching index*, *crowning index*, canopy base height, surface, passive and *active crown fire*.

Both the Sierra Nevada Forest Plan Amendment (2004) and the Herger-Feinstein Quincy Library Group (HFQLG) use the reduction of flame lengths as a measure of the success of fuels treatments. Flame lengths of 4 feet or less are the desired condition. As flame length and fireline intensity are reduced by treating surface and canopy fuels, fireline production rates for ground crews increase.

Table 3.1 Flame length, fireline intensity and fire behavior (NWCG Fire Behavior Handbook 1992).

Flame length (ft)	Fireline Intensity (BTU/ft/sec)	Description of Fire Behavior
0-4	0-100	Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4-8	100-500	Fires are too intense for direct attack on the head with hand tools. Hand line cannot be relied upon to hold the fire. Direct attack on flanks with engines, dozers and retardant aircraft may be effective.
8-11	500-1000	Fires may present serious control problems-torching, crowning and spotting. Direct attack ineffective.
>11	>1000	Crowning, spotting and major fire runs are probable. Control efforts at the head of the fire are ineffective.

Surface fuels also influence fireline production rates. Fuel Models (FM) 8 and 9 are used to represent treated (thinned and underburned) surface fuels and FM 10 represents pre-treatment conditions. More detailed descriptions of fuel models in the project area are found under “Surface Fuels”.

Table 3.2 Line production rates by fuel model (NWCG Fireline Handbook 2005).

Fuel Model	Engine Crew 5 person (chains/hr)*	Type 1 hand crew (chains/hr)	Type 2 hand crew (chains/hr)	Type 2 dozer, 20% slope (chains/hr)
8-Closed timber litter	24	40	24	70-105
9-Hardwood and conifer litter	22	28	16	50-85
10-Timber litter and understory	20	6	4	10-20

*Production rate for engine crew is for initial action only.

Pre- and post-treatment fire behavior was modeled using Fuels Management Analyst Plus (FMA), Version 3 (Carlton 2005). Forest Inventory Analysis (FIA) tree list data collected for the Freeman Project was input into FMA and surface and crown fire behavior was modeled using Crown Mass. The outputs model a wildfire under 90th percentile weather conditions (Table 3.3) in treated and untreated units. Units in Defensive Fuel Profile Zones (DFPZs) were modeled in the following stand types: eastside pine, Sierra mixed conifer and white/red fir. Area Thin units were also modeled for comparison. The DFPZ units were modeled post-treatment as thinned to 40% canopy closure with an underburn. Area Thin units were modeled post-treatment thinned to 50% canopy closure with an underburn. Fuel Model 10 was used to model pre-treatment surface fuels and FM 8 and 9 were used to model treated, underburned fuel beds. All FMA runs were made using a slope of 20% to approximate topographic conditions in the project area.

Fire behavior modeling outputs are site specific to the Freeman Project area, as local stand data was used. These outputs are only intended for use in the Freeman Project area. Modeled fire behavior gives a snapshot of a simulated fire event, so these outputs should be used only as a guide in concert with local fire behavior knowledge. Actual fire behavior can vary widely as fuels, topography and weather change. Fuel models represent a homogenous condition; actual fuel beds are much more variable in loading, arrangement and continuity. Fuel models used here are based on the most recent available Plumas National Forest coverage.

Nintieth-percentile weather conditions (Table 3.3) were used for modeling to be consistent with methodology used in the Sierra Nevada Forest Plan Amendment Record of Decision (2004) and by the Herger-Feinstein Quincy Library Group Forest Recovery Act FEIS. Data used in calculating 90th percentile conditions was taken from Smith Peak Lookout, a seasonal weather station within the Freeman Project area (Table 3.3). The data was analyzed using Fire Family Plus (Main et al. Systems for Environmental Management 2003). A wind reduction factor of 0.3 was applied to untreated stands, while treated stands received a wind reduction factor of 0.4. These wind reduction factors were applied to 20-foot wind speeds to show sheltered and partially sheltered fuel conditions (Rothermel 1983).

Table 3.3 Weather variables and values for 90th percentile weather for Smith Peak located within the Freeman Project area.

Weather Variable	Value
Maximum temperature, F	80
Minimum relative humidity, %	14
1 hour fuel moisture, %	4
10 hour fuel moisture, %	5
100 hour fuel moisture, %	6
1000 hour fuel moisture, %	7
20 foot wind speed, mph	12
Herbaceous fuel moisture, %	49
Woody fuel moisture, %	67
Years of data	1977-2002

3.2.5 Affected Environment

The Freeman Project lies between Grizzly Ridge on the west and Lake Davis to the east. Big Grizzly Creek enters the project area from the north and drains into Lake Davis. A portion of Humbug Creek drains the southern end of the project. Freeman, Cow and Dan Blough Creeks drain into Lake Davis from Grizzly Ridge. Elevation ranges from 6,900 feet at the top of Grizzly ridge to 5,800 feet in Grizzly Valley. The Freeman Project connects to three fuels treatments: Humbug and Happy Jack (proposed) to the west and Grizz (proposed) to the northwest.

Red and white fir forest is found on the upper elevation north slopes of Grizzly Ridge. Lower on the slope, Sierra mixed conifer and eastside pine is found. Numerous meadows and aspen groves are intermingled throughout the project area. Stringers of lodge pole pine dissected by meadows are found along and east of Forest Road 24N10.

3.2.5.1 Fire History

Historic

Historic mean fire return intervals in red and white fir forest types range from 39-65 years (Agee 1993). Fire severity in this vegetation type can vary widely from low to high depending on topography, surface and ladder fuels and weather. Fire return intervals in Sierra mixed conifer averages between 1-25 years. A study plot in eastside pine, near the Portola area, 5 miles south of the project area, found a median fire return interval of 7 years (Moody and Stephens 2002). Frequent low to moderate intensity fires created fire resistant stand structures as shown by photographic evidence and fire scar data (Gruell 2001; Moody and Stephens 2002).

Recent History

Beginning in the 1800s, the historic mixed conifer forest changed substantially. Logging of the larger ponderosa, Jeffery and sugar pine allowed white fir to increase in density. Stocking levels increased, leaving residual stands susceptible to insect attack. These factors, in conjunction with the advent of organized wildland fire suppression in the 1920s have increased dead and down fuel loading, with resultant increase in potential fire size and intensity (Gruell 2001). Timber harvest removed many of the larger fire resistant trees.

Analysis of PNF spatial datasets for the period 1970-2005 indicates that no fire larger than 10 acres has originated from the project area. Two large fires (>100 acres) have burned into the project area from outside. In 1921, a 1,555-acre fire burned through the southern portion of the project area. A second fire in 1929 (3,299 acres) came over Grizzly Ridge from the west and burned a small portion of the western edge of the project. During the period 1970-1996, 43 fires (20 human caused) burned 7 acres, with the largest fire being 1 acre. The north facing slope and wind sheltering effect of Grizzly Ridge tend to keep fire size small. The high public use and presence of nearby Smith Peak Lookout are also factors, as fires are easily detected and suppression action initiated quickly. Grazing has been a constant presence in the project area since the 1890s and contributed to reducing grass fuels (Elliott 2005). However, the project area is within 5 miles of the city of Portola and public use of the area for recreation and wood gathering appears to be on an upward trend, increasing the statistical chance of human caused fires (Plumas County Communities Wildfire Mitigation Plan 2005). The lack of large fire history in the Freeman Project area raises a concern that surface and ladder fuel accumulation is becoming a problem.

3.2.5.2 Surface Fuels

Surface fuels and surface fire intensity are the primary drivers of fire behavior, followed by ladder fuels and crown fuels (Reinhardt and Scott 2001; Alexander 1987). Surface fuels are described and categorized by Fuel Models (FM). Fuel models in the Freeman Project area were derived from PNF spatial datasets and are described below (Anderson 1982, Rothermel 1983).

Fuel Model 1—This model represents dry grasslands and savannas with little shrub or timber present. Two hundred seventy acres or 2% of the fuels in the project area represent this fuel model. Fire behavior in FM 1 is fast moving with up to 4-foot flame lengths. In the Freeman Project area, this fuel model occurs in meadows with some live fuel content and does not exhibit spread rates as great as the typical FM 1.

Fuel Model 2—Open shrub and timber this model represents stands with a grass understory. FM 2 makes up 13% (2,018 acres) of the Freeman Project area and is mostly found in the flatter portions in the north and east as large meadows with stringers of pine. Grasses in FM 2 in the project area have similar fire behavior characteristics as FM 1 (see above). Fire behavior in FM 2 exhibits a lower rate of spread than FM 1, but can generate higher flame lengths (6 feet) due to dead litter from over story trees in the fuelbed.

Fuel Model 5—This is a brush fuel model, typically used to represent young green shrubs with little dead fuel component. Fire behavior in FM 5 is characterized by a low rate of spread and flame lengths of 4 feet or less. FM 5 is not a problem fuel type except during severe drought or high wind conditions. This model represents roughly 10% (1,526 acres) of the project area.

Fuel Model 8—Short needle conifer stands consisting of red and white fir and lodge pole pine represents this fuel model. Surface fuels consist of compact litter with little undergrowth and dead woody fuel. This fuel model is used to represent post treatment fuel conditions, as fire behavior in FM 8 is usually slower burning and of lower intensity. Flame lengths typically do not exceed 1 foot and initial attack in FM 8 is normally successful unless high winds are present. FM 8 comprises 19% (2767 acres) of the project area.

Fuel Model 9—This model is similar to FM 8, representing long needle conifers such as ponderosa and Jeffery pine. Rate of spread and flame lengths (2-3 feet) are slightly greater than FM 8 due to the more aerated nature of the litter. This model is used to represent post treatment conditions in eastside pine forest types. Initial attack in FM 9 is usually successful barring extreme weather conditions. Only 1% (147 acres) of FM 9 is found in the project area.

Fuel Model 10—Fire behavior in this fuel model demonstrates the highest intensity of the timber models. Conifer stands with heavy dead and down material and dense ladder fuels are typical. Crowning, torching and spotting are more frequent in FM 10. Flame lengths of 5 feet or greater are common and fires in FM 10 are at the threshold of control by direct attack. This model is frequently used to represent untreated, over mature or disease-ridden stands. FM 10 comprises 47% (7051 acres), the largest proportion of the Freeman Project area.

The remaining 10% of the project area is classified as FM 98 and 99. These models represent water, rock, or barren land with no flammable vegetation. Some wet meadows and sagebrush flats near Lake Davis are shown as FM 99, hence the relatively high percentage of these models.

3.2.5.3 Fire Regime Condition Class

Condition Class is used to describe the extent to which a landscape has deviated from historic fire return intervals (RMRS GTR-87-2002):

- Condition Class 1: Fire regime is within historic range and risk of losing key ecosystem components is **Low.** Vegetation attributes (species composition and structure) are intact and functioning within the historic range.
- Condition Class 2: The fire regime has been moderately altered from the historic range. The risk of losing key ecosystem components is **Moderate**. Fire frequencies have departed from historic ranges by one or two return intervals. This would result in moderate changes to one of the following: fire size, intensity and severity and landscape patterns. Vegetation attributes have been moderately altered from the historic range.
- Condition Class 3: The fire regime has been significantly altered from the historic range. The risk of losing key ecosystem components is **High.** Fire frequencies have departed from their historic range by multiple return intervals. This results in dramatic changes to one of the following: fire size, intensity and severity and landscape patterns. Vegetation attributes have been significantly altered from the historic range.

Spatial datasets, derived from the 2003 Fire and Resource Assessment Program, Fire Regime and Condition Class, for the project area show that 60% of the landscape is in Condition Class 3, 26% in Condition Class 2 and only 13% in Condition Class 1. A large portion of the Freeman Project area is at risk of loss from a stand-replacing fire.

3.2.5.4 Wildland/Urban Interface

One thousand eight hundred ninety-two acres of the Freeman Project are classified as Wildland/Urban Interface (WUI). The project uses the descriptions and coverages of WUI as defined in the Plumas County Fire Plan (2005). WUI is broken into 3 classifications: Urban Core, Adjacent WUI (within ½ mile of a community) and Extended WUI (within 1 mile of a community). The southern portion of the Freeman Project is adjacent to Lake Davis Highlands, a resort community north of Portola. Lake Davis Highlands is in direct alignment with prevailing southwesterly winds and is upslope from ignition sources such as Highway 70. This alignment puts Lake Davis Highlands at particular risk to wildfires. Six hundred sixty nine acres of the project is Adjacent WUI, while 1,301 acres are classified as Extended WUI. There is a small (0.1 acre) piece of Urban Core in the project area.

3.2.5.5 Air Quality

The First Order Fire Effects Model (FOFEM) (Reinhardt et. al.2000) was used to predict smoke emissions from pile burning, underburning and wildfire. The wildfire was modeled under dry, summer conditions with a heavy fuel load to simulate a pre-treatment event. The underburn was modeled under moister, spring conditions with a light fuel load to represent the post-treatment fuel bed. The pile burn was modeled using moist, spring conditions with a typical fuel load.

Table 3.4 Emissions per acre by fire type.

Fire type	PM 10 (Lbs per acre)	PM 2.5 (Lbs per acre)	CO (Lbs per acre)	CO2 (Lbs per acre)
Wildfire	1,879	1,592	20,988	99,871
Underburn	374	317	4,170	20,445
Pile burn	1,705	1,444	18,652	112,973

Emissions from the pile burn were similar to the wildfire (Table 3.4), reflecting consumption of heavy fuels in both fire types. However, FOFEM assumes that the entire acre is involved in fire, thus it can over predict emissions. Wildfires and prescribed fires are patchier in nature, with a mosaic of burn intensities. Managers can choose when to light prescribed fire, metering out smoke under favorable conditions for dispersal. Lighting patterns can avoid stumps and logs and reduce smoke production. Conversely, wildfires consume all available fuel in the fuel bed. Emissions from a wildfire would occur in a concentrated event, under weather conditions with the potential to impact communities far from the Freeman Project area. Wildfire events can last for several weeks (i.e., the 2006 Boulder Complex Fire, the 1999 Mt. Hough Complex and the 2000 Storrie Fire).

Portola and Lake Davis Highlands are within five miles of the Freeman Project area and could be affected by smoke from prescribed fire. A north wind event could move smoke into Sierra Valley to the southeast; however burn projects would be conducted with a south or southwest wind that would move smoke away from developed areas. Smoke from prescribed fire activities would remain confined to the Lake Davis watershed under most atmospheric conditions and would disperse in the afternoon as the morning inversion lifts. All burning is done in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District (NSAQMD). The smoke plan requires burning with wind directions that transport smoke away from communities and the amount of acres burned daily are limited. Burns are conducted during approved burn days, when atmospheric conditions favor smoke dispersion. Prescribed burning takes place in spring or fall after the first rains when fuels are relatively moist to reduce the potential for escape.

Currently the 24-hour ambient air quality standard for PM 2.5 in Portola Valley is 65µg/m3 for both the California Air Quality Standard (CAAQS) and the National Air Quality Standard (NAAQS) and the annual arithmetic mean standard is 15µg/m3 for the NAAQS and 12µg/m3 for the CAAQS. Since 1999, the Portola Valley has not exceeded this standard. The closest it has gotten occurred on December 3, 2005 with a 24-hour measurement of 60µg/m3.

To prevent the likelihood of exceeding the 24-hour PM 2.5 standard, fire managers take the following steps.

1. A detailed Burn Plan is written for the project. It includes:
    a. Burn objectives.
    b. Location, description and maps of the project.
    c. Description of a range of weather conditions needed to achieve the burn objectives while producing minimal smoke emissions.
    d. Personal and their qualification needed to complete the burn.
    e. Responsible parties.
    f. Contingency plan for escape fire.
    g. Medical plan.
    h. Public relation plan.
    i. Fire behavior modeling with desired fire behavior.
    j. Smoke management plan (SMP).
    k. Burn permit.
2. An Air Pollution Permit is obtained from Northern Sierra Air Quality Management District prior to burning and the Smoke Management Plan (SMP) is discussed and approved by the Air Pollution Control Officer (APCO).
3. Burns are only conducted on “Permissive Burn Days” as specified by Air Quality. Permissive Burn Days are usually days that have good smoke dispersal and a low probability of developing an inversion.
4. Communities are notified in advance of burn projects and given information on the number of days of ignition and possible impacts from the smoke.

5. Portable weather stations are set up in the project area at least a week before beginning ignition and weather conditions at the site are monitored daily.
6. Spot weather forecasts are received daily during the project burn and weather from the portable weather station on site is used. The spot weather forecast also provides mixing height, speed and direction of transport winds; crucial factors in smoke dispersal.
7. During the burn weather is taken hourly by both the portable weather station and a belt weather kit so that any changes can quickly be assessed and measures taken.
8. A SMP is completed for all burn projects. This plan details the steps that will be taken to prevent an adverse smoke event. This includes:
    a. Limiting ignition to 150 acres per day.
    b. Adjusting the time of ignition to limit adverse smoke impacts due to inversion.
    c. Burning on Permissive Burn Days when the prevailing wind blows smoke away from populated areas and/or disperses before it reaches the communities.
    d. Smoke is monitored throughout the burn by the lookouts, the burn boss (both on the burn site and from a distance) and the fuels tech. (both on the burn site and from a distance).
9. Should adverse smoke impacts affect smoke sensitive area the SMP has mitigation measures that will be taken. They include:
    a. Halt ignitions, except as needed to maintain control of fire.
    b. Suppress fire.
    c. Begin immediate mop up.
    d. Discontinue mop up if favorable conditions return.

3.2.6 Environmental Consequences

3.2.6.1 Alternative 1 (Proposed Action)

Direct and Indirect Effects

Fire behavior modeling outputs are shown below in Table 3.5 and are applicable for all the action alternatives. The combination of mechanical treatments and underburning reduce surface, ladder and canopy fuels. Flame length, rate of spread and fireline intensity all decrease measureably from the No-action Alternative (Table 3.6). Torching and crowning indices increase, as does canopy base height, reducing the crown fire hazard. Mortality in the residual stand is decreased by 57-63% from the No-action Alternative. Fire type changes from passive crown fire to surface fire. In some cases it wouldn’t be until after prescribed burning was completed that these fire behavior conditions would be met, so there could be a period of up to 4 years where residual fuel from thinning activities would slightly increase flame length. Whole-tree yarding would be used wherever possible to keep slash to a minimum. The initial reduction in surface and ladder fuels would improve the existing condition.

DFPZ, DFPZ/WUI and WUI units would be evaluated after treatment; those units not meeting desired surface fuel conditions would be underburned, grapple piled and burned, or masticated. In some units, desired conditions might be met without the need for follow-up underburning. Area thinning and group selection units would also be evaluated and further treated as needed to meet desired conditions. Aspen units would be at less risk to stand-replacing fires by removal of the more flammable conifers currently encroaching on aspen stands. One unit (028) would be treated by underburning only.

Treatments in DFPZ and WUI units would enhance firefighter production rates by reducing flame lengths and rates of spread to levels where initial attack success is likely (less than 4 foot flame length). Improved access to escape routes and safety zones would benefit firefighter safety. Treatments would provide anchor points for initial attack on wildfires and for initiating prescribed fires. Lake Davis Highlands would receive additional protection from wildfire ignitions originating from the southwest.

RHCA would be mechanically thinned where equipment booms can reach in; otherwise RHCAs would be hand thinned up to 8-inch dbh. Hand thin units would be piled and burned, with piling and burning taking place away from riparian vegetation. RHCA treatement would reduce the risk of stand-replacing fire along stream courses. In the June-July 2006 Boulder Complex Fire, on the Mt. Hough Ranger District near Antelope Lake Recreation Area, RHCAs provided avenues to carry the fire within the DFPZ. Thinning would decrease flamelengths and fire intensity, preserving more riparian habitat.

Emissions for prescribed fire and pile burning are shown in Table 3.4. The exact number of acres and amount of emissions is in question, as not all fuels treatments may require underburning to meet desired conditions. Mitigation of smoke impacts to Portola and Lake Davis Highlands would consist of burning under favorable atmospheric conditions; limiting acres burned daily, allowing piles to dry before ignition and ceasing ignition if smoke dispersion conditions degrade. Monitoring of smoke transport is required by NSAQMD in the smoke management plan. Daily coordination with NSAQMD and review of a daily spot weather forecast from the Redding Fire Weather office is required prior to igniting any prescribed fire. It is estimated that Alternative 1 will have approximaterly 15-75 acres of grapple piles to burn, equaling 11-54 tons of PM 2.5 in the air.

Cumulative Effects

The Proposed Action would decrease flame lengths, fireline intensity and rate of spread. Crown base height, torching and crowning indices would all be increased, all of these factors combined would reduce crown fire hazard and increase the probability of successful and safe initial attack in the project area. Fuel treatments would remain effective for up to 10 years without additional entries based on a review of similar projects completed since the mid 1990’s. Treated DFPZ and

WUI units would be monitored and maintenance would begin as surface fuels accumulate to 5-7 tons per acre and regeneration of understory vegetation occurs. Prescribed fire and mechanical treatment would be used to maintain DFPZs. Group selection units would also be monitored and grapple piled, masticated, or underburned as needed for regeneration.

Table 3.5 Fire behavior outputs for action alternatives (Alternatives 1, 3 and 4).

Unit	Treatment Type	Flame length (ft)	Rate of spread (ch/hr)	Fireline intensity (BTU/ft/sec)	Torching index (mph)	Crowning index (mph)	Canopy base height (ft)	Fire type	Mortality (%)
3	DFPZ Mech. Thin	1.2	2.3	69	39.38	40.54	14	surface	2
4	Area Thin	3.1	9.6	69	49.24	42.68	18	surface	2
8	DFPZ Mech. Thin	1.2	2.3	69	39.38	40.54	14	surface	2
24	DFPZ Mech. Thin	1.2	2.3	8	34.60	41.61	23	surface	5
30	Area Thin	3.1	9.6	69	79.40	35.39	31	surface	9
33	DFPZ Mech. Thin	3.1	9.6	69	49.24	30.99	18	surface	5
53	DFPZ Mech. Thin	3.1	9.6	69	49.24	30.99	18	surface	5
76	DFPZ/WUI Mech. Thin	3.1	9.6	69	49.24	30.99	18	surface	5
82	DFPZ/WUI Mech. Thin	1.2	2.3	8	34.60	41.61	23	surface	5
86	Area Thin	3.1	9.6	69	34.30	49.43	12	surface	1
132	DFPZ Mech. Thin	3.1	9.6	69	49.24	30.99	18	surface	5

The Proposed Action would provide connectivity to adjacent projects such as the Humbug and Happy Jack DFPZs to the west and the proposed Grizz DFPZ to the northwest. Connectivity to fuels work on private land proposed near Lake Davis Highlands would also occur. Road maintenance associated with the Proposed Action would improve access for fire suppression equipment.

The effects of past, present and reasonably foreseeable future projects include:

- Past timber sales from 1980 to the present have contributed to increased numbers of white fir as desirable pine species were cut. White fir stocking and residual slash from past harvests would be reduced within treatment units.
- Insect infestations during drought conditions in the late 1980s have prompted several salvage sales from 1990 to the present. Some mortality is still occurring and is continually adding to the fuel loading within the project area. Much of the insect mortality is likely due to stress from overstocking and the Proposed Action would reduce the number of stems per acre within treatment units.
- Public fuel wood permits were issued in the 1980s and 1990s to help reduce lodgepole pine stocking levels and remove dead trees. Four hundred acres near Camp 5 were

opened, with a limited effect to fuel loads, since much dead and down lodgepole remains. Some of this material would be removed where treatments occur.

- Grazing would continue and slightly reduce fine fuels in allotments.
- Human caused ignitions from recreation users, woodcutters and OHVs would continue to increase. The Proposed Action would increase initial attack success, particularly within treatment units. Treated areas would be effective as anchor points for fire suppression forces.
- Roadside snags would continue to be removed by woodcutters. Snag related injuries and spotting from burning snags would be reduced and add to firefighter and public safety.
- The Humbug and Happy Jack DFPZ projects to the west and the proposed Grizz DFPZ to the northwest connect to the Freeman Project. Continuity within the HFQLG DFPZ network would be maintained and treatment effectiveness enhanced by the Proposed Action. Coordination would be necessary to reduce cumulative impacts from smoke from pile and underburns in these projects and the Proposed Action. Connectivity to projects on private lands would be created.
- The proposed pike eradication project at Lake Davis would have unknown effects, since a decision has not been made regarding which alternative will be implemented as of this writing. A combination of poisoning and lowering of the lake is the most likely action. Blowing dust from exposed lakebed could impact air quality. Smoke from prescribed fire in the Freeman Project could add to impaired air on windy days. Visitor use in the Lake Davis area could decline in the event the lake was drained.

The implementation of this alternative in combination with past, present and reasonably foreseeable future projects would reduce surface, ladder and crown fuels, improve firefighter and public safety and increase fireline production rates.

3.2.6.2 Alternative 2 (No-action)

Direct and Indirect Effects

Surface, ladder and crown fuels would not be treated, resulting in a decrease in fireline production rates over time as fuels continued to accumulate. Initial attack success would be reduced, as flame lengths and rates of spread would exceed firefighter capabilities for direct attack during 90th percentile (and greater) weather conditions. Torch and crowning indices, as well as canopy base height would remain low, with a higher likelihood of passive or active crown fires (Table 3.6). Mortality in untreated stands would exceed 60 percent in most cases. Lake Davis Highlands would continue to be at risk from wildfire ignitions to the southwest.

There would be no emissions from prescribed burning associated with the Freeman Project. Wildfires would have the potential to impact air quality and public health in Portola and Lake Davis Highlands, dependent on wind direction, fire size and fire duration. Fire managers would have few options available to mitigate smoke impacts from a wildfire event. There would be no improvement in either firefighter and public safety or fire manager's capability to suppress wildfires under the No-action Alternative.

Table 3.6 Fire behavior outputs for the No-action Alternative (Alternative 2).

Unit	Flame length (ft)	Rate of spread (ch/hr)	Fireline intensity (BTU/ft/sec)	Torching index (mph)	Crowning index (mph)	Canopy base height (ft)	Fire type	Mortality (%)
3	8.5	14.7	212	0	40.50	1	passive	68
4	11.3	17.8	212	0	42.68	1	passive	59
8	8.5	14.7	212	0	30.41	1	passive	68
24	12.1	24.3	114	0	20.07	1	passive	73
30	9.7	15.9	212	5.31	26.44	5	passive	74
33	10.4	17.5	212	0	27.63	3	passive	65
53	10.4	17.5	212	0	27.63	3	passive	65
76	10.4	17.5	212	0	27.63	3	passive	65
82	12.1	24.3	212	0	20.47	1	passive	73
86	11.0	18.4	212	0	28.49	1	passive	58
132	10.4	17.5	212	0	27.63	3	passive	65

Cumulative Effects

No improvement in suppression effectiveness or firefighter and public safety would result from this alternative. Surface fuels would continue to accumulate from insect, disease and overstocking and ladder fuels would continue to grow, lowering canopy base heights and increasing potential for crown fire activity.

No connectivity with adjacent DFPZs would occur, reducing their effectiveness and leaving gaps in the DFPZ network. Fuels management work done on private lands would not be enhanced. Access for fire equipment would degrade as no additional road maintenance would take place.

The effects of past, present and reasonably foreseeable future projects include:

- Past timber sales from 1980 to the present has contributed to increased numbers of white fir as desirable pine species were cut. White fir stocking levels and residual slash from past harvests would be not be reduced.
- Insect infestations during drought conditions in the late 1980s have prompted several salvage sales from 1990 to the present. Much of the insect mortality is likely due to stress from overstocking and this condition would worsen over time.
- Public fuel wood permits were issued in the 1980s and 1990s to help reduce lodgepole pine stocking levels and remove dead trees. 400 acres near Camp 5 were opened, with a limited effect to fuels, as much dead and down lodgepole remains.
- Grazing would continue and slightly reduce fine fuels in allotments.

- Human caused ignitions from recreation users, woodcutters and OHVs would continue to increase. Initial attack success would degrade as surface and ladder fuels increase over time. Firefighter and public safety would be compromised.
- Roadside snags would continue to be removed by woodcutters. Snag-related injuries and spotting from burning snags would be reduced and add to firefighter and public safety.
- The Humbug DFPZ project to the west and the proposed Grizz DFPZ to the northwest connect to the Freeman Project. Connectivity within the HFQLG DFPZ network would be compromised and a gap in treatments would be created. Treatments on private lands would not be as effective.
- The proposed pike eradication project at Lake Davis would have unknown effects, as a Proposed Action has not been issued as of this writing. A combination of poisoning and lowering of the lake is the most likely action. Blowing dust from exposed lakebed could impact air quality. There would be no additional smoke impacts to the area other than from wildfires. Visitor use in the Lake Davis area could decline in the event the lake was drained.
- No improvement in existing conditions would occur as a result of this alternative.

3.2.6.3 Alternative 3

Direct and Indirect Effects

The effects of Alternative 3 would be similar to the Proposed Action, except that Alternative 3 would thin and pile material rather than remove conifers surrounding aspen stands as biomass. In the Proposed Action, aspen stands were surrounded by extended treatment zones. In these zones, all conifers < 30” dbh would be removed. Alternative 3 proposes to thin rather than remove conifers surrounding the aspen stands. In the DFPZ, DFPZ/WUI and WUI Zones, where units are adjacent to aspen stands, this extended treatment zone has been absorbed into the adjacent unit, whenever one exists. When there is not an adjacent unit, the surrounding stand will not be treated and was therefore eliminated. There would be 86 less acres that would not be treated under this alternative. Fire behavior in treated units would be the same as seen in the Proposed Action (Table 3.5). Additional (RHCA) acres may be added due to using riparian vegetation as an indicator rather than a defined buffer as in the Proposed Action. The 86 acres not treated under Alternative 3 would experience similar fire behavior as shown under the No-action Alternative and be at greater risk of loss to wildfire. Aspen units would have a slightly greater susceptibility to a crown fire, as some conifer would remain adjacent to the aspen stands and contribute crown and surface fuels to the fuel bed. However, these differences are not measurable as the change in treatment is small and is dispersed throughout the project area. Little change in fire suppression effectiveness and firefighter and public safety would be noticed from the Proposed Action. The amount of grapple pile acres that would need to be burned post treatment would equate to approximately 15-90 acres, which would equal 11-65 tons of PM 2.5.

Cumulative Effects

Cumulative effects are similar to those in the Proposed Action.

3.2.6.4 Alternative 4 (Preferred Alternative)

Direct and Indirect Effects

This alternative treats aspen in the same fashion as Alternative 3. The most important difference is that 500 more acres would be treated in DFPZ and WUI by mechanical thinning as opposed to grapple piling or mastication. Mechanical thinning is more efficient and removes more fuels from the site than grapple piling or mastication (Graham et al. 2004). Fire behavior in these units would be similar to mechanical thinning units shown in Table 3.5. These units would meet desired conditions for flame length and rate of spread without the intermediate step of burning grapple piles or having mastication debris left in the fuel bed. Canopy base height would be higher, torching and crowning indices would increase and the risk of passive or active crown fire would be reduced compared to the No-action Alternative. Fire fighter and public safety would thus be further improved with the addition of more mechanical thinning. The direct effects seen in the Proposed Action would be spread over 500 additional acres in this alternative.

With more fuel removed from the fuelbed, emissions would be the least during underburning. Pile burning emissions would also be reduced as fewer acres would be grapple piled and burned, 4.5-15 acres. This would equate to between 3-11 tons of PM 2.5 in the air.

Cumulative Effects

Cumulative effects would be similar to the Proposed Action. The implementation of this alternative in conjunction with the past, present and foreseeable future projects as mentioned under the Proposed Action section would reduce surface, ladder and crown fuels, improve firefighter and public safety and enhance fireline production rates to the greatest extent of the three action alternatives.

3.3 Forest Resource Effects

3.3.1 Introduction

The following assessment is summarized from the Forest Vegetation Report for the Freeman Project, which is incorporated by reference (USFS PNF BRD 2006g). This assessment addresses how the different alternatives impact forest vegetation, as measured by canopy cover, average diameter and basal area. Basal area is then related to appropriate stocking levels to maintain stand growth and health, including resistance to epidemic levels of insects and disease.

Although much of our current direction gives us desired conditions in terms of canopy cover, foresters typically use basal area to evaluate density due to ease and consistency of field measurement. Basal area is the area occupied by tree stems at 4.5 feet above the ground. Canopy cover can be measured in several different ways but the measurements made by one instrument, calculated by regression analysis, or made by ocular estimate have no comparison to measurements made in a different manner. Because of this, there is no agreed upon standard for density based on canopy cover. Canopy cover is related to density and therefore, basal area, but is very dependent on stand history—was the stand open grown or dense early in stand development; has there been partial harvesting, etc.? Using the modeling output (described under "Analysis Methodology"), a local correlation between basal area and canopy cover was derived for the purpose of developing marking guidelines for the project.

Stocking is typically compared against the basal area of a normally stocked stand (Dunning and Reineke 1933). Normal stocking is the highest density a forest stand can obtain before mortality will approach growth. 'Normal' in this context is maximum site occupancy and does not imply desired or even typical. 55% of normal is generally considered to be the low end of full site occupancy. Below this level, trees are growing with little competition from surrounding trees. Net cubic foot volume growth of wood is strongly related to stand density up to this level of basal area. In other words, the addition of another tree to an acre increases the amount of wood produced on that acre. Above this level, there is a range over which density and growth are not related until a point of very high density (usually around 90% of normal) where stands begin to stagnate. Over the middle range (55-90), the amount of biomass being grown is relatively constant. At the low end of this range this biomass is being spread over fewer stems, i.e. fewer fatter trees. At the high end of the range, that same amount of biomass is spread to more skinny trees. Trees are competing for growing space throughout this range and some lose out and die from lack of sunlight as they are shaded.

For maximum yield of wood, stands are generally thinned to between 55% and 70% of 'normal' basal area. Young stands that still have height growth potential are managed at the low end of this range because of their ability to grow rapidly, increasing crown area by growing taller. Most stands in the project area are still growing in height. At densities over 70% of normal, losses due to bark beetle mortality increase greatly.

In the DFPZ/WUI the objective is not to maximize growth but to create a condition that will bring crown fire to the ground and provide safer firefighting conditions. Stands may be thinned more heavily to meet this objective. Generally speaking, mechanical thinning is the preferred treatment to achieve both silviculture and fire risk reduction objectives due to the ability to remove trees of all sizes, reduce canopy cover and the fact that the material is removed from the site, with only landing piles left to be burned.

3.3.2 Summary of the Effects

3.3.2.1 Alternative 1 (Proposed Action)

This alternative treats 3,970 acres by mechanical removal (aspen PAC thinning, helicopter ITS, mechanical thin, mechanical thin in aspen). All mechanically treated units are anticipated to meet the desired canopy cover. All of the mechanically treated areas within the DFPZ will be under 70% of normal stocking post-treatment and in 20 years. In the area thin, all stand types except the 100 acres of mixed conifer and white fir 3M types (see Analysis Methodology section for a definition of types) will be below 70% of normal post-treatment and in 20 years. In addition, in eastside pine 4 M/D, the 191 acres proposed for grapple piling/mastication and the 18 acres proposed for hand thinning will be above 70% of normal.

Of the 57 acres being hand thinned in this alternative, 28 acres meet the desired canopy cover. Twenty-nine acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D-RFR3D, SMC4M-MHC3S/4M/5M, and WFR4D/3D will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). In other words, hand thinning is not always an effective treatment to reduce canopy cover, but does reduce ladder fuels to some extent. Similarly, of the 1,542 acres of grapple pile/mastication/thin to 11” dbh treatment, only 1,088 acres will meet the desired condition, due to the diameter limit. These treatments are proposed due to slope, watershed effects, lack of access or other concerns.

Alternative 1 has variable width extended treatment zones around the aspen stands in which all conifers <30” dbh would be removed. These zones cover approximately 400 acres (as mapped using an average 75 foot width) of conifer forest that would be cut to allow sunlight into the aspen stand. These 400 acres would be changed to the early seral (0-2) CWHR class from size class 4 (Table 3.15), along with the 175 acres in groups.

Based on calculations from FVS harvest stand tables, approximately 176 pounds of borax would be applied to approximately 1,254 acres.

3.3.2.2 Alternative 2 (No-action)

Under the No-action Alternative, according to FVS, the desired condition of 40% canopy cover or below would only occur in the SMC4P/S and WFR4/5P types. In twenty years none of the types will have canopy cover at or below 40%. Approximately 1,800 acres proposed for treatment under the action alternatives would have stocking levels over 70% of normal and would be at risk of loss to bark beetles if not treated. Tree competition would lead to mortality, generally of trees too small to be of much use to wildlife as snags, with a subsequent increase in fuel loading. No diseased trees would be removed through thinning or group selection.

3.3.2.3 Alternative 3

This alternative treats 3,719 acres by mechanical removal. Table 3.19 displays the amount of each CWHR type grouping that is being treated by each prescription in this alternative. There are no extended treatment zones on the aspen stands, so the only change from size class 4 to 0-2 is due to groups.

Of the 54 acres being hand thinned in this alternative, 25 acres meet the desired canopy cover. 29 acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D, RFR3D, WFR4D/3D, and WFR4M/RFR4M will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). Similarly, of the 1,582 acres of grapple pile/mastication/thin to 11” dbh treatment, only 1,107 acres will meet the desired condition, due to the diameter limit. All of the mechanically treated areas within the DFPZ will meet the desired canopy cover and be under 70% of normal stocking post-treatment and in 20 years. In the area thin, all stand types except the 106 acres of mixed conifer and white fir 3M types will be below 70% of normal post-treatment and in 20 years. In addition, in eastside pine 4 M/D, the 107 acres proposed for grapple piling/mastication and the 27 acres proposed for hand thinning will be above 70% of normal.

Based on calculations from FVS harvest stand tables, approximately 187 pounds of borax would be applied to approximately 1,333 acres. There are no extended treatment zones on the aspen stands.

3.3.2.4 Alternative 4 (Preferred Alternative)

This alternative treats the highest number of acres mechanically, 4,508 acres. Table 3.20 displays the amount of each CWHR type grouping that is being treated by each prescription in this alternative. Of the 42 acres being hand thinned in this alternative, 23 acres meet the desired canopy cover. 19 acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D, RFR3D, WFR4D/3D, and WFR4M/RFR4M will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). Similarly, of the 727 acres of grapple pile/mastication/thin to 11” dbh treatment, only 578 acres will meet the desired condition, due to the diameter limit. This alternative achieves the desired condition on more acres than the others.

All of the mechanically treated areas within the DFPZ will be under 70% of normal stocking post-treatment and in 20 years. In area thin, all stand types except the 68 acres of mixed conifer and white fir 3M types will be below 70% of normal post-treatment and in 20 years. In addition, the 43 acres of eastside pine 4 M/D proposed for grapple piling/mastication and the 27 acres proposed for hand thinning will be above 70% of normal. This alternative achieves the desired condition on significantly more acres than the others.

This alternative also has no aspen extended treatment zones, but changes treatment on many acres from grapple pile or mastication to mechanical thinning. It is likely that most of these areas are pre-commercial, that is, do not have enough value in the products removed to cover the cost of removal. However, the advantage of mechanical thinning is that a product is removed, primarily biomass for power generation but including some small saw logs, the fuel is removed from the site, and there are no piles left to burn.

Based on calculations from FVS harvest stand tables, approximately 220 pounds of borax would be applied to approximately 1,837 acres. This alternative also has no aspen extended treatment zones.

3.3.3 Scope of the Analysis

Geographic Analysis Area: The geographic area used for this analysis are the stand (for attributes such as density and health) and the project area (for seral stage distribution). Individual trees interact in terms of competition and disease spread at the stand scale. Seral stage analysis and planning for un-even aged management can be done at any ‘landscape’ scale so using the project area was sufficient and allows for an easy aggregation upward by combining projects without having any overlap.

Timeframe of Analysis: Modeling was taken out 20 years, which is the predicted time interval before the stand would be entered again for treatment, including DFPZ maintenance.

3.3.4 Analysis Method

The project area vegetation was sampled by stratifying the vegetation using the *California Wildlife Habitat Relationships* (CWHR) classification system. CWHR types are vegetative areas with similar species composition, tree size and density.

Stand exam plots were taken in 52 units and aggregated into 10 CWHR types (some ‘types’ used in the analysis combine similar CWHR types in order to have enough plots to make the data statistically significant), focusing on larger size classes than will be treated mechanically (Table 3.7). No data was collected in the RFR5D type, 220acres of which are planned for treatment. The type that was sampled that is most similar is the WFR5M/SMC5M and the results of modeling should be similar.

This data was modeled using the Forest Vegetation Simulator-FVS (Dixon 2003) to predict the outcome of different treatments. Five prescriptions were modeled: no action, thinning to 40% canopy cover in a DFPZ, thinning to a 50% canopy cover outside the DFPZ (area thinning, except for eastside pine which retains a desired condition of 40%), hand thinning to an eight inch upper diameter (generally RHCAs and steeper areas) and thinning to an 11” dbh in mastication and grapple pile treatments. FVS models canopy cover by calculating the crown diameter of each tree based on dbh and species, arranging the trees on a given acre according to their position in the canopy. This value may or may not be similar to canopy cover measured in the field using an instrument such as a densitometer. All analysis is based on FVS. Diameters shown in the tables in this report are quadratic mean diameter (QMD) which includes all trees. This diameter is usually smaller than the diameter indicated by the CWHR type, which is based on aerial photo interpretation using only trees visible from above.

Treatment units usually contain several CWHR types (as well as inclusions of non forest), as unit boundaries are most often based on topographic features, land allocation and roads. Each action alternative has a different mix of treatment types. Information is summarized by type, with the various treatments by type displayed for each alternative in a separate table.

Table 3.7 Stand exam units and corresponding CWHR type in the Freeman Project area.

CWHR Strata	Units data was collected from
SMC4P/S	3,8,75
WFR4/5P	3,8,10,48,75,88
SMC/WFR3S/M	13,96,118
WFR/SMC5M	20,113
WFR4D	24,82,99,116
LPN4M/3/4/5D	25,27,60,130,136
EPN4M/D	33,41,53,72,76,119,132,138
WFR/RFR4M	9,73,86,87,93,103,108,111
SMC4M	4,52,63,91,94,97
SMC3/4D	26,29,30,40,83,105,126,131,133,139

3.3.5 Affected Environment

The project area is generally northeast facing, running from Grizzly Ridge down to Lake Davis. Vegetation types vary throughout the project area primarily based on elevation, which ranges from about 6,800 feet on the ridge to 5800 feet at the lake. The higher elevations are dominated by red and white fir, which grades into the mixed conifer type down slope. The flat areas around the lake are dominated by pine, including lodgepole pine in and along meadows. Aspen stands are common around meadows and continuing up the slope along drainages.

3.3.5.1 Stand History

The project area was extensively harvested during the period of railroad logging with subsequent natural regeneration creating a forest dominated by trees in the 80 to 100 year old age class. Since the larger, more vigorous, dominant trees with good form were typically harvested, being of higher value, the seed source available for natural regeneration was from poorer trees, resulting in a subtle degeneration of the genetic quality of the current stand. Species composition was shifted to the less valuable species such as fir and incense cedar since few larger pines were left to provide a seed source. Pines that were left were often heavily infected with dwarf mistletoe, which then spread to any natural pine regeneration.

The majority of the predominately pine stands near Lake Davis have had little harvest in the past 20 years, due to archeological concerns, bald eagle nesting and visual sensitivity in the recreation area. These stands would have developed under a frequent low intensity fire regime. The policy of fire suppression for the past 80 years has led to an increase in white fir and lodgepole pine which are more susceptible to fire, as well as an overall increase in stocking. Conifers have encroached into meadows and aspen stands. Some lodgepole stands, particularly those in the recreation area around the lake, were ‘dog hair’ thickets of small trees that have now succumbed to bark beetles, creating a tangle of dead and down stems.

Upland stands on the moister, northeast facing slope had a less frequent fire return interval, naturally burning in a mosaic fashion that perpetuated the mixed conifer type. Fire suppression in this type also led to a higher percentage of shade tolerant species, primarily white fir, as well as an overall increase in stocking levels. These stands have been intensively harvested in the past 20 years, first by a succession of regeneration cuts in the form of shelterwoods, strip cuts and clear cuts, as well as the removal of scattered large overstory trees. At that time, Forest Service management emphasized maximizing growth and yield of forest products. Larger, older trees that were growing more slowly were replaced by plantations that would be intensively managed. Where there was an existing understory, usually dominated by the shade tolerant fir, old overstory trees were removed with the intention of harvesting the fir under a relatively short rotation (80 to 120 years) under which there was a reasonable risk that the fir would not succumb to drought and/or insects. Table 3.8 displays the current distribution of CWHR types in the project area (there may be slight discrepancies with other reports due to rounding of acres and grouping of CWHR types).

Waves of salvage harvest occurred as insect epidemics hit during the drought of the early 1990’s. Bark beetle mortality was extensive, leaving many formerly overstocked stands understocked and loaded with dead and down fuel, particularly in fir types. Mortality also occurred in dense pine stands, especially in lodgepole pine. Not all dead material was removed in salvage harvests, increasing fuel loadings and adding to the risk of stand replacing fire.

Relative to early historical forest structure, the existing forest has a greater uniformity of age classes and lesser structural complexity, principally because of fewer large diameter trees. Natural regeneration resulted in large areas dominated by 11-24” dbh (diameter at breast height) trees (Table 3.8.). Many stands have few large trees, snags, or large down logs. Large tree (>24” dbh) density ranges from less than 1 to 12 per acre, averaging less than 2 large trees per acre, compared to 5-30 large trees per acre in the pre-European period.

Table 3.8 Existing CWHR size class

CWHR Size Class (dbh)	Existing (%)	Existing (Acres)
0-2 (0-6”)	10	1,220
3 (6-11”)	19	2,192
4 (11-24”)	62	7,354
>5 (>24”)	9	1,082
Total	100	11,848*

*total acres of forested land within project area

The aspen type has been most altered from the historic range, due to changes in the hydrologic regime from the creation of Lake Davis, road building, timber harvest, livestock grazing and fire suppression. Only remnant fragments of aspen stands currently exist.

3.3.5.2 Insects and Disease

Many stands in the project area have been affected by insects and disease. Diseases include annosus root disease, white pine blister rust and dwarf mistletoe. With the exception of white pine blister rust, an introduced disease, these pathogens are endemic to forests and are part of the natural disturbance regime. Unnaturally high stocking levels and a higher proportion of white fir has increased levels of native pathogens.

Disease

Blister rust

Sugar pine is at great risk from an introduced, non-native disease, blister rust (*Cronartium ribicola*). This disease is present throughout the project area, although many of the larger trees affected were removed during salvage projects. Large trees do not typically succumb to the disease, which physically girdles the tree with a canker, although the tree may be weakened to the point where it is susceptible to other diseases or insects. A small percentage of sugar pines (less than 10%) exhibit “major gene resistance” to the disease, a genetically dominant trait which is readily passed on to the next generation of trees. Mature trees are tested to see if they possess this trait and if they are found to be resistant, are carefully protected as a future seed source. There are several of these trees within the project area. As fortunate as this resistance is, there are already strains of blister rust that have mutated such that this resistance is overcome. Perhaps more promising in the long run is “slow rusting”, a type of disease resistance that is genetically and physiologically more complex and as such, difficult to artificially breed for, but which is also much less likely to be overcome by mutations in the disease. Until we better understand what the future holds, it is prudent not to harvest any live sugar pine unless the removal of a tree is necessary to meet a specific management objective (such as a hazard tree).These mature trees, even those that are not “major gene resistant” contribute greatly to the genetic pool of the next generation, which inevitably will be reduced by as much as 90% as a result of blister rust. No live sugar pine will be harvested in this project, unless the tree is considered to be a hazard tree.

Dwarf mistletoe

Dwarf mistletoe (*Arceuthobium* spp.), a parasitic plant that lives off trees, impacts tree health and growth. Dwarf mistletoes are generally host specific, but the same species of mistletoe (when mistletoe is referred to in the remainder of this document the reference is to dwarf mistletoe) infects both ponderosa and Jeffery pine. Mistletoe is generally less of a problem in the mixed conifer type than in single species stands because of this host specificity. Although a natural part of the ecosystem, early harvesting which removed the highest quality trees (generally not those infected) caused mistletoe to proliferate. The “witch’s broom”, an overgrowth of branches that occurs in response to infection, is particularly flammable and rapidly spreads ground fire up into tree crowns. Mistletoe spreads easily to understory trees through the dispersion of sticky seeds.

Young trees infected with mistletoe do not outgrow it, become deformed and are often weakened to the point of death.

Pockets of severe mistletoe infestation occur throughout the project and are a particular problem in the pine stands around the lake. Trees less than 30” dbh and heavily infected with mistletoe (especially infections in the upper crown) will be harvested, unless specifically needed as a habitat component for wildlife (mistletoe trees may be retained along the edges of meadows and in stands managed for bald eagle habitat). The intent is not to totally eliminate mistletoe, but rather to reduce the impact so that enough young trees survive and grow to be large trees.

Annosus root disease

Annosus root disease, (*Heterobasidion annosum*), is spread by airborne spores. There are specific strains of the disease for pine and fir and one does not infect the other. Fir trees can be infected through basal wounds and root grafting but generally are not killed outright by the disease. Pine is typically infected through cut stumps and mortality is rapid. Trees are weakened and die in a circular pattern spreading from the central infected stump. The only remedy is to plant a different tree species. Again, due to the host specificity, this is less of a problem in mixed conifer stands.

A common silvicultural practice to prevent the spread of annosus is to apply a layer of borax to freshly cut stumps soon after harvest. According to the manufacturer, Wilbur-Ellis, the directions state that when applied properly, one pound of Sporax (the copyright name of borax) will adequately cover 50 square feet of stump surfaces. This method is very effective in mitigating the spread of *Heterobasidion annosum* spores (Kliejunas 1989; Schmitt, Parmeter and Kliejunas 2000; Adams 2004; Kliejunas and Woodruff 2004; Information Ventures 2005).

Alternatives to borax include shifting the species composition of a stand, where possible, to take advantage of the host specificity of annosus. Unfortunately, there is no definite way to eradicate annosus. The fungi can exist in the root system of dead trees as a saprophyte for up to 50 years. Attempts at eradication usually involve ripping up all stumps and stems and then drying them out fully. This method is very expensive and has a major impact to soils. Harvesting timber in weather conditions under which the disease cannot survive (temperatures above 104° F and below 41° F) is also not practical. Another approach to reduce the spread of annosus is to introduce a competing fungus, *Phlebiopsis gigantea*. The premise is that a more benign organism provides a protective effect from *Heterobasidion annosum* by establishing itself on the host before *annosum* can. The effectiveness of this practice has not been established in western US forests due to concerns regarding the introduction of a non-native organism into the ecosystem. In addition, *Phlebiopsis gigantean* is not currently allowed by law to be used as a pesticide. It would be illegal to do so with prior approval from the United States Environmental Protection Agency (EPA).

Forest Insects

Annosus root disease, (*Heterobasidion annosum*), is spread by airborne spores. There are specific strains of the disease for pine and fir and one does not infect the other. Fir trees can be infected through basal wounds and root grafting but generally are not killed outright by the disease. Annosus contributes to ongoing mortality in fir by weakening trees that are then killed by bark beetles during drought periods. Pine is typically infected through cut stumps and mortality is rapid. Trees are weakened and die in a circular pattern spreading from the central infected stump. The only remedy is to plant a different tree species. Again, due to the host specificity, this is less of a problem in mixed conifer stands. Annosus is present throughout the project area in both pine and fir.

A common silvicultural practice to prevent the spread of annosus is to apply a layer of borax to freshly cut stumps soon after harvest. According to the manufacturer, when applied properly, one pound of Sporax (the copyright name of borax) will adequately cover 50 square feet of stump surfaces. The Sporax label and Material Safety Data Sheet are on file in the project record. Sporax is very effective in preventing annosus from colonizing stumps simply by creating a temporarily hostile environment (Kliejunas 1989; Schmitt, Parmeter and Kliejunas 2000; Adams 2004; Kliejunas and Woodruff 2004; Information Ventures 2005).

Alternatives to borax include shifting the species composition of a stand, where possible, to take advantage of the host specificity of annosus. Unfortunately, there is no way to completely eradicate annosus. The fungi can exist in the root system of dead trees as a saprophyte for up to 50 years. Attempts at eradication usually involve ripping up all stumps. This method is very expensive and has a detrimental impact to soils. Harvesting timber in weather conditions under which the disease cannot survive (temperatures above 104° F and below 41° F) is also not practical. Another approach to reduce the spread of annosus is to introduce a competing fungus, *Phlebiopsis gigantea*. The premise is that a more benign organism provides a protective effect from *Heterobasidion annosum* by establishing itself on the host before annosus can. This practice is not widespread in western US forests due to concerns regarding the introduction of a non-native organism into the ecosystem.

3.3.6 Environmental Consequences

3.3.6.1 Action Alternatives

Direct and Indirect Effects

In both the DFPZ and area thin, stands will be thinned from below to achieve the desired canopy cover. Table 3.9 displays the upper diameter, as calculated by the FVS model, to achieve the canopy cover in a strict thinning from below if the stand were homogeneous. It also shows the upper diameter to meet the standard to leave a minimum ‘% of existing basal area’ (30% for all eastside pine types and all other CWHR 4M and 4D classes; 40% for CWHR 5M, 5D and 6 classes, allowing for some minor variance by stating ‘generally in the largest trees’) is never more limiting than the diameter to achieve the desired canopy cover. FVS is a distance independent model (as are the vast majority of forestry models-spatial information about tree location is generally too expensive and impractical to collect) and cannot 'make decisions' on the basis of a tree's location relative to the other trees in the stand. Modeling provides information on the average condition, but cannot account for the spatial heterogeneity characteristic of many of the stands. Trees larger than the diameters (but < 30" dbh), listed in Table 3.9 in the canopy cover column could be harvested if they occur in intermediate or suppressed crown positions or in poor health. High risk trees larger than the diameter limit for meeting the basal area retention (but less than 30" dbh) that are at risk of dying within 20 years (Ferrell 1980), such as those with large cankers, mistletoe in the upper crown, evidence of rot, progressive crown dieback, off-color foliage and/or active insect activity, will also be harvested if not needed to meet desired snag levels.

The application of borax to the cut surface of pine stumps greater than or equal to 14" diameter will prevent colonization by annosus spores.

Mechanical Thinning to 40% Canopy Cover in the DFPZ

The intention of DFPZ treatments is to create a condition where a crown fire will drop to the ground and fire fighters can perform a direct attack against wildfire (USFS 1999). The desire is to have relatively open stands dominated by large trees, with some smaller trees present in small clumps or individually and an open forest floor. Overall, fuel treatments will primarily be accomplished through thinning from below to a 40% canopy cover and prescribed fire. Thinning from below is not only the most desirable prescription to reduce the risk of stand replacing wildfire, but in most cases, is also the best silvicultural system to grow large trees. Table 3.9 displays the upper diameter as modeled using FVS.

In mechanical harvest units within the DFPZ, stands will be thinned to 40% canopy cover. The standard to leave a minimum '% of existing basal area' (30% for all eastside pine types and all other CWHR 4M and 4D classes; 40% for CWHR 5M, D and 6 classes) is never more limiting than the diameter to achieve the desired canopy cover. In other words, the prescription will be to meet the desired canopy cover, which is well within the basal area standard. Table 3.9 displays the diameters associated with these thresholds, as modeled using FVS.

Mechanical thin units also contain RHCAs, the inner portion (equipment exclusion zone) of which (see RHCA treatment section for details) will not be treated mechanically in stands with 15% slope or less (in steeper units, the entire RHCA will be hand thinned if needed). Across the entire project, this equipment exclusion zone amounts to approximately 5% of the area. This area has a higher desired canopy cover, 60% and will be hand thinned. There is concern that additional openings in the form of landings and skid trails (put in after the unit is marked to the desired 40% canopy cover) will further reduce habitat suitability for closed canopy dependent species. Generally, existing landings and skid trails are used where they are in suitable locations and these are factored into the initial canopy cover used in the modeling from which the basal area and upper diameter limit (UDL) guidelines used in marking are derived. In some cases, skid trails have to be straightened due to using whole tree yarding and/or landings have to be expanded to accommodate biomass material to be chipped. Sale administrators estimate that an additional 3-5% of the area could be put into new landings and skid trails. The retention of higher canopy cover in equipment exclusion zones should compensate for the estimated 3-5% of the area in new landings and skid trails, but in particular instances where larger landings and an extensive new skid trail system are known to be needed, the marking will be modified to retain higher canopy cover in the remainder of the unit.

Table 3.9 Maximum diameter to achieve minimum canopy cover and basal area requirements by type within the Freeman DFPZ/GS Project (FVS modeled).

CWHR Strata	Upper diameter limit to achieve 40% Canopy Cover (dbh)	Upper diameter limit to achieve 50% Canopy Cover (dbh)	Upper diameter limit to achieve 30% Basal Area retained (dbh)*	Upper diameter limit to achieve 40% Basal Area retained (dbh)*
SMC4P/S	4	0	N/A	N/A
WFR4/5P	4	0	N/A	N/A
SMC/WFR3S/M	10	8	N/A	N/A
WFR/SMC5M	6	2	N/A	32
WRF4D	16	8	24	N/A
LPN4M/3/4/5D	20	N/A	30	N/A
EPN4M/D	18	N/A	28	N/A
WFR/RFR4M	14	2	30	N/A
SMC4M	12	6	34	N/A
SMC3/4D	16	8	26	N/A

* N/A is shown for types where the basal area retention standard or canopy cover does not apply.

All types are below 70% of normal after the thinning (Table 3.10) and remain so for at least 20 years. In pine stands, thinning to a 40% canopy cover is consistent with the approximate desired level of stocking for tree growth. In mixed conifer and fir types, thinning to a 40% canopy cover will under-stock the stand from the standpoint of maximizing timber yield, which is acceptable given the DFPZ land allocation. Some of the mixed types (SMC4P/S and WFR4/5P) are already under-stocked and below 40% canopy cover due to existing white fir mortality and salvage harvest. In these stands, the remaining clumps will be thinned, focusing on the removal of trees in lower crown classes (suppressed and intermediate) and those with poor crowns (less than 30% live crown ratio- the percentage of the stem with live foliage) and consequently, poor capacity for future growth.

Thinning will increase the growth and vigor of the stands and reduce mortality due to inter-tree competition and bark beetles. Since most of the stands are young enough to respond to release, diameter growth will be greatly accelerated at this level of stocking. For example, the EPN4M/D type (the most common type being treated in the project) has an increase in average tree diameter from 10” to 21” just as a result of the thinning (by removing the smallest trees in the stand). This effect continues as the trees released from crowding occupy new growing space. This type would have an average diameter of 11” in 2026 if left untreated, but is expected to have an average diameter of 23” in 2026 when thinned to a 40% canopy cover.

Mistletoe, insects and disease will be reduced in the stands by preferentially removing affected trees. Thinning also allows for the re-introduction of fire without excessive tree mortality. Underburning will kill shrubs and small trees that create ladder fuels and maintain the desired lower stocking level.

Area Thinning Treatments

Treatments outside the DFPZ will be very similar to those within the DFPZ, with a slightly higher desired canopy cover except in pine types. Where there is sufficient stocking in healthy trees, fir and mixed conifer stands will be thinned to a canopy cover of approximately 50%.

The intention of the QLG act is to move towards an un-even aged condition using group selection and thinning. Due to the current size/age class distribution heavily skewed to trees 11-23” dbh, the first step in moving to an uneven-aged distribution is to remove trees in this size class, particularly those in suppressed and intermediate crown classes. Stocking levels will be lowered to a more fire and insect resilient level and remove trees at risk of mortality in the next twenty years.

Table 3.10 Attributes post treatment and in 2026 for the ‘Thin to 40% Canopy Cover’ (DFPZ mechanical thin) prescription for stands in the Freeman Project (FVS modeled).

CWHR Strata	Post Treat Basal Area (ft2/ acre)	Post Treat % ‘Normal’ Basal Area	Post Treat ave dbh (in)	Post Treat CC (%)	Year 2026 Basal Area (ft2/ acre)	Year 2026 % ‘Normal’ Basal Area	Year 2026 ave dbh (in)	Year 2026 CC (%)
SMC4P/S	99	31	7	31	141	44	9	44
WFR4/5P	104	26	7	34	142	36	8	45
SMC/WFR3S/M	123	48	11	40	160	62	13	45
WFR/SMC5M	192	52	20	40	193	52	21	40
WRF4D	172	42	18	40	193	49	18	42
LPN4M/3/4/5D	123	58	14	40	138	65	16	42
EPN4M/D	138	65	21	40	147	69	23	40
WFR/RFR4M	164	41	11	40	193	49	13	45
SMC4M	155	48	15	40	181	56	17	43
SMC3/4D	154	48	18	40	172	53	20	42

*Quadratic mean diameter of all trees, not the same as overstory tree diameter. Types are typically mapped from aerial photos, so the type label reflects overstory tree diameter. ** The SMC4P/S and WFR4/5P types are not thinned in the model due to the existing condition of canopy cover below 40%.. CC = canopy cover.

The effects will be very similar to that described for the thinning in DFPZ. Thinning to a 50% canopy cover puts all the types except SMC/WFR3S/M and SMC4M (and the pine types which are still thinned to 40% canopy) at or below 55% of ‘normal’ basal area, which will result in some loss of growth at the stand level (Table 3.11). SMC4P/S, WFR4/5P and WFR/RFR4M are still below 55% in 20 years. At these lower stocking levels, diameter growth of individual trees will be enhanced. In 20 years, SMC/WFR3S/M has a basal area above 70% of normal and is at risk.

Thinning to 11" dbh Upper Diameter Limit

This prescription models the grapple pile and mastication treatments both within the DFPZ and Area Thinning Zone. This prescription is applied where the trees to be removed are generally below saw log size (11" dbh) and there is an excessive amount of down woody debris and/or shrubs that act as ladder fuels and compete with young trees. It is a versatile treatment and works well in areas that have been understocked due to mortality. Grapple piling will be preceded by hand felling of undesired material (generally 11" dbh and less), which could include excess trees in plantations and larger dead trees not being intentionally left as snags. In addition to piling the felled material, down material in excess of standards will be piled. Grapple equipment will also be used to uproot shrubs to reduce ladder fuels. Piles will be burned within a year or two of treatment. Mastication will be used to kill shrubs and undesirable small trees and redistribute the fuel to a less flammable state that will decompose more rapidly. Grapple piling has a similar effect to hand thinning in terms of residual stand density, but has the additional advantage of being able to treat brush and pile larger undesirable material.

Table 3.11 Attributes post treatment and in 2026 for the 'Thin TO 50% Canopy Cover' (mechanical thin outside of DFPZ) prescription for stands in the Freeman Project (FVS modeled).

CWHR Strata	Post Treat Basal Area (ft^2/acre)	Post Treat Percent of 'Normal' Basal Area	Post Treat ave dbh (in)	Post Treat CC (%)*	Year 2026 Basal area (ft^2/acre)	Year 2026 %'Normal' Basal Area	Year 2026 ave dbh (in)	Year 2026 CC (%)*
SMC4P/S	99	31	7	32	143	44	8	44
WFR4/5P	104	26	6	35	144	36	8	47
SMC/WFR3S/M	145	56	9	50	204	79	11	57
WFR/SMC5M	201	54	13	47	210	57	14	48
WRF4D	204	51	15	43	236	59	15	53
LPN4M/3/4/5D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EPN4M/D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WFR/RFR4M	170	43	8	43	203	51	9	51
SMC4M	173	54	10	50	211	66	11	54
SMC3/4D	185	57	13	50	213	66	15	52

* The SMC4P/S, WFR4/5P, WFR/SMC5M , LPN4M/3/4/5D and WFR/RFR4M types are not thinned in the model due to the existing condition of CC below 50%.

Mastication and piling equipment can operate on slopes up to 40-45% without considerable damage to soils, so this treatment can extend upslope beyond mechanical harvesting equipment. Mastication will be used to kill shrubs and undesirable small trees. Mastication does not immediately reduce fuel loading but rearranges material in a manner that reduces the risk of crown fire initiation and allows for more rapid decomposition.

In all types except WFR4D, EPN4M/D and SMC3/4D, thinning to 11” dbh would reduce the canopy cover to below 40% (Table 3.12). In this case, the UPPER DIAMETER LIMIT for thinning would be as shown in Table 3.9. In the EPN4M/D and SMC3/4D types this treatment would not achieve the desired 40% canopy cover. For EPN4M/D the stocking is at 92% of normal (high risk) and increases to 96% of normal in 20 years.

Thinning to 8” dbh Upper Diameter Limit

An 8” dbh UPPER DIAMETER LIMIT is felt to be the upper end of feasibility for hand piling without prohibitive cost. Additionally, there are concerns about putting larger material into burn piles, both from the standpoint of wasting a resource that may be economically removed in the future and soil impacts with the long residual burn time of larger sized material. Hand thinning will occur in inner RHCAs (or the entire RHCA on steeper slopes) to a minimum of 60% canopy cover and on slopes greater than 40-45%.

Table 3.12 Attributes post treatment and in 2026 for the ‘Thin to 11” dbh’ (mastication and grapple pile treatment) prescription for stands in the Freeman Project (FVS modeled).

CWHR Strata	Post Treat Basal area (ft^2/acre)	Post Treat %‘Normal’ Basal Area	Post Treat ave dbh *(in)	Post Treat CC (%)**	Year 2026 Basal area (ft^2/acre)	Year 2026 % ‘Normal’ Basal Area	Year 2026 ave dbh (in)	Year 2026 CC (%)*
SMC4P/S	83	26	17	23	104	32	20	26
WFR4/5P	89	22	17	24	109	27	19	26
SMC/WFR3S/M	76	24	18	21	86	35	20	23
WFR/SMC5M	178	48	25	35	176	48	26	35
WRF4D	182	46	18	41	202	51	18	43
LPN4M/3/4/5D	128	60	18	36	136	64	20	37
EPN4M/D	183	86	18	50	199	94	20	51
WFR/RFR4M	147	37	18	32	165	42	20	33
SMC4M	136	42	18	33	155	48	19	35
SMC3/4D	160	50	18	41	179	56	20	43

*Quadratic mean diameter of all trees, not the same as overstory tree diameter. Types are typically mapped from aerial photos, so the type label reflects overstory tree diameter. **For stands where thinning to 11” dbh would result in a condition below 40 or 50%, the desired canopy cover becomes the limiting factor.

In the SMC4P/S and WFR4/5P types thinning to 8” dbh would reduce the canopy cover to below 40%, in which case the desired canopy cover would be the limiting factor (Table 3.13). In all other types the canopy cover is above the desired condition of 40%. EPN4M/D is at 100% of normal even after thinning to 8” dbh and at high risk of insect mortality.

Group Selection Treatments

Group selection (GS) creates small 0.5-2 acre openings in the forest canopy. Regeneration in the openings will either be natural or by planting. It is anticipated that pine and mixed conifer stands will need to be planted to get pine regeneration and to introduce rust-resistant sugar pine. Group openings in pine types usually do not need site preparation prior to planting. Fir types are anticipated to seed in naturally, following site preparation to reduce the amount of dead and down material. All group openings will be monitored to assure regeneration.

Silviculturally, one of the most important features of group selection is the effect that the surrounding stand has on the group. This effect can be both positive and negative. Positive effects include the potential for natural regeneration, sparing the expense of tree planting and providing shade and site protection for the seedlings. The primary negative effect is the reduction of growth in the group due to competition for sunlight and moisture from trees on the edge. In a water-limited system, the roots of trees on the edge can quickly fill in the opening. It is critical to monitor the regeneration in openings and to tend it aggressively, if necessary. If the regeneration is not successful, the result is a high-graded stand in which timber yield cannot be sustained. In DFPZ units that also have group selection, overall canopy for the stand will drop below 40%.

Under a regulated (sustainable over time), un-even aged group selection, with a 200-year rotation (200-years is suggested for poorer sites under QLG and used here to simplify the example–this project has both good and poor sites) and a 20-year interval, there are 10 age classes of trees, each occupying 10% of the area. It takes a different length of time to grow from one size class to another, given a managed stand (Table 3.14). The distribution shown in Table 3.14 assumes that it takes size class 0 20 years to grow to size class 3, which then takes 20 years to grow to size class 4. Once a stand reaches size class 4, 1/3 of the stands will grow to become size class 5, while 2/3 will stay at size class 4. That portion of the stand that reaches size class 4, stays at 5 until harvested, then 10% become size class 0 every 20 years.

Group selection is intended to balance the age class distribution toward a regulated condition for uneven-aged management. An analysis of size (as proxy for age) class distribution for stands in federal ownership within the project area shows that, as would be expected given the extensive logging around the turn of the century, there is a considerable amount of size class 4 (12-24" dbh) and a lack of larger diameter trees (Table 3.15).

Under a regulated (sustainable over time), uneven-aged GS, with a 200-year rotation (200-years is suggested for poorer sites under QLG and used here to simplify the example) and a 20-year interval, there are 10 age classes of trees, each occupying 10% of the area. It takes a different length of time to grow from one size class to another, given a managed stand (Table 3.14). This distribution assumes that it takes size class 0 20 years to grow to size class 3, which then takes 20 years to grow to size class 4. Once a stand reaches size class 4, 1/3 of the stands will grow to become size class 5, while 2/3 will stay at size class 4. That portion of the stand that reaches size class 4, stays at 5 until harvested, then 10% become size class 0 every 20 years.

Table 3.13 Stand attributes under 'thin to 8" dbh upper diameter limit' in 2006 and 2026 within the Freeman DFPZ/GS project (FVS modeled).

CWHR Strata	Post Treat Basal area (ft2/acre)	Post Treat %'Normal' Basal Area	Post Treat ave dbh* (in)	Post Treat CC(%)**	Year 2026 Basal area (ft2/acre)	Year 2026 Percent of 'Normal' Basal Area	Year 2026 ave dbh* (in)	Year 2026 CC (%)*
SMC4P/S	95	30	15	27	126	39	18	32
WFR4/5P	99	30	15	27	124	31	18	31
SMC/WFR3S/M	115	45	12	35	142	55	14	38
WFR/SMC5M	188	51	22	38	187	51	23	38
WRF4D	205	52	15	48	228	57	16	50
LPN4M/3/4/5D	136	64	17	38	146	69	19	40
EPN4M/D	211	100	16	56	218	103	19	56
WFR/RFR4M	159	40	17	35	181	46	19	37
SMC4M	159	49	15	41	183	57	17	43
SMC3/4D	174	54	16	45	199	62	19	47

*Quadratic mean diameter of all trees, not the same as overstory tree diameter. Types are typically mapped from aerial photos, so the type label reflects overstory tree diameter. **For stands where thinning to 8" dbh would result in a condition below 40 or 50%, the desired canopy cover becomes the limiting factor.

GS is intended to balance the age class distribution toward a regulated condition for uneven-aged management. An analysis of size (as proxy for age) class distribution for stands in federal ownership within the project area shows that, as would be expected given the extensive logging around the turn of the century, there is a considerable amount of size class 4 (11-23" dbh) and a lack of larger diameter trees (Table 3.15).

Table 3.14 The distribution of size class based on a balanced uneven-aged approach to growing for trees in poor site conditions.

Age	CWHR Type Size Class	Area (%)
0-20	0-2	10
20-40	3	10
40-60	4	10
60-80	4	10
80-100	4	10
100-120	5	10
120-140	5	10
140-160	5	10
160-180	5	10
180-200	5	10

Table 3.15 The regulated vs. existing conditions and the effect of the Proposed Action and alternatives on size class distribution.

Size Class	Age	Regulated Condition *	Existing condition	Alternative 1	Alternative 3	Alternative 4
		% (Acres)	% (Acres)**	% (Acres)	% (Acres)	% (Acres)
0-2 (0-6" dbh)	0-20	10 (1,184)	10 (1,220)	15 (1,795)	12 (1,395)	12 (1,394)
3 (6-10" dbh)	20-40	10 (1,184)	19 (2,192)	19 (2,192)	19 (2,192)	19 (2,192)
4 (11-23" dbh)	40-100	30 (3,554)	62 (7,354)	61 (7,186)	61 (7,186)	61 (7,186)
5 (24" dbh+)	100-200	50 (5,920)	9 (1,082)	6 (674)	9 (1,074)	9 (1,075)

*under uneven-aged management 200-year rotation
**Aspen treatments within aspen stands are not factored into the total, since this is an intentional type conversion rather than conifer regeneration.

Under HFQLG FRA, group selection harvest is based on a 150-year rotation for Dunning sites 1 and 2 (Forest Service site classes 1-3) and 200 years for Dunning sites 3 through 5 (Forest Service site classes 4 and 5), averaging 175 years. The annual harvest would be 1/175 or 0.57 percent of the QLG pilot project area. Since it is impractical to harvest every area every year, a cutting cycle of 20 years was proposed. With entries every 20 years, the annual harvest in a given area would be 0.57% times 20 or 11.4% of the available land base. A key point is that the HFQLG legislation included all acres in calculating the expected annual accomplishment. This included spotted owl PACs and SOHAs, low sites, recent burns and RHCAs, all of which would theoretically be up for harvest within the 175-year rotation. The rationale for including these areas in the 5-year pilot is that the over-accomplishment can be easily adjusted for in later years (USFS 1999, Appendix E). The effect of including all lands in the harvest base is to increase the amount of harvest scheduled in any given year.

The map developed by the QLG group showed that out of 14,967 acres (a small area was added to the project after this analysis was done, the acres used here are from an earlier version of the project area) in the project area, 12,700 are available for group selection. This translates to group selection acres of 72 at the 0.57% annual rate, 724 acres at a 10-year re-entry interval and 1,448 acres at a 20-year interval.

Not all of this area is actually available for harvesting timber. Besides the protections in place for various wildlife species (i.e., protected activity centers (PAC), spotted owl habitat areas (SOHA)) and riparian areas, there are existing roads, not all of the area is forested (i.e., barren, grass and shrub) and some of what is forested is not of merchantable size, particularly if on steep slopes with more expensive logging systems. By removing the acres that cannot practically be treated with group selection, 4,389 acres remain in the project area. This translates into 25, 250 and 500 acres at the various harvest intervals described above in a pure application of un-even aged regulation.

In order to move the existing condition toward the desired condition, under-stocked areas need to be regenerated, the youngest age classes need to grow and most of the current size 4 needs to grow into size 5 to make up the deficit there. Harvesting areas that are currently in size class 4 or 5 increases the percentage of size 1 and reduces the percentage of size 4 and 5, delaying the time to full regulation. Harvesting groups of larger trees, other than those that take advantage of pockets of health problems, would delay the time needed to achieve an uneven-aged condition. Stand planned for mechanical harvest were evaluated in the field for possible group selection opportunities that would improve forest health, resulting in 175 acres being identified for group selection.

Cumulative Effects

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Additionally, by focusing on the impacts of past human actions there is a risk of ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects.

The current vegetation reflects the sum total of all that has happened. Given the extensive logging around the turn of the century, there is a considerable 'bulge' in CWHR class 4 (12-24" dbh) and a lack of larger diameter trees. For a list of past actions that effect forest vegetation see Appendix E.

The cumulative effect of all of the activities impacting forest vegetation will be to reduce the number of acres in the current 'bulge' in CWHR size class 4. The activities in the adjacent areas under Forest Service management would be similar to those occurring in the project area.

Since the fate of QLG un-even aged management, group selection, is uncertain beyond the pilot project timeframe (currently ending in 2009), it is premature to suggest that the landscape would conform to the QLG vision in the long run. Whether the long-term strategy is even or un-even aged management, the thinning activities will benefit either end by improving growth and reducing the risk of epidemic insect and disease outbreaks.

DFPZ Maintenance

In July of 2003, a Record of Decision was signed for the *Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG FRA) Final Supplemental Environmental Impact Statement.* It documented the results of an environmental analysis of effects of alternative management strategies for maintenance of DFPZs within the HFQLG *Pilot project area*. The Final Supplement and this Record of Decision, in combination with the original HFQLG Act FEIS and ROD, provide the programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot project area.

Table 3.16 shows the acres by treatment type under Alternative 1 that would occur if the DFPZ were to be maintained as projected in the programmatic SEIS. The vegetative maintenance prescriptions used in the tables were developed from land allocations, slope breaks and vegetative characteristics consistent with the programmatic projections in the FSEIS. These models make projections of future conditions under a given set of assumptions and not actual predictions of future schedules and their environmental consequences. The effects of these projected treatments are discussed in the HFQLG SEIS.

The future maintenance for the Proposed Action is projected to include 1,594 acres of prescribed fire, 419 acres of hand treatment, 1,618 acres of mechanical treatment and 16 acres of herbicides. Alternative 3 was not analyzed separately due to the fact that it has only 22 fewer acres of treatment than Alternative 4. Alternative 4 (Table 3.17) is projected to include 1,576 acres of prescribed fire, 411 acres of hand treatment, 1,615 acres of mechanical treatment and 15 acres of herbicides. The herbicide treatment shows up due to isolated small acreages of shrubs within units. Based on site-specific analysis of the vegetation types and slopes in the project area, reviews of other projects completed within similar types and slopes and current direction to avoid use of herbicides, the foreseeable maintenance would consist of prescribed fire, hand treatments and some mechanical treatments. Herbicide use is not planned as part of the reasonably foreseeable DFPZ maintenance.

The DFPZ is designed to be effective for a period of 10-years. The earliest maintenance treatment to maintain effectiveness is expected to be approximately 10 years from completion of the initial DFPZ, based on a review of similar projects completed since the mid 1990's. The direct, indirect and cumulative effects of the foreseeable maintenance (hand, mechanical and prescribed fire treatments) would be similar to those described in the HFQLG FSEIS (pages 47—305).

Prior to implementing DFPZ maintenance, a site-specific project environmental analysis would be completed. The project would be designed to comply with forest plan standards. Surveys would be completed to insure that TE&S plants and cultural resources would be protected through flagging and avoidance.

Table 3.16 HFQLG SEIS projected DFPZ maintenance treatments under Alternative 1.

Allocations	Mixed Forest Types						Eastside Pine Type			Red-fir/Alpine Types			Brush	None	Total
	MX-A	MX-B	MX-C	MX-D	BO-E	MX-E	EP-A	EP-B	EP-C	RF-A	RF-B	RF-C	BR-A	NV	
Slopes ≤ 30%															
Amphibian Buffers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAT Perennial Streams	4	108	3	0	0	0	4	416	23	0	4	0	307	78	947
Owl/Goshawk Nest Stands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wild and Scenic Rivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Old Forest Emphasis Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical Aquatic Refuge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Land Allocations	80	1084	213	0	0	0	40	617	41	0	0	0	201	20	2,296
Subtotal-Slopes ≤ 30%	**84**	**1,192**	**216**	**0**	**0**	**0**	**44**	**1,033**	**64**	**0**	**4**	**0**	**508**	**98**	**3,243**
Slopes >30%															
Amphibian Buffers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SAT Perennial Streams	1	8	5	0	0	0	0	0	0	0	0	0	1	0	15
Owl/Goshawk Nest Stands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wild and Scenic Rivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Old Forest Emphasis Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical Aquatic Refuge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Land Allocations	27	263	59	0	0	0	1	23	0	0	0	0	16	0	389
Subtotal-Slopes >30%	**28**	**271**	**64**	**0**	**0**	**0**	**1**	**23**	**0**	**0**	**0**	**0**	**17**	**0**	**404**

Clear = Hand Thin, Light Gray = Prescribed Fire, Gray = Mechanical Thin, Black = Herbicides

Table 3.17 HFQLG SEIS projected DFPZ maintenance treatments under Alternative 4.

Allocations	Mixed Forest Types						Eastside Pine Type			Red-fir/Alpine Types			Brush	None	Total
	MX-A	MX-B	MX-C	MX-D	BO-E	MX-E	EP-A	EP-B	EP-C	RF-A	RF-B	RF-C	BR-A	NV	
Slopes ≤ 30%															
Amphibian Buffers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SAT Perennial Streams	4	104	3	0	0	0	4	408	23	0	0	0	300	77	**923**
Owl/Goshawk Nest Stands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Wild and Scenic Rivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Old Forest Emphasis Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Critical Aquatic Refuge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other Land Allocations	80	1080	213	0	0	0	39	617	41	0	4	0	199	20	**2,293**
Subtotal-Slopes ≤ 30%	**84**	**1,184**	**216**	**0**	**0**	**0**	**43**	**1,025**	**64**	**0**	**4**	**0**	**499**	**97**	**3,216**
Slopes >30%															
Amphibian Buffers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
SAT Perennial Streams	1	7	5	0	0	0	0	0	0	0	0	0	0	0	**13**
Owl/Goshawk Nest Stands	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Wild and Scenic Rivers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Old Forest Emphasis Areas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Critical Aquatic Refuge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Other Land Allocations	28	257	59	0	0	0	1	23	0	0	0	0	15	5	**388**
Subtotal-Slopes >30%	**29**	**264**	**64**	**0**	**0**	**0**	**1**	**23**	**0**	**0**	**0**	**0**	**15**	**5**	**401**

Clear = Hand Thin, Light Gray = Prescribed Fire, Gray = Mechanical Thin, Black = Herbicides

3.3.6.2 Differences Between the Action Alternatives

The primary difference in the action alternatives is the mix of treatments. Generally speaking, mechanical thinning is the preferred treatment to achieve both silviculture and fire risk reduction objectives due to the ability to remove trees of all sizes and the fact that the material is removed from the site, with only landing piles left to be burned. Burning piles within a stand poses a risk to the residual trees. Piled material can also be a source of insect infestation at certain times of the year. The most beneficial alternative is that which treats the most acres mechanically.

Alternative 1 (Proposed Action)

This alternative treats 3,970 acres by mechanical removal (aspen PAC thinning, helicopter ITS, mechanical thin, mechanical thin in aspen). Table 3.18 displays the amount of each CWHR type grouping that is being treated by each prescription in Alternative 1. All mechanically treated units are anticipated to meet the desired canopy cover. All of the mechanically treated areas within the DFPZ will be under 70% of normal stocking post-treatment and in 20 years. In the area thin, all stand types except the 100 acres of mixed conifer and white fir 3M types (see Analysis Methodology section for a definition of types) will be below 70% of normal post-treatment and in 20 years. In addition, in eastside pine 4 M/D, the 191 acres proposed for grapple piling/mastication and the 18 acres proposed for hand thinning will be above 70% of normal.

Of the 57 acres being hand thinned in this alternative, 28 acres meet the desired canopy cover. 29 acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D-RFR3D, SMC4M-MHC3S/4M/5M and WFR4D/3D will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). In other words, hand thinning is not always an effective treatment to reduce canopy cover, but does reduce ladder fuels to some extent. Similarly, of the 1,542 acres of grapple pile/mastication/thin to 11” dbh treatment, only 1,088 acres will meet the desired condition, due to the diameter limit. These treatments are proposed due to slope, watershed effects, lack of access, or other concerns.

This alternative has variable width extended treatment zones around the aspen stands in which all conifers <30” dbh would be removed. These zones amount to approximately 400 acres (as mapped using an average 75 foot width) of conifer forest that would be cut. They would gradually fill in with forest vegetation over time as the aspen clone expands and/or natural conifer regeneration takes place. These 400 acres would be changed to the early seral (0-2) CWHR class from size class 4 (Table 3.15), along with the 175 acres in groups.

Based on calculations from FVS harvest stand tables, borax would be applied to approximately 1,254 acres (does not include mechanical thin in fir types). A total of approximately 176 pounds of borax would be applied across the project area.

Table 3.18 Estimated acres of CWHR type in the Freeman Project area by prescription in Alternative 1.

CWHR Strata	40 % Thin	50% Thin	Hand Thin	Grapple/ Masticate	Aspen MT	Aspen PAC	Underburn	Total Acres
Aspen	1	0	0	2	229	11		243
EPN/PPN/JPN	774		27	191	58	0	20	1070
LPN	209		0	42	3	10	15	279
RFR5D	129	0	4	139	0	0		272
SMC3S/P/M/WFR3M/S/P								
WFR2S SMC2P/S								
RFR2S/3M/P	32	107	1	385	34	0		559
SMC3/4/5/6D								
RFR3D	250	123	1	221	55	2	2	654
SMC4M								
MHC3S/4M/5M	218	435	3	269	121	1		1047
SMC4P/S/5P/S								
RFR4S	39	14	0	68	9	0		130
WFR4/3D	53	108	10	42	26	0		239
WFR/RFR4M	131	262	0	79	27	0		499
WFR4/5P/4S	4	262	9	47	5	0		327
WFR/SMC5M	38	40	0	21	1	0		100
Non-forest(inclusions in other types)	67	38	2	36	44	0	2	189
Total:	**1,945**	**1,389**	**57**	**1,542**	**612**	**24**	**24**	**5,608**

*small acreages of miscellaneous types were included in this category

This alternative has variable width extended treatment zones around the aspen stands in which all conifers <30” dbh would be removed. These zones amount to approximately 400 acres (as mapped using an average 75’ width) of conifer forest that would be cut to allow sunlight into the aspen stand. They would gradually fill in with forest vegetation over time as the aspen clone expands and/or natural conifer regeneration takes place. These 400 acres would be changed to the early seral (0-2) CWHR class from size class 4 (Table 3.15), along with the 175 acres in groups.

Based on calculations from FVS harvest stand tables, borax would be applied to approximately 1,254 acres (does not include mechanical thin in fir types). A total of approximately 176 pounds of borax would be applied across the project area.

Alternative 3

This alternative treats 3,719 acres by mechanical removal. Table 3.19 displays the amount of each CWHR type grouping that is being treated by each prescription in this alternative. There are no extended treatment zones on the aspen stands, so the only change from size class 4 to 0-2 is due to groups.

Of the 54 acres being hand thinned in this alternative, 25 acres meet the desired canopy cover. Twenty-nine acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D, RFR3D, WFR4D/3D and

WFR4M/RFR4M will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). Similarly, of the 1,582 acres of grapple pile/mastication/thin to 11" dbh treatment, only 1,107 acres will meet the desired condition, due to the diameter limit. All of the mechanically treated areas within the DFPZ will meet the desired canopy cover and be under 70% of normal stocking post-treatment and in 20 years. In the area thin, all stand types except the 106 acres of mixed conifer and white fir 3M types will be below 70% of normal post-treatment and in 20 years. In addition, in eastside pine 4 M/D, the 107 acres proposed for grapple piling/mastication and the 27 acres proposed for hand thinning will be above 70% of normal.

Table 3.19 Estimated acres of CWHR type in the Freeman Project area by prescription in Alternative 3.

CWHR Strata	40 % Thin	50% Thin	Hand Thin	Grapple/ masticate	Aspen MT	Aspen PAC	Underburn	Total Acres
Aspen	7	0	0	1	220	11	0	**239**
EPN/PPN/JPN	817		27	194	0	0	20	**1058**
LPN	209		0	42	0	0	15	**266**
RFR5D	129	0	4	139	0	0	0	**272**
SMC3S/P/M/WFR3M/S/P	0	0	0	0	0	0	0	**0**
WFR2S SMC2P/S	0	0	0	0	0	0	0	**0**
RFR2S/3M/P	32	113	1	385	0	0	0	**531**
SMC3/4/5/6D	0	0	0	0	0	0	0	**0**
RFR3D	263	126	1	239	0	0	3	**632**
SMC4M	0	0	0	0	0	0	0	**0**
MHC3S/4M/5M	272	444	0	277	0	0	0	**993**
SMC4P/S/5P/S	0	0	0	0	0	0	0	
RFR4S	44	15	0	71	0	0	0	**130**
WFR4/3D	56	111	10	42	0	0	0	**219**
WFR/RFR4M	131	262	0	79	0	0	0	**472**
WFR4/5P/4S	8	263	9	56	0	0	0	**336**
WFR/SMC5M	38	40	0	21	0	0	0	**99**
Non-forest(inclusions in other types)	70	37	2	36	1	0	2	**148**
Total	**2,076**	**1,411**	**54**	**1,582**	**221**	**11**	**40**	**5,395**

*small acreages of miscellaneous types were included in this category

Based on calculations from FVS harvest stand tables, borax would be applied to approximately 1,333 acres (does not include mechanical thin in fir types). A total of approximately 187 pounds of borax would be applied across the project area.

Alternative 4 (Preferred Alternative)

Four thousand five hundred eight acres will be treated mechanically under this alternative. Table 3.20 displays the amount of each CWHR type grouping that is being treated by each prescription in this alternative. Of the 42 acres being Of the 23 acres being hand thinned in this alternative, 10 acres meet the desired canopy cover. Nineteen acres in types EPN4M/D, RFR5D, SMC3D/4D/5D/6D, RFR3D, WFR4D/3D and WFR4M/RFR4M will not meet the desired condition of 40 or 50% canopy cover (DFPZ or area thin). Similarly, of the 727 acres of grapple pile/mastication/thin to 11” dbh treatment, only 578 acres will meet the desired condition, due to the diameter limit. This alternative achieves the desired condition on many more acres than the others. All of the mechanically treated areas within the DFPZ will be under 70% of normal stocking post-treatment and in 20 years. In area thin, all stand types except the 68 acres of mixed conifer and white fir 3M types will be below 70% of normal post-treatment and in 20 years. In addition, the 43 acres of eastside pine 4 M/D proposed for grapple piling/mastication and the 27 acres proposed for hand thinning will be above 70% of normal. This alternative achieves the desired condition on significantly more acres than the others.

This alternative also has no aspen extended treatment zones, but changes treatment on many acres from grapple pile or mastication to mechanical thinning. It is likely that most of these areas are pre-commercial, that is, do not have enough value in the products removed to cover the cost of removal. However, the advantage of mechanical thinning is that a product is removed, primarily biomass for power generation but including some small saw logs, the fuel is removed from the site, and there are no piles left to burn.

Based on calculations from FVS harvest stand tables, approximately 220 pounds of borax would be applied to approximately 1,837 acres. This alternative also has no aspen extended treatment zones.

3.3.6.3 Alternative 2 (No-action)

Direct and Indirect Effects

Defensible Fuel Profile Zones

Under the No-action Alternative, the DFPZ fire risk reduction strategy will not be implemented and existing stands will continue to be at risk of loss due to stand-replacing fire. According to FVS, the desired condition of 40% canopy cover or below would only occur in the SMC4P/S and WFR4/5P types (Table 3.21). In twenty years none of the types will have canopy cover at or below 40%. No diseased trees would be removed under the No-action Alternative.

According to FVS, the SMC3/4D, LPN4M/3/4/5D and EPN4M/D types currently have stocking over 70% of normal. These types will grow at a reduced rate and be at risk of mortality due to inter-tree competition and insects. Additionalyy, in twenty years, the SMC/WFRS/M type will also have a density greater than 70% of normal. Mortality in over-stocked stands will increase fuel loading and fire risk. Diameter growth will be reduced. Pine stands with stocking in excess of 150 square feet of basal area will be at high risk of epidemic bark beetle mortality (Fiddler, et al. 1989). Mistletoe will continue to develop in affected stands, slowing growth and increasing risk of loss to fire. Shade tolerant species will continue to develop in the understory, providing a continuous fuel ladder. Diameter growth and the development of stands into CWHR size class 5 will be slow due to competition. The EPN4M/D type, which currently has an average diameter of 10” will only develop an average diameter of 11” in 20 years.

Table 3.20 Estimated acres of CWHR type by prescription in the Freeman Project area Alternative 4.

CWHR Type	40 % Thin	50% Thin	Hand Thin	Grapple/ masticate	Aspen MT	Aspen PAC	Underburn	Total Acres
Aspen	4	0	0	3	220	11	0	**238**
EPN/PPN/JPN	892	0	26	140	0	0	0	**1,058**
LPN	216	0	0	35	0	0	15	**266**
RFR5D	228	0	4	17	0	0	0	**249**
SMC3S/P/M/WF R3M/S/P	0	0	0	0	0	0	0	**0**
WFR2S SMC2P/S	0	0	0	0	0	0	0	**0**
RFR2S/3M/P	106	121	0	267	0	0	0	**494**
SMC3/4/5/6D	0	0	0	0	0	0	0	**0**
RFR3D	274	345	1	3	0	0	1	**624**
SMC4M	0	0	0	0	0	0	0	**0**
MHC3S/4M/5M	380	454	0	155	0	0	0	**989**
SMC4P/S/5P/S	0	0	0	0	0	0	0	**0**
RFR4S	48	37	0	34	0	0	0	**119**
WFR4/3D	103	111	0	6	0	0	0	**220**
WFR/RFR4M	176	262	0	33	0	0	0	**471**
WFR4/5P/4S	17	296	9	2	0	0	0	**324**
WFR/SMC5M	57	40	0	1	0	0	0	**98**
Non-forest (inclusions in other types)	69	40	2	31	1	0	2	**145**
Total	**2,570**	**1,706**	**42**	**727**	**221**	**11**	**18**	**5,295**

*small acreages of miscellaneous types were included in this category

Under-stocked stands (generally those below 55% of ‘normal’), within types SMC4P/S, WFR4/5P and WFR/RFR4M will remain so, often with high fuel loadings, limiting natural regeneration and increasing fire risk. Pine will continue to be under-represented in the stand composition. Although individual trees in these poorly stocked stands have the potential to grow to a large diameter, most of these stands will not develop the density associated with “old-growth”. In twenty years, those same types remain below 55% of normal.

Table 3.21 Attribute changes between 2006 and 2026 for the No-action Alternative for sampled CWHR types in the Freeman DFPZ/GS Project (FVS modeled).

CWHR Strata	Year 2006 Basal Area (ft^2/acre)	Year 2006 % 'Normal' Basal Area	Year 2006 ave dbh (in)	Year 2006 CC (%)	Year 2026 Basal Area (ft^2/ acre)	Year 2026 % 'Normal' Basal Area	Year 2026 ave dbh (in)	Year 2026 CC (%)
SMC4P/S	99	31	7	32	143	44	8	44
WFR4/5P	104	26	6	35	144	36	8	47
SMC/ WFR3S/M	154	60	6	57	218	85	8	65
WFR/SMC5 M	202	55	11	48	212	57	12	50
WFR4D	240	60	8	65	275	69	9	66
LPN4M/3/4/5 D	156	74	9	47	172	81	10	50
EPN4M/D	226	107	10	64	239	113	11	64
WFR/RFR4M	170	43	8	44	203	51	9	52
SMC4M	178	55	8	53	218	68	9	59
SMC3/4D	200	79	9	58	230	71	10	60

*Quadratic mean diameter of all trees, not the same as overstory tree diameter. Types are typically mapped from aerial photos, so the type label reflects overstory tree diameter. CC = canopy cover

Group Selection and Area Thinning

The imbalance in age class structure will continue. Stands will remain relatively even-aged. Although there will be some progress towards a higher percentage of the area in larger (>24" dbh) trees, growth will be slow due to tree competition. Areas of current mortality will be at high risk of loss in a wildfire due to the heavy fuel loading. Regeneration of currently under-stocked areas, mainly in the fir types, will occur slowly.

3.4 Special Habitat and Biodiversity Area Effects

3.4.1 Introduction

The following assessment is summarized from the botany report for special interest plant species and other botanical resources for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006c). The purpose of this Botany Report is to describe the effects of the proposed project on plant species of the Plumas National Forest Special Interest list, Special Habitats, Management Indicator Species (MIS) species and other botanical resources. Notes about revegetation with native species are included in the Management Recommendations section.

3.4.2 Summary of the Effects

3.4.2.1 Action Alternatives

The special habitats in the Freeman Project area are seeps, springs, aspen and willow-alder communities.

There are seven seeps and ten springs known in the project area. Each of these sites has been surveyed for sensitive and special interest plants. A total of 11 springs and seeps occur in or near treatment units (within 100 feet). Nine control areas will be designated to protect these 11 springs and seeps. Some control areas will have more than one seep or spring and five of them will also contain occurrences of the sensitive plant species *Botrychium minganense*. These control areas will be flagged and avoided. The protection measures for the special habitats in the project area are summarized in Chapter 2, under Specific Design Features and Mitigations. These protections are consistent with the SOP's for RHCA's (Appendix D).

3.4.2.2 Differences Between the Action Alternatives

Alternative 1

There are 300 acres of aspen stands delineated within the Freeman Project area, each of which exhibits a varying degree of conifer encroachment. Alternative 1 would treat 645 acres. Alternative 1 proposes to have extended treatment zones around the aspen groves where conifers would be removed. Alternative 1 would be a more effective treatment because it would allow sunlight to reach the laterally extending aspen roots (Shepperd 2004).

Alternative 3 and 4 (Preferred Alternative)

Alternatives 3 and 4 would treat 233 acres. Alternatives 3 and 4 would not treat the extended treatment zones. Alternative 3 and 4 would be less effective aspen treatments than the Proposed Action.

3.4.2.3 Alternative 2 (No-action)

There would be no direct effects from the No-action Alternative other than those associated with current ongoing actions. The general discussion of the indirect and cumulative effects of Alternative 2 would be similar to those in the Freeman Project BE with the exception of the special habitat and aspen communities. The effects to aspen communities are discussed below.

As conifer encroachment increases, under the No-action Alternative, wildlife forage and habitat are adversely impacted, both on-site and across the immediate landscape. Under the No-action Alternative, conifer encroachment would continue and competition for resources would increase. Over time the percentage of aspen stands at highest risk of loss can be expected to increase. The likelihood of a stand-replacing fire occurring within the aspen stands would also increase over time, further increasing the risk of losing the stand.

With fire permanently excluded from some areas wildlife habitat, ecological diversity and hydrologic function will be lost.

3.4.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for analyzing cumulative effects to special habitats is the project boundary. The Freeman Project will not affect special habitats outside of the project area. Therefore, an analysis area equal to the project area insures adequate conservation.

Timeframe of Analysis: Past and current activities listed in Appendix E have altered special habitats. The effects of past activities are built in to this analysis in that they are largely responsible for the existing landscape.

3.4.4 Analysis Method

The Freeman Project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for rare species. In the field, areas identified as potential special habitats were surveyed at a high level of intensity (complete survey). Special habitat location data were recorded using Global Positioning Systems and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to special habitats and identify potential detrimental treatments. A stand loss risk analysis for aspen communities was done according to US Forest Service Region 5 protocols (USFS 2002).

3.4.5 Affected Environment

Special habitats in the Freeman Project area include aspen communities, seeps, springs and willow/alder communities.

3.4.5.1 Springs and Seeps

Groundwater seeps, springs, wet meadows and other wetlands were documented at numerous sites within the project area (Moore and Jennings 2004). These habitats are considered sensitive resources because they provide valuable habitat for a diversity of plants and wildlife and perform essential ecological and hydrological functions. Wetlands also support numerous Plumas NF sensitive and special interest plants species (Hanson 1999, 2003a, 2003b). Buffer zones will be established and maintained around seeps, springs and associated meadows according to the SOP for RHCA which can be found in the Freeman Project record.

3.4.5.2 Willow/Alder Plant Community

Groundwater seeps and spring wetlands in the project area support a rich array of hydrophytic species including shrubs. The most notable common shrub community within riparian areas and seeps/springs in and adjacent to the Freeman Project is riparian willow and alder shrub stands. These areas will be protected by enacting current SOP's regarding RHCA's.

3.4.5.3 Aspen Communities

Quaking aspen (*Populus tremuloides*) is a hardwood tree species that reproduces vegetatively by sprouting suckers in response to fire and other disturbances. It can form large colonies of clonal trees. Aspen communities support biodiversity, provide wildlife forage and habitat, create the conditions required by a variety of plant assemblages and conserve riparian soil moisture (Jones et al. 2005).

Many stands of quaking aspen throughout the forest and across the region are not successfully regenerating. The lack of successful regeneration is attributable to the combination of many factors including, but not limited to: past fire activity; conifer encroachment; stand microclimate changes; and grazing pressures. These factors, in combination with other alterations, have lead to an overall concern for the productivity and health of aspen stands. In comparison with pine and other native conifer communities, quaking aspen stands are of limited extent on the PNF landscape (USFS PNF BRD 2006k). Limited occurrence on the landscape, as well as the distinctive ecological niches and processes that occur within aspen communities, create unique and diverse habitats that are often absent elsewhere.

Aspen stands are also a valuable aesthetic resource. The Plumas Visitors Bureau of Commerce promotes aspen as a visitor attraction and advertises in local and regional publications and their tourism web site every autumn.

Fire suppression on the PNF has allowed for an increase in the occurrence of dense patches of early, mid and late-seral stage conifer within aspen. There is a general lack of pure aspen stands across the District, except where recent fires have occurred. The lack of pure stands displays a fundamental point that is applicable to many stands within the region; when large-scale disturbances, such as fire, are removed from disturbance-dependent ecosystems like aspen communities, the communities will successionally convert.

A lack of fire enables conifers to establish within aspen groves while preventing stimulation of new aspen sprouts. Conifers exhibit numerous competitive advantages over aspen including a more developed root system, longer annual photosynthetic duration period and a greater tolerance to shaded growth conditions. Another substantial disadvantage aspen clones must endure is the hindrance that grazing and browsing exerts upon sprout regeneration. Over-browsing and over-grazing by ungulates often leads to repetitive incremental disturbances that may yield substantial adverse effects to stand regeneration over time.

Due to greater shade tolerance and other various ecological advantages, conifers have begun to adversely influence aspen community stability. Conversion of aspen stands to conifer also leads directly to changes in vegetative understory composition and diversity. Aspen are very shade intolerant and are generally not found to successfully root sprout under a moderate to closed canopy. In fact, root sprouting requires warm soil temperatures, typically around 74°F. Thus, shaded soil surfaces, or areas where duff is considerably deep, are less likely to provide favorable sprouting conditions. Furthermore, both individual and patches of conifer trees limit the amount of sunlight received by aspen foliage, thus lowering photosynthetic production and further hindering aspen stand productivity.

Conditions for seed induced sprouting of aspens are rare. The majority of clones observed on today’s landscape are perpetuated through effective root sprouting. By extrapolating the conifer encroachment trend and the associated impacts of the encroachment upon aspen root sprouting, as well as the impacts of competition upon mature stands, one can foresee the gradual decline of aspen communities. With fire permanently excluded from some areas (such as in the wildland urban interface) and suppressed in other areas, any elimination of aspen communities from the forested landscape is likely to be permanent. In addition to the lost of landscape diversity, wildlife habitat, ecological diversity and hydrologic function (including sediment storage, water yield alterations and changes within riparian understory composition and diversity) would also be affected.

A stand loss risk analysis was done by PNF personnel in 2005 and 59% of the stands in the Freeman Project area were found to have a high or highest risk of loss. The analysis was done according to US Forest Service Region 5 protocols (USFS 2002). Table 3.22 summarizes the acres of aspen stands to be treated and their associated risk of loss. Degree of risk ranges from none to highest.

Table 3.22 Acres of aspen risk loss factors in the Freeman Project area.

	Alternative 1 (Proposed Action)	Alternative 2 (No-action)	Alternative 3	Alternative 4 (Preferred Alternative)
Highest	26	27	25	25
High	87	107	80	80
Moderate	74	86	71	71
Low	56	70	56	56
Total	243	290	232	232

Some aspen stands are not included in any of the action alternatives because they were found after the alternatives had been developed or they are within protected areas. They are included in Alternative 2, the No-action Alternative. The degrees of risk are defined below.

Risk of Stand Loss Analysis

Highest: The clone is being lost from above *AND* is not being replaced from below:

- Conifer crowns have overtopped the aspen crowns, (primary risk factor) and
- Conifer species comprise at least half the canopy (primary risk factor) and
- Regeneration absent or unsuccessful due to excessive browsing or other factors (primary risk factor)

(If 2 or more primary risk factors are indicated on field form, then the ranking = highest)
High: The clone is being lost from above OR is not being replaced from below.
(If at least one of the primary risk factors affecting crown and regeneration is indicated on field form, then the ranking = high)
Moderate: One or more risk factors below is present, but clone not in immediate danger. May include one or more of the factors below:

- Conifer closure > 25%, but < 50% [if > 50%, ranking is High or Highest]
- Aspen cover < 40%
- Dominant aspen are decadent
- Aspen regeneration 5 – 15 ‘ tall is < 500 stems per acre
- Regeneration being excessively shaded by conifers
- Browsing is limiting extent and numbers of successful (> 5’ tall) regeneration

(If one or more of these risk factors is indicated on field form then ranking = moderate)
Low: Clone essentially healthy, mature trees and/or regeneration for the most part healthy and vigorous, no obvious signs that the clone has receded, < 15% of the clone affected by risk factors.
None: None of the above risk factors present, mature trees vigorous, regeneration 5–15’ tall ≥ 500 stems.

3.4.6 Environmental Consequences

3.4.6.1 Action Alternatives

Springs and Seeps

Groundwater seeps, springs, wet meadows and other wetlands were documented at numerous sites within the project area (Moore and Jennings 2004). These habitats are considered sensitive resources because they provide valuable habitat for a diversity of plants and wildlife and perform essential ecological and hydrological functions. Wetlands also support numerous Plumas NF sensitive and special interest plants species (Hanson 1999, 2003a, 2003b). Buffer zones will be established and maintained around seeps, springs and associated meadows according to the SOP for RHCA which can be found in the Freeman Project record.

Willow/alder Plant Community

Groundwater seeps and spring wetlands in the project area support a rich array of hydrophytic species including shrubs. The most notable common shrub community within riparian areas and seeps/springs in and adjacent to the Freeman Project is riparian willow and alder shrub stands. These areas will be protected by enacting current SOP's regarding RHCA's.

3.4.6.2 Differences Between the Action Alternatives

Alternative 1 (Proposed Action)

Aspen Communities

There are 300 acres of aspen stands delineated within the Freeman Project area, each of which exhibit a varying degree of conifer encroachment. Under the Proposed Action, aspen will be released from conifer competition in 40 units, ranging in size between 1 and 85 acres. This treatment would occur on a total of approximately 645 acres. The aspen treatment units in the Proposed Action include the area within an extended treatment zone around the aspen stands. The extended treatment zone extends an average of 75 feet from the aspen stands and will not exceed 150 feet from the aspen stand. The 75-foot average extension was added to the mapped area of aspen stands to form a perimeter of aspen treatment areas, yielding the total of 645 acres.

Of the total 645 acres of aspen treatment units, 350 acres are within RHCA's. Under the Proposed Action, within RHCA's only hand treatment will occur on slopes greater than 15%. Adding the slope restriction to these 350 acres reduces the total aspen treatment acres by 50 acres. These 50 acres will be treated by hand thinning, removing trees up to 8" in diameter. Depending on the size and number of conifers remaining, this treatment would most likely be less effective at promoting aspen regeneration.

Conifers up to 29.9" dbh will be removed, but specified trees in stream corridors that provide bank stability will be left.

Removal of conifers in the 150-foot extended treatment zone would create suitable habitat for the aspen stand to increase in size and productivity. Allowing sunlight to reach the lateral roots extending away from the aspen will stimulate suckering (Shepperd 2004). The treatment within the aspen stands would provide mild disturbance, which also stimulates suckering. Treatment in the extended treatment zone would also reduce the risk of stand-replacing fires within aspen groves.

A no-equipment buffer zone (25' wide) will be established along each side of the stream channels to ensure no disturbance to bank stability. Equipment may be positioned outside of the buffer and harvest/gather material via an extendable harvest arm attachment. Crossing of the stream channel will be allowed in the case of special circumstances only and requires permission from the Sale Administrator and Hydrologist. If a crossing were deemed necessary for effective harvest and fuel reduction, reconstruction of channel banks by the contractor will be required.

Skid trails and landings will be pre-designated. Skid trails will be spaced approximately every 80 - 120’, generally perpendicular to streams and skidders would be allowed to enter the outer RHCA on these skid trails. Landings will be located outside of the aspen stand perimeter and RHCA buffer zones to minimize disturbance to the aspen communities as well as the RHCA buffer zones. Skid trail and landing layout is critical and the appropriate resource specialist, in combination with the timber sale administrator, would be consulted.

Compaction from equipment is likely to occur. Erosion from disturbed areas is unlikely to be extensive, as residual understory vegetation is anticipated to remain abundant. Only low ground pressure equipment (under 8.0 psi) would be allowed to enter an RHCA; it would not be allowed within the no-equipment buffer zone.

Unless deemed necessary by resource specialists following post-harvest review, aspen units would not be underburned or subsoiled.

The proper placement of hand piles is a critical component of aspen stand protection. Due to the proximity of most aspen roots to the soil surface, (95% within 4”) and due to the susceptibility of the cambium layer to heat exposure, pile burning within the established communities is highly discouraged. Pile burning within aspen stands often leaves small areas of bare soil, causes root mortality due to the length of heat exposure, may leave mature trees susceptible to fungal or insect infestation and may kill sub-adult and mature trees through heat exposure.

It is expected that small short-term impacts within each treated aspen stand may occur, but as natural recovery mechanisms are reinvigorated through an effective stand release, these impacts are expected to be of short duration.

Very similar aspen treatments have been done successfully in the Lassen National Forest. A five-year study, including control groups, was done to test the hypothesis that conifer removal, along with control of grazing, would enhance recruitment of new aspen stems. The study is published in a peer-reviewed scientific journal (Jones et al. 2005). Treatment consisted of removing conifers up to 26” dbh. Commercial and nonmerchantable trees were removed by hand felling with chain saws and transported to landings by grapple skidders. Trees less than 10” dbh were hand piled and burned within the aspen stands.

Jones et al. (2005) report the effectiveness of conifer removal in the regeneration of aspen stands. Growth results were measured annually for four years following treatment. A reduction in density of some size classes was seen in the first two years after treatment. After four years an increase in aspen density, as compared to control stands, was observed for all size classes. The increase can be attributed to hormonal stimulation as a result of the disturbance and/or the increased available sunlight. Several other factors can also affect the results: amount of rainfall, annual fluctuations of seasonal temperatures, grazing pressures. The study mentioned above made use of control groups to account for these variables. The authors cite several other published articles with similar results that support their findings.

In conclusion, over the long-term, it is expected that implementation of the Proposed Action would be beneficial to both landscape and on-site resource diversity.

Alternative 3 and 4

Aspen Communities

The aspen treatment areas would be defined by the extent of riparian vegetation and only aspen stands within that vegetation would be treated. This amounts to a total of 232 acres, in units ranging from 1 to 31 acres in area. Additionally, Alternative 3 would evaluate the upper diameter limit of conifer retention, based on whether the conifers were present previous to the aspen stand. These changes would result in a greater number of conifers left within some aspen stands and greater canopy cover around some aspen stands.

All of the 232 acres of aspen treatment units are within RHCA's. Under Alternative 3, the slope restriction will change from the 15% in the Proposed Action to 35% in Alternative 3 and 4. Only hand treatment will occur on slopes greater than 35% within RHCA's. This change will allow a greater number of acres to be treated. Although this change will increase the short-term risk of sediment reaching the stream, the risk is outweighed by the long term benefits to be gained by treating the aspen communities (Barbara Drake personal communication). Standards for ground cover, found in the Land and Resource Management Plan (USFS PNF 1988) will be adhered to and will reduce sedimentation.

The effects of Alternative 1, as discussed above, would apply to this alternative with the following exceptions. The positive effects discussed in Alternative 1 would be realized, but to a lesser degree.

Under this alternative some areas around treated aspen stands would remain untreated. Those stands would be less likely to expand in area due to the existing conifers. At the perimeter of those aspen stands competition for resources would continue and would likely increase. The aspens would be likely to respond favorably to the treatment done within the stand, but they would have less chance of expanding into the surrounding area where greater canopy cover remains.

The risk of a stand replacing fire would be less than that of the No-action Alternative but greater than that of Alternative 1. If the area around the aspen is densely forested and left untreated the likelihood of high-intensity fire reaching the aspen would be higher than if the area had been treated.

Cumulative Effects

The effects of past activities are built into this analysis in that they are largely responsible for the existing landscape. Management activities that have cumulatively impacted aspen communities on the forest include: historic grazing, timber harvest, fire suppression, prescribed fire, road construction and any activity that caused a change in water flow.

Grazing has occurred in the Beckwourth Ranger District for at least the previous 150 years. Grazing in the Grizzly Valley Allotment will continue to impact aspen communities. Cattle can damage new aspen suckers, degrade aspen habitats and spread noxious weeds. Grazing can prevent suckers from reaching maturity. In areas where cattle cause impacts to streams, water flow may be appreciably altered. Normally moist riparian areas may dry out due to these changes, thereby decreasing aspen productivity due to lack of water. Cattle can transport noxious weeds and provide the disturbance that favors their establishment. Competition from noxious weeds can impede aspen growth. Freeman Project activities would not add to the adverse effects of grazing on aspen communities for the following reasons: the project would not alter grazing regimes, aspen surveys and risk-loss analysis has been done for the project area, treatments are designed to benefit aspen communities.

The Lake Davis Pike Eradication project may affect aspen communities by altering the hydrology of nearby riparian habitat. It is possible that the proposed draw down of Lake Davis would cause some riparian areas to be drained at an unnatural time of year. Lack of water in early summer may adversely affect aspen productivity. These potential effects will be analyzed in the environmental document for that project and will be mitigated appropriately. Freeman Project activities would not have adverse effects on aspen communities for the following reasons: the project would not alter hydrologic regimes, aspen surveys and risk-loss analysis has been done for the project area, treatments are designed to benefit aspen communities.

The Lake Davis Pike Eradication project may affect the spread of noxious weeds. There are known populations of Canada thistle (*Cirsium arvense*) and tall whitetop (*Lepidium latifolium*) on the shore of the lake. Both of these weeds can become dominant in riparian areas. Competition from these weeds can adversely impact aspen communities. Standard weed precautions will be followed during implementation of both the Freeman and Lake Davis Pike Eradication projects and will minimize the risk of noxious weed infestation. These known weed sites will not be disturbed by project activities. Details of noxious weed sites, risks and treatments can be found in Appendix B, (the Noxious Weed Risk Assessment) of the Biological Evaluation for Threatened, Endangered and Sensitive Plant Species.

Watershed restoration projects have occurred in the Freeman Project area over the past several years. Changes in hydrology can affect aspen habitats. These projects were designed to restore the natural hydrological regime. Overall, aspen habitat should increase as a result of the restoration. Standard weed precautions were followed during implementation.

It is also likely that future management actions would include recreation, some prescribed fire and timber management activities. Standards and Guidelines apply to all foreseeable future actions and would reduce cumulative effects on aspen communities. Standards and Guidelines can be found in the HFQLG SEIS ROD (2003).

3.4.6.3 Alternative 2 (No-action)

Aspen Communities

The degree of conifer encroachment in aspen communities is directly related to a decrease in understory production (Mueggler 1985). Thus, as conifer encroachment increases, under the No-action Alternative, wildlife forage and habitat are adversely impacted, both on-site and across the immediate landscape. Currently, 59% of the aspen stands in the Freeman Project area are considered to be at highest risk of loss. Under the No-action Alternative, conifer encroachment would continue and competition for resources would increase. Over time the percentage aspen stands at highest risk of loss can be expected to increase. The likelihood of a stand-replacing fire occurring within the aspen stands would also increase over time, further increasing the risk of losing the stand.

With fire permanently excluded from some areas (such as in the wildland urban interface) and suppressed in other areas, any elimination of aspen communities from the forested landscape is likely to be permanent. Other resources lost, beyond reduced landscape diversity, are often manifested in wildlife habitat, ecological diversity and hydrologic function (including sediment storage, water yield alterations and changes within riparian understory composition and diversity).

3.5 Wildlife Effects

3.5.1 Introduction

A Biological Assessment/Biological Evaluation (BA/BE) was written by the wildlife biologist to determine whether the Proposed Action, as well as other action alternatives, would result in a trend toward listing or loss of viability for sensitive species and to document effects on threatened, or endangered species and/or their critical habitat as part of determining whether formal or informal consultation is needed. The BA/BE was prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act [19 U.S.C. 1536 (c), 50 CFR 402] and standards established in Forest Service Manual direction (FSM 2672.42).

Five categories of species are considered in the BA/BE; threatened, endangered, proposed, candidate and Forest Service sensitive species. Species federally listed as endangered by the United States Department of the Interior Fish and Wildlife Service (USFWS) are species currently in danger of extinction throughout all or a significant portion of their range. Species listed as threatened are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. A proposed species is any species that is proposed in the Federal Register to be listed as a threatened or endangered species under the ESA (50 CFR 402.03). A candidate species is a species for which the USFWS has on file enough information to warrant or propose listing as endangered or threatened. Sensitive species are designated by the Regional Forester and are species that have known or suspected viability problems due to (1) significant current or predicted downward trends in population numbers or density and/or (2) significant current or predicted downward trends in habitat quantity or quality for these species. The Forest Service considers the long-term conservation needs of sensitive species in order to avoid future population declines and the need for federal listing.

The BA/BE document consists of both a Biological Assessment for federally listed wildlife species potentially occurring on the PNF (“Federal Endangered and Threatened Species that may be affected by projects on the Plumas National Forest” updated February 14, 2006 (USFWS database, Appendix A)) and a Biological Evaluation for Region 5 Sensitive Species (updated June 8, 1998, appended March 6, 2001 and May 7 2003 and updated April 26, 2004, with a subsequent correction memo dated May 12, 2004 and supplemented with an additional direction letter dated August 4, 2004). None of the new sensitive terrestrial invertebrates, aquatic invertebrates or amphibians added to the Regional list with the 2004 updates are reported as occurring on the PNF. Table 3.23 contains a list of TES species that potentially occur on the PNF and may be addressed in the BA/BE. Brief habitat accounts are attached as Appendix G of the BA/BE. No critical habitat as designated by the USFWS is present within or near the project area (Federal Register, March 13, 2000).

Table 3.23 Threatened, endangered, proposed and sensitive animal species that potentially occur on the Plumas National Forest

Species	Category
Invertebrates	
Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*)	Threatened
Fish	
Hardhead minnow (*Mylopharodon conocephalus*)	Sensitive
Amphibians	
California red-legged frog (*Rana aurora draytonii*)	Threatened
Foothill yellow-legged frog (*Rana boylii*)	Sensitive
Mountain yellow-legged frog (*Rana muscosa*)*	Sensitive
Northern leopard frog (*Rana pipiens*)	Sensitive
Reptiles	
Northwestern pond turtle (*Clemmys marmorata marmorata*)	Sensitive
Birds	
Bald eagle (*Haliaeetus leucocephalus*)	Threatened
American peregrine falcon (*Falco peregrinus anatum*)	De-Listed - Sensitive
Northern goshawk (*Accipiter gentilis*)	Sensitive
California spotted owl (*Strix occidentalis occidentalis*)	Sensitive
Great gray owl (*Strix nebulosa*)	Sensitive
Willow flycatcher (*Empidonax trailii brewsteri*)	Sensitive
Greater sandhill crane (*Grus canadensis tabida*)	Sensitive
Swainson's hawk (*Buteo swainsoni*)	Sensitive
Mammals	
Sierra Nevada red fox (*Vulpes vulpes necator*)	Sensitive
American marten (*Martes americana*)	Sensitive
Pacific fisher (*Martes pennanti pacifica*)	Sensitive
California wolverine (*Gulo gulo luteus*)	Sensitive
Pallid bat (*Antrozous pallidus*)	Sensitive
Townsend's big-eared bat (*Corynorhinus townsendii*)	Sensitive
Western red bat (*Lasiurus blossevillii*)	Sensitive

*The Sierra Nevada population of the mountain yellow-legged frog designated as a candidate species by USFWS (Federal Register January 16, 2003 Volume 68, #11), but listing under the Endangered Species Act is precluded by the need to take other listing actions of a higher priority.

Several T&E species identified in the list of T&E species provided by the "Federal Endangered and Threatened Species that may be affected by Projects in the Plumas National Forest", updated February 14, 2006, accessed via USFWS county list web page (http://www.fws.gov/sacramento/es/spp_lists/NFActionPage.cfm) (Appendix A), have been eliminated from further analysis, based on past analysis and concurrence from the USFWS (HFQLG BA/BE Rotta 1999, USFWS letter 1-1-99-I-1804 dated August 17, 1999) or due to lack of species distribution and/or lack of designated critical habitat. These species are listed below:

- Winter Run Chinook Salmon (*Oncorhynchus tshawaytsha*)
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Delta Smelt (*Hypomesus transpacificus*)
- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)
- Central Valley spring-run Chinook salmon (*Oncorhynchus tshawaytsha*)

- Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)
- Critical Habitat for vernal pool invertebrates (Butte County)
- Critical habitat for California Red-legged frog (currently Proposed)

In addition, there is no known habitat or known occurrences and the Freeman Wildlife Analysis Area is above the elevational range for the following threatened or endangered species: Valley elderberry longhorn beetle and California red-legged frog. Therefore, these two species will not be discussed further in this document. There is also no suitable habitat and have been no observations within the Freeman Wildlife Analysis Area for the following sensitive species: hardhead minnow, Northern leopard frog and Swainson's hawk. Therefore, these three species will not be discussed further in this document.

3.5.2 Summary

3.5.2.1 Bald Eagle

Aternative 1 (Proposed Action)

- Potentially quicker development in future bald eagle nesting habitat on approximately 923 acres of 3,537 acres within the Bald Eagle Habitat Management Area (BEHMA) in the Wildlife Analysis Area. However, there would be a loss of approximately 89 acres through GS and aspen ETZ for a total net gain of 834 acres of future bald eagle nesting habitat.
- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of bald eagle nesting habitat as a result of high intensity wildfire. This alternative would decrease the risk of primary use area loss due to wildfire for a minimum of three primary use areas immediately adjacent to fuels treatments.

Aternative 2 (No-action)

- No short-term reduction in bald eagle habitat.
- No fuels treatment would leave habitat vulnerable to high intensity wildfire, increasing the risk of large scale habitat fragmentation, loss of primary and secondary use areas and loss of bald eagle nesting habitat.

Aternative 3

- Potentially quicker development in future bald eagle nesting habitat on approximately 977 acres of 3,537 acres within the BEHMA in the Wildlife Analysis Area. However, there would be a loss of approximately 27 acres through GS for a total net gain of 950 acres of future bald eagle nesting habitat.

- Same as Alternative 1

Aternative 4 (Preferred Alternative)

- Potentially quicker development in future bald eagle nesting habitat on approximately 1,116 acres of 3,537 acres within the BEHMA in the Wildlife Analysis Area. However, there would be a loss of approximately 23 acres through GS for a total net gain of 1,093 acres of future bald eagle nesting habitat.
- Same as Alternatives 1 & 3.

3.5.2.2 California Spotted Owl

As discussed in the BA/BE, the best scientific evidence suggests that California spotted owl populations are either declining gradually or stable, but perhaps leaning toward decline (Franklin 2003, Dunk 2005). On May 15, 2006, after a 12 month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA (FR, Vol 71, N0. 100, May 24, 2006). The USFWS considered the information presented in the 2006 meta-analysis and found that populations of California spotted owl in the Sierras showed little evidence of a decline and concluded that the owls' status in the Sierra Nevada is not deteriorating as is evidenced by the increasing adult survival and stationary trend of the populations.

It is acknowledged that the actions proposed with the Freeman Project would reduce suitable owl habitat. It is acknowledged that there are some disparities in habitat typing between CWHR and stand inventory data and that the acres of 4M, 4D, 5M and 5D could be inexact estimates of habitat availability. This data is probably adequate for evaluating landscape-level changes in habitat types and is currently the best information available for evaluation of site-specific impacts to owl core areas. The FIA plot data was run through the Forest Vegetation Simulator model (FVS), and for the most part, all vegetation layer CWHR size classes matched the appropriate size class based on the QMD for all trees >10" dbh.

Within the Freeman Wildlife Analysis Area, approximately 60% of the National Forest land is composed of CWHR types considered suitable owl habitat. Post Project (Alternative 4), approximately 52% of the Wildlife Analysis Area would be composed of these same CWHR types. None of the seven PACs/SOHAs would be modified, thus maintaining the most important owl habitat for breeding and probably adult survival. Adult occupancy in the currently occupied PACs and SOHAs is not expected to decline, would be maintained as viable PACs. The decline in owl habitat as a result of the Freeman Project within owl Home Range Core Areas and in habitat across the Wildlife Analysis Area could increase risk to natal dispersal and short term owl recruitment. Thus, based on PAC and habitat availability, the current adult population and distribution within the Wildlife Analysis Area would continue post project, but no short term increase in spotted owls is expected. These PACs, SOHAs and the remaining 52% of the suitable habitat would be in a more fire resilient condition than currently exists, thus providing for a longer term increased retention and recruitment of large tree habitat over the analysis area.

Lambda figures within the meta-analysis are good for the populations being studied. Applying such information to other owl populations in a general context is appropriate, but inferences regarding the Plumas owl population as being similar to the Lassen or the El Dorado are unsubstantiated. The rate of population change on the Plumas owl populations is probably within the range identified in the meta-analysis.

The 2006 meta-analysis concludes that the potential consequences of the Forest Service management plan to spotted owls are unknown because:

1. the extent of vegetation manipulations is largely under the control of local managers and will likely vary across the Sierra Nevada; and
2. threshold levels of quality habitat necessary to maintain individual pairs of spotted owls on a site are largely unknown.

The recommendations from the meta-analysis are to develop well designed experimental studies coupled with the spotted owl demographic studies. The PLAS administrative study is mentioned as quasi-experimental limiting the scope of the results of the studies.

Lee and Irwin (2005) using a combination of population data from the southern Sierra Nevada and canopy cover measurements and forest simulation models, demonstrated that modest fuels treatments (mechanical thinning plus fuel-break construction) in the Sierra Nevada would not be expected to reduce canopy cover sufficiently to have measurable effects on owl reproduction. They predicted that with mechanical thinning and fuel break construction treatments (including DFPZ construction scenario) in combination with either no fire or mixed—lethal fire scenarios will not degrade canopy conditions in productive owl territories. They also predicted that it would not impede improvement of non-productive territories. In contrast, lethal fire simulations produced a pronounced and lasting negative effect. The general trend with all fuel treatments was towards higher proportions of intermediate canopy covers (40-69% canopy cover) and lower proportions of sparse canopy cover (0-39%) over time, whereas lethal fire scenarios produced sparse canopy cover discernible 4 decades later. “The immediacy of the fire threat creates an urgency to act even as key uncertainties remain” (Lee & Irwin, 2005). On May 15, 2006, after a 12 month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA. This conclusion was based in part on the best available data that indicated “most California spotted owl populations in the Sierra Nevada are stable or increasing and adult survival rates show an increasing trend” and that “Forest fuels reduction activities, notably those provided for in the Sierra Nevada Forest Plan Amendment of 2004, may have a short-term impact on owl populations. But fuels reduction will have a long-term benefit to California spotted owls by reducing the risk of catastrophic wildfires that pose a major threat to California spotted owl habitat”.

There are slight difference in the effects to owl habitat between Alternatives 1, 3 and 4 in regards to implementation of actions designed to create DFPZs, implementing group selection, aspen extended treatment zones (Alternative 1) and area thinning w/biomass removal.

The three proposed action alternatives avoid habitat modification within PACs/SOHAs. No changes in spotted owl PAC/HRCA/SOHA occupancy, distribution or the spotted owl population on the PNF is expected to occur.

Alternative 1 (Proposed Action)

- A potential decrease in spotted owl foraging habitat by about 2,760 acres of 18,684 acres and a decrease in nesting habitat by about 246 acres of 6,306 acres, leaving 85.2% of the existing suitable foraging habitat and 96.1% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Within 3 HRCAs, a total of approximately 614 acres of suitable habitat would become unsuitable, with the average reduction of 205 acres/HRCA.
- Placement of groups in proposed densities and aspen ETZs could result in up to 390 acres of matrix forest supporting more edge habitat than forest interior habitat, creating more risk and uncertainty associated with habitat suitability than all action alternatives.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Because of the three items above, implementation of Alternative 1 involves a level of risk to owl habitat in the short term and uncertainty about future owl activity; this level of risk is less than Alternative 4.
- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of owl habitat as a result of high intensity wildfire. This alternative would decrease the risk of PAC loss due to wildfire for a minimum of three PACs immediately adjacent to and upslope, of fuels treatments.

Alternative 2 (No-action)

- No short-term reduction in owl habitat, no treatment within HRCAs and no change in forest interior habitat.
- No fuels treatment would leave habitat vulnerable to high intensity wildfire, increasing the risk of large scale habitat fragmentation, loss of PACs and loss of owl habitat.
- Implementation of Alternative 2 involves little to no risk to owl habitat in the short term and thus future owl activity would be less uncertain. Not reducing the risk of catastrophic wildfire would pose a threat to long term availability and recruitment of owl habitat.

Alternative 3

- A potential decrease in spotted owl foraging habitat by about 2,610 acres of 18,684 acres and a decrease in nesting habitat by about 243 acres of 6,306 acres, leaving 86.0% of the existing suitable foraging habitat and 96.1% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Within 3 HRCAs, approximately 620 acres of suitable habitat would become unsuitable, with the average reduction of 207 acres/HRCA.
- Placement of groups in proposed densities could result in up to 136 acres of matrix forest supporting more edge habitat than forest interior habitat, creating additional risk and uncertainty associated with habitat suitability, but this risk is less than alternatives 1 & 4 due to lower group density providing for larger forested blocks between groups.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Because of the three items above, implementation of Alternative 3 involves a level of risk to owl habitat in the short term and uncertainty about future owl activity; this level of risk is less than either Alternatives 1 & 4.
- Same as Alternative 1.

Alternative 4 (Preffered Alternative)

- A potential decrease in spotted owl foraging habitat by about 3,037 acres of 18,684 acres and a decrease in nesting habitat by about 379 acres of 6,306 acres, leaving 83.7% of the existing suitable foraging habitat and 94.0% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Within 3 HRCAs, approximately 631 acres of suitable habitat would become unsuitable, with the average reduction of 210 acres/HRCA.
- Placement of groups in proposed densities could result in up to 147 acres of matrix forest supporting more edge habitat than forest interior habitat, creating additional risk and uncertainty associated with habitat suitability.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on spotted owl and spotted owl habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Because of the three items above, implementation of Alternative 4 involves the highest risk of all alternatives to owl habitat in the short term and greatest uncertainty about future owl activity.
- Same as Alternative 1 & 3.

3.5.2.3 Northern Goshawk

There are slight difference in the effects to goshawk habitat between Alternatives 1, 3 and 4 in regards to implementation of actions designed to create DFPZs, implementing group selection, aspen extended treatment zones (Alternative 1) and area thinning w/biomass removal.

Alternative 1 (Proposed Action)

- Potential decrease in goshawk nesting habitat by about 3,006 acres, leaving 88.0% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Two goshawk PACs would be entered with area thinning for aspen to maintain habitat diversity with no loss of suitable habitat.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Implementation of Alternative 1 involves a level of risk to goshawk habitat in the short term and uncertainty about future goshawk activity; this level of risk is less than Alternative 4.
- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of goshawk habitat as a result of high intensity wildfire. This alternative would decrease the risk of PAC loss due to wildfire for a minimum of six PACs immediately adjacent to and upslope, of fuels treatments.

Alternative 2 (No-action)

- No short-term reduction in goshawk habitat.
- No fuels treatment would leave habitat vulnerable to high intensity wildfire, increasing the risk of large scale habitat fragmentation, loss of PACs and loss of goshawk habitat.
- Implementation of Alternative 2 involves little to no risk to goshawk habitat in the short term and thus future goshawk activity would be less uncertain.

Alternative 3

- Potential decrease in goshawk nesting habitat by about 2,853 acres, leaving 88.6% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Two goshawk PACs would be entered with area thinning for aspen to maintain habitat diversity with no loss of suitable habitat.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group

selection areas. Implementation of Alternative 3 involves a level of risk to goshawk habitat in the short term and uncertainty about future goshawk activity; this level of risk is less than either Alternatives 1 & 4.

- Same as Alternative 1.

Alternative 4 (Preferred Alternative)

- Potential decrease in goshawk nesting habitat by about 3,416 acres, leaving 86.3% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Two goshawk PACs would be entered with area thinning for aspen to maintain habitat diversity with no loss of suitable habitat.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on goshawk and goshawk habitat. There would be a cumulative reduction in habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Implementation of Alternative 4 involves the highest risk of all alternatives to goshawk habitat in the short term and greatest uncertainty about future goshawk activity.
- Same as Alternative 1 & 3.

3.5.2.4 Great Gray Owl

There are slight difference in the effects to great gray owl habitat between Alternatives 1, 3 and 4 in regards to implementation of actions designed to create DFPZs, implementing group selection, aspen extended treatment zones (Alternative 1) and area thinning w/biomass removal.

Alternative 1 (Proposed Action)

- Potential decrease in great gray owl nesting habitat by about 1,817 of 8,668 acres, leaving 79.0% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Approximately 52 acres (18 acres of hand and 34 acres of mechanical thinning) of the 1,836 acres of preliminary PACs will be treated for aspen enhancement and forest health. No reduction in suitable habitat is expected with these treatments.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on great gray owl and great gray owl habitat. There would be a cumulative reduction in nesting habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Implementation of Alternative 1 involves a level of risk to great gray owl nesting habitat in the short term and uncertainty about future great gray owl activity; this level of risk is less than Alternative 4.
- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of great gray owl habitat as a result of high intensity wildfire. This alternative would decrease the

risk of preliminary PAC loss due to wildfire for a minimum of three PACs immediately adjacent to and upslope, of fuels treatments.

Alternative 2 (No-action)

- No short-term reduction in great gray owl habitat.
- No fuels treatment would leave habitat vulnerable to high intensity wildfire, increasing the risk of large scale habitat fragmentation, loss of PACs and loss of great gray owl habitat.
- Implementation of Alternative 2 involves little to no risk to great gray owl habitat in the short term and thus future great gray owl activity would be less uncertain.

Alternative 3

- Potential decrease in great gray owl nesting habitat by about 1,697 of 8,668 acres, leaving 80.4% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Approximately 52 acres (18 acres of hand and 34 acres of mechanical thinning) of the 1,836 acres of preliminary PACs will be treated for aspen enhancement and forest health. No reduction in suitable habitat is expected with these treatments.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on great gray owl and great gray owl habitat. There would be a cumulative reduction in nesting habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Implementation of Alternative 3 involves a level of risk to great gray owl nesting habitat in the short term and uncertainty about future great gray owl activity; this level of risk is less than either Alternatives 1 & 4.
- Same as Alternative 1.

Alternative 4 (Preferred Alternative)

- Potential decrease in great gray owl nesting habitat by about 1,882 of 8,668 acres, leaving 78.3% of the existing suitable nesting habitat within the Wildlife Analysis Area.
- Approximately 52 acres (18 acres of hand and 34 acres of mechanical thinning) of the 1,836 acres of preliminary PACs will be treated for aspen enhancement and forest health. No reduction in suitable habitat is expected with these treatments.
- Based on the direct/indirect effects, implementation of this alternative would contribute to cumulative effects on great gray owl and great gray owl habitat. There would be a cumulative reduction in nesting habitat for the next 50 years in the fuel treatments to 50+ years in group selection areas. Implementation of Alternative 4 involves the highest risk of all alternatives to great gray owl nesting habitat in the short term and greatest uncertainty about future great gray owl activity.
- Same as Alternatives 1 & 3.

3.5.2.5 Fisher and Marten

Alternative 1 (Proposed Action)

- Potential decrease in fisher and marten denning habitat by about 1,261 acres of 9,077 acres, retaining 86.1% of the existing suitable denning habitat within the Wildlife Analysis Area.
- Approximately 10,923 acres of the 275,000 acre draft forest carnivore network is present within the Wildlife Analysis Area. Of the 10,923 acres approximately 7,365 acres may be considered suitable habitat. Based on the 7,365 acres of suitable habitat there is a potential decrease of approximately 721 acres or 9.8%.
- Implementation of Alternative 1 involves a level of risk to fisher and marten habitat in the short term and uncertainty about possible future fisher and marten activity; this level of risk is less than Alternative 4.
- Implementation of fuels treatments could decrease the likelihood of active crown fires and increase ability of fire management to suppress, control and contain fires. This could reduce the potential risk of increased large-scale habitat fragmentation and loss of fisher and marten habitat as a result of high intensity wildfire.

Alternative 2 (No-action)

- No short-term reduction in fisher and marten habitat.
- No fuels treatment would leave habitat vulnerable to high intensity wildfire, increasing the risk of large scale habitat fragmentation and loss of fisher and marten habitat.
- Implementation of Alternative 2 involves little to no risk to fisher and marten habitat in the short term and thus possible future fisher and marten activity would be less uncertain.

Alternative 3

- Potential decrease in fisher and marten denning habitat by about 1,201 acres of 9,077 acres, retaining 86.8% of the existing suitable denning habitat within the Wildlife Analysis Area.
- Approximately 10,923 acres of the 275,000 acre draft forest carnivore network is present within the Wildlife Analysis Area. Of the 10,923 acres approximately 7,365 acres may be considered suitable habitat. Based on the 7,365 acres of suitable habitat there is a potential decrease of approximately 692 acres or 9.4%.
- Implementation of Alternative 3 involves a level of risk to fisher and marten habitat in the short term and uncertainty about possible future fisher and marten activity; this level of risk is less than either Alternatives 1 & 4.
- Same as Alternative 1.

Alternative 4 (Preferred Alternative)

- Potential decrease in fisher and marten denning habitat by about 1,549 acres of 9,077 acres, retaining 82.9% of the existing suitable denning habitat within the Wildlife Analysis Area.
- Approximately 10,923 acres of the 275,000 acre draft forest carnivore network is present within the Wildlife Analysis Area. Of the 10,923 acres approximately 7,365 acres may be considered suitable habitat. Based on the 7,365 acres of suitable habitat there is a potential decrease of approximately 897 acres or 12.2%.
- Implementation of Alternative 4 involves a level of risk to fisher and marten habitat in the short term and greatest uncertainty about possible future fisher and marten activity.
- Same as Alternatives 1 & 3.

3.5.3 Scope of the Analysis

Geographic Area: The proposed treatment area is located in predominately Sierra mixed conifer forest habitat. The **Treatment Area** is defined as the units to be treated. This includes approximately 3,066 acres of DFPZ, 2,727 acres of Area Thinning, up to 175 acres of group selections and access roads to the groups. The **project area** is defined as the treatment area plus an additional larger land base which encompasses all of the treatment area which equals approximately 14,950 acres. This project area is located at elevations ranging from 5,600 feet at Humbug Creek to 7,693 feet at Smith Peak. For the purpose of the BA/BE, the **Wildlife Analysis Area** is defined as the project area (which includes treatment areas) plus an additional larger land base. The additional larger land base was determined by potential indirect and cumulative effects on California spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. So the Wildlife Analysis Area goes out to and encompasses the closest PACs/HRCAs to the project area. The Wildlife Analysis Area totals approximately 46,039 acres (Figure 3.1) of which 41,388 acres are National Forest Lands. This Wildlife Analysis Area is also being used for all other wildlife species analyzed in the BA/BE since the effects of the project to those species will not extend beyond the analysis area boundary for the California spotted owl. All direct, indirect and cumulative effects discussed occur within this 46,039 acre Wildlife Analysis Area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to TES and TES habitat.

The Wildlife Analysis Area developed for the Freeman Project overlaps the Happy Jack Wildlife Analysis Area developed for the Happy Jack project (FY07 project) by about 2,006 acres near Happy Valley. No Happy Jack treatments (DFPZ, area thinning or group selection units) occur within the Freeman Wildlife Analysis Area; no Freeman treatments occur within the Happy Jack Wildlife Analysis Area.

Timeframe: The timeframe used for determining cumulative effects depends on the length of time that lingering effects of the past actions would continue to impact the species in question.

For the Freeman Project, general information based on the history of the area and sight specific information based on available data, going back approximately 25 years and forward approximately 5 years, was incorporated.

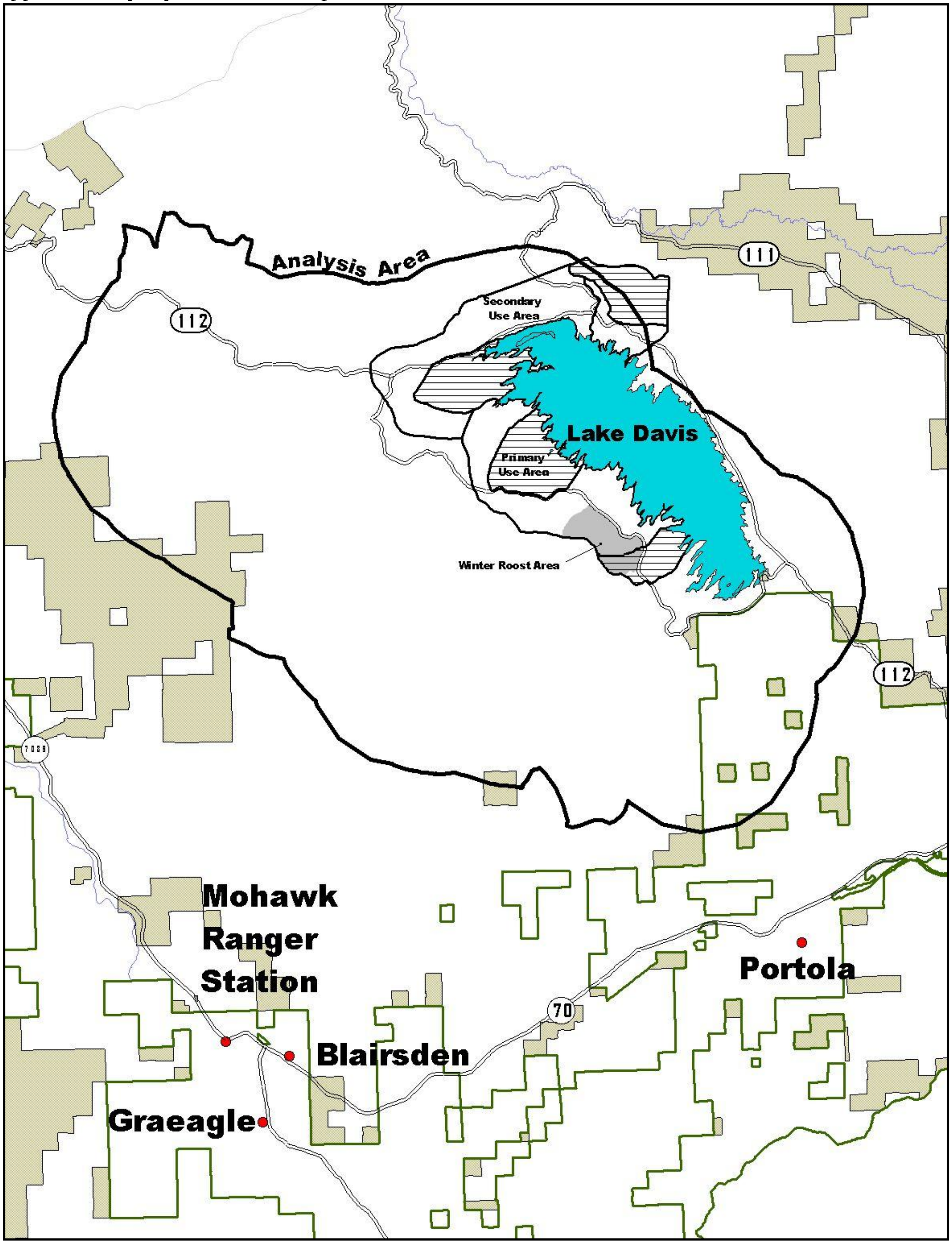

Figure 3.1 Freeman Wildlife Analysis Area with Bald Eagle Primary Use Areas (horizontal stripping), Secondary Use Areas (black outline) and Winter Roost Area (solid color) all make up the Bald Eagle Habitat Management Area (BEHMA).

3.5.4 Analysis Methodology

The Freeman Project was reviewed using aerial photographs, digital orthophoto quadrangles (DOQs), vegetation layer spatial datasets, species specific spatial datasets and known information to help determine suitable habitat for TES species (i.e. California spotted owls, Northern goshawks, etc). In the field, areas identified as suitable habitat are surveyed to the following R5 protocols and acceptable standards:

- "Standardized protocol for Surveying Aquatic Amphibians" (Fellers and Freel 1995)
- "Western Pond Turtle Survey Methods" (Reese 1993)
- "Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation Areas, March 12, 1991 (Revised February 1993)"
- "Survey Methodology for Northern Goshawks in the Pacific Southwest Region, U.S. Forest Service" (USDA Forest Service 2000)
- "Survey Protocol for the Great Gray Owl in the Sierra Nevada of California, May 2000" (USDA Forest Service 2000)
- "A Willow Flycatcher Survey Protocol for California, May 29, 2003" (Bombay, et al. 2003)
- "American Marten, Fisher, Lynx and Wolverine: Survey Methods for Their Detection" (Zielinski and Kucera 1995)

Species nest sites and locations were recorded using Global Positioning System (GPS) and incorporated into spatial datasets. For the analysis of effects, changes to suitable habitat and impacts to protected activity centers (PACs)/territories were determined by using a spatial dataset of the vegetation layer combined with type of treatments (i.e. mechanical thinning, grapple piling, hand thinning, etc).

3.5.5 General (Terrestrial & Aquatic Habitat)

3.5.5.1 Affected Environment—General

Existing conditions within the proposed project include areas of moderate to high fuel loading. On average, surface and ladder fuels exceed levels necessary to achieve the desired conditions for DFPZ. The existing height to live crown is estimated at one to five feet. Given the current surface fuel condition, combined with existing height to live crown, a wildfire in the 90th percentile fire weather condition would transfer fire from the surface to the tree canopy.

Appendix B displays all pre-treatment and estimated proposed post treatment vegetation information currently available within the Wildlife Analysis Area. All vegetation information is displayed using the California Wildlife Habitat Relationships (CWHR) vegetation codes (Appendix C defines these codes) and serves as the baseline acres for analysis. The vegetation layer is a composite of remote sensed data and local project specific vegetation data all based on aerial photo interpretation. This vegetation data was then updated with the FIA plot data collected in 2005. Table 3.24 summarizes the amount of 4M, 4D, 5M and 5D CWHR types within the Wildlife Analysis Area.

3.5.5.2 Environmental Consequences—General

Direct effects include immediate changes in habitat conditions and disturbance/harassment to individuals, including direct mortality, during project activities. It is assumed in this analysis that all action alternatives would be implemented as stated, in compliance with all rules and regulations governing land management activities, including the use of the appropriate Limited Operating Periods (LOP) identified in Table 2.10. Direct disturbance, including mortality to individual animals addressed in this document is highly unlikely, due to survey efforts for selected species, incorporation of LOP’s where appropriate and implementation of Forest Standards and Guidelines. Indirect effects include effects that occur later in time or beyond the action area of the project. Indirect effects can also include effects to a species prey base.

Cumulative effects analysis for ESA compliance includes "those effects of future State or Private activities, not involving Federal activities that are reasonably certain to occur within the action area of the Federal action subject to consultation". Under NEPA, cumulative effects represent the impact on the environment, which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.

Table 3.24 Summary of CWHR 4M, 4D, 5M, 5D acres within the Wildlife Analysis Area derived from vegetation layer (all acres are approximate and National Forest System Lands only)

CWHR Type*	Wildlife Analysis Area
EPN4D	940
EPN4M	3,011
EPN5D	129
EPN5M	783
JPN4M	18
LPN4D	284
LPN4M	702
LPN5D	144
MHC4M	100
PPN4M	64
RFR4D	190
RFR4M	292
RFR5D	521
RFR5M	44
SMC4D	2,844
SMC4M	7,497
SMC5D**	2,512
SMC5M	1,382
WFR4D	1,319
WFR4M	1,423
WFR5D	194
WFR5M	597
Total	**24,990**

*4=small 11-24” dbh, 5=medium/large >24” dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, EPN=Eastside Pine, JPN=Jeffrey Pine, LPN=Lodgepole Pine, MHC=Montane Hardwood-Conifer, PPN=Ponderosa Pine, RFR=Red Fir, SMC=Sierran Mixed Conifer, WFR = White Fir. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.
** CWHR type 6 incorporated into 5D

3.5.5.3 General Effects of Action Alternatives—Terrestrial Habitat

Direct and Indirect effects

Fuels Treatment/DFPZ

Overall fuel treatments, including DFPZ construction would be accomplished through thinning from below and the reintroduction of fire into the ecosystem. Thinning from below concentrating on small diameter fuel ladders is useful in that this prescription reduces overstocking, largely the result of fire suppression (Agee 1993, USDA-Sierra Nevada Forest Plan Amendment 2001). In hand thinning units and equipment exclusion zones the removal of ≤8” dbh conifers would generally result in little or often no impact on current canopy closures. What losses are incurred within the under story would be quickly regained in the over story as reduced competition for resources allows dominant and co-dominant (20”-30”) trees to grow faster.

Mechanical thinning that involves the cutting of some co-dominant (20”-30”) conifers remove both large structure and canopy cover. This change in canopy cover would be sufficient to result in acres changing to a lower canopy cover class immediately following treatment of dense stands. Mechanical thinning to achieve the desired condition within DFPZs (action alternatives), as per Table 2 of the SNFPA FSEIS ROD 2004 and designed as per Freeman Alternatives 1, 3 & 4 would result in the following:

1. CWHR 4M, 4D: Stands within DFPZs supporting CWHR types 4M (40-59% canopy cover) and CWHR types 4D (60-100% canopy cover) are projected to become 40% canopy cover (M).
2. CWHR 5M, 5D: Stands within DFPZs supporting CWHR types 5M (40-59% canopy cover) and CWHR types 5D (60-100% canopy cover) are projected to become 40% canopy cover (M).
3. Hand-thinning conifers ≤ 8” dbh planned within RHCA equipment exclusion zones within DFPZ units would not result in a change in the 4M, 4D, 5M, 5D.

Mechanical thinning with biomass removal simplifies the complexity and structure of the stand, opening up the stand by treating the lower and mid-level vegetative layers. Removing more structures that provide the vegetative layering, deformities, snags and future decadence, reduces the closed nature of the stand which provides diverse microclimates that spotted owls need in order to control exposure and changes in ambient temperature for roosting. Biomass removal can degrade/remove hiding cover in the lower and mid canopy often used by young spotted owlets. Feller-bunchers used to remove biomass also create open paths and disrupt down woody material, through crushing, moving, etc. Thus biomass removal in suitable habitat would result in habitat degradation and would be analyzed as a direct reduction in suitable habitat for owls, goshawks and mesocarnivores, etc.

The loss of snags important for wildlife is expected with logging and prescribed fire; however snag recruitment is also expected with retention of 30”+dbh conifers and some recruitment due to fire kill. The net result of snag loss and gain is undetermined. However, the three action alternatives call for the retention of snags at SNFPA Standards (3 to 6 snags/acres, ≥15” dbh).

With any of the three action alternatives, within the DFPZ, Wildland Urban Interface (WUI) and Area Thinning units (excluding groups) the project is leaving three to six of the largest snags/acre in the treatment area, primarily within the RCHA equipment exclusion zones. However, based on past projects and discussions with sale administraters’ experience with OSHA safety officer representatives, it is anticipated that the majority of snags would be felled and very few snags would be left. As shown in the 1999 HFQLGFRA FEIS, DFPZ integrity and firefighter safety can be compromised by the amount and distribution of snags within the DFPZ, but the four snags per acre, located strategically within the DFPZ, can provide an effective DFPZ.

Alternative 1 treats approximately 240 more acres than Alternative 3, while Alternative 4 treats about 46 acres less than Alternative 3. Assuming equal distribution and density of snags across the Wildlife Analysis Area, Alternative 4 maintains more snags than all the other alternatives.

Thinning activities and underburning may prevent and/or can allow for the control of catastrophic wildfires by reducing fuel loading and ladder fuels. Fuel reduction activities may also cause a loss in the availability of Large Woody Debris (LWD). The effects of the losses in LWD would be mitigated for by the retention of logs as described in the SNFPA FSEIS standards & guidelines. These retention standards were designed to meet the needs of wildlife. There is also a potential for future recruitment of LWD due to snag falling within DFPZs. The three action alternatives call for the retention of LWD at SNFPA Standards (10-15 tons/acre ≥12 inches diameter).

Sporax (borax) would be applied to pine stumps ≥14 inches dbh in mechanically harvested units in both DFPZs and Area Thinning treatment areas. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc (1995), this rate is considered non-toxic to vertebrate species. The potential for borax leaching into ground-water or surface water contamination is low; it is practically nontoxic to fish, aquatic invertebrate animals, birds and mammals. Borax does not build up (bioaccumulate) in fish, inferring no build up in other vertebrate species. Thus Sporax applied to stumps should not impact TES species or their prey base.

Because of the way that CWHR size class is calculated, some treated areas have the potential to change to a larger size class, due to the removal of small diameter trees, which increases the mean diameter of the remaining forest stand. This potential change was not considered for this analysis of effects, as treated stands may not reflect attributes of suitable habitat associated with CWHR class due to the reduction in structural diversity at the stand level as a result of fuels treatments that reduce canopy cover and remove structure.

Group Selection

Historically, Sierran mixed conifer forest landscapes probably consisted of a complex array of mostly small, even-aged aggregations and/or stands representing a wide range of age and size classes (Verner et al. 1993, page 253). Lightning fires that affected small areas (ranging in size from a single tree to groups of trees to several acres) probably were relatively common and an important influence on stand structure (Ibid, page 247). Patches of fire-induced openings (and other stand disturbance elements such as bark-beetle kill) produced a variable, irregular patchwork of even-aged groups, most from less than an acre to several acres in size. Consequently a relatively fine-grained pattern of variability, modified by topography existed at a landscape scale (Ibid, page 247). Group Selection harvest methods could create gaps and openings in the forested stands ½ to 2 acres in size that could approximate pre-settlement stand structure (Ibid, page 271).

The group selection treatments would result in the creation of forest openings and gaps that would have 1) all conifers below 30 inch dbh removed (except desirable regeneration and oaks/hardwoods are retained as described in Proposed Action) and 2) project generated fuels treated with prescribed fire, but 10-15 tons per acre of the largest down logs greater than 12 inches diameter would be retained where it exists.

Where ½ to 2 acre groups are implemented, the CWHR 4M, 4D, 5M, 5D is replaced in each small group unit with a small opening supporting brush/seedling/sapling type habitat (CWHR 1), while the surrounding matrix (conifer stands between the groups) would be thinned with biomass removal.

Groups could increase the edge to interior ratio; that is the stand provides less continuous forest cover and interior habitat and becomes a stand of multiple edges, beneficial to species that prefer edges to the detriment of forest interior species (Harris, 1984; Forest Fragmentation website). Remaining forested patches between the groups (often referred to as the “matrix”) appear to be nothing more than corridors between the gaps, as interspersion and juxtaposition of groups increases the contrast of the created edges. Edge effects of these induced ecotones on both the microclimate and on wildlife can extend into the forested patches beyond what is actually created by the group (Harris, 1984; Hunter, 1990; Forest Fragmentation website). Furthermore, these remnant corridors are then subjected to skid trails and thinning with biomass removal, further reducing the amount of continuous forest cover. The combination of group openings, along with thinning with biomass removal, skid trails and landings, would create a mosaic of forest that may not be suitable for forest interior habitat species (defined as species that require large patches of a relatively homogenous habitat type), that may be negatively affected by management practices that fragment larger patches of habitat into smaller patches with numerous edges (Harris, 1984; Scalet, et al, 1996). Sensitive species considered forest interior species include spotted owl, fisher (Hunter 1990), goshawk and marten (Luman and Neitro, 1979).

It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by old forest species. Alternative 1 creates 175 acres of groups across approximately 3,966 available acres of mechanical harvest treatment area equaling a group density of approximately 4.4%. Alternative 3 creates 175 acres of groups across 3,723 acres of mechanical harvest treatment area equaling a group density of approximately 4.7%, while Alternatives 4 creates fewer acres of groups (174 acres) across 4,514 acres of mechanical harvest treatment area equaling a group density of approximately 3.9%. Thus, groups are more dispersed across the landscape with Alternative 4 than with Alternatives 1 & 3, with groups more clumped in the landscape with Alternative 3.

Area Thinning

Overall area thinning would be accomplished through thinning from below reducing overstocking, largely the result of fire suppression (Agee 1993, USDA-Sierra Nevada Forest Plan Amendment 2001). In hand thinning units and equipment exclusion zones the removal of ≤8” dbh conifers would generally result in little or often no impact on current canopy closures. What losses are incurred within the under story would be quickly regained in the over story as reduced competition for resources allows dominant and co-dominant (20”-30”) trees to grow faster.

Mechanical thinning that involves the cutting of some co-dominant (20”-30”) conifers remove both large structure and canopy cover. This change in canopy cover would be sufficient to result in acres changing to a lower canopy cover class immediately following treatment of dense stands. Mechanical thinning to achieve the desired condition within area thin treatments with biomass removal (action alternatives), as per Table 2 of the SNFPA FSEIS ROD 2004 and designed as per Freeman Alternatives 1, 3 and 4 would result in the following:

1. CWHR 4M, 4D: Stands within area thin treatments supporting CWHR types 4M (40-59% canopy cover) and CWHR types 4D (60-100% canopy cover) are projected to become 50% canopy cover (M).
2. CWHR 5M, 5D: Stands within area thin treatments supporting CWHR types 5M (40-59% canopy cover) and CWHR types 5D (60-100% canopy cover) are projected to become 50% canopy cover (M).
3. Hand-thinning conifers ≤ 8” dbh planned within RHCA equipment exclusion zones within DFPZ units would not result in a change in the 4M, 4D, 5M, 5D.

Mechanical thinning with biomass removal simplifies the complexity and structure of the stand, opening up the stand by treating the lower and mid-level vegetative layers. Removing more structures that provide the vegetative layering, deformities, snags and future decadence, reduces the closed nature of the stand which provides diverse microclimates that spotted owls need in order to control exposure and changes in ambient temperature for roosting. Biomass removal can degrade/remove hiding cover in the lower and mid canopy often used by young spotted owlets. Feller-bunchers used to remove biomass also create open paths and disrupt down woody material, through crushing, moving, etc. Thus biomass removal in suitable habitat would result in habitat degradation and would be analyzed as a direct reduction in suitable habitat for owls, goshawks and mesocarnivores, etc. Snags and LWD would be similar as described for DFPZ.

Aspen Treatments

Aspen treatments that involve the cutting of all the conifers (Alternative 1) or most of the conifers (Alternatives 3 and 4) remove both large structure and canopy cover. This change in canopy cover would be sufficient to result in acres changing to a lower canopy cover class immediately following treatment. Mechanical thinning to achieve the desired condition within Aspen Stands (action alternatives) and designed as per Freeman Alternatives 1, 3 & 4 would result in the following:

1. CWHR M: Aspen stands supporting CWHR types M (40-59% canopy cover) are projected to become 10% to 24% canopy cover (S).
2. CWHR D: Aspen stands supporting CWHR types D (60-100% canopy cover) are projected to become 10% to 24% canopy cover (S).

3. Hand-thinning conifers ≤ 8” dbh is planned within RHCA equipment exclusion zones (25’) within aspen stands and would not result in a change in canopy cover.

The aspen extended treatment zones (ETZs) in Alternative 1 would result in the creation of forest openings and gaps that would have 1) all conifers below 30 inch dbh removed (except hardwoods are retained as described in Proposed Action) and 2) project generated fuels treated with prescribed fire, but 10-15 tons per acre of the largest down logs greater than 12 inches diameter would be retained where it exists. No ETZs would be implemented under alternative 3 & 4.

Where ETZs are implemented, the CWHR 4M, 4D, 5M, 5D is replaced in each unit with a small opening supporting brush/seedling/sapling type habitat (CWHR 1), while the surrounding matrix (conifer stands between the ETZs), are expected to have linear openings created for skid trails that remove sawlogs from the ETZs to designated landings. The amount of this disturbance is not quantified.

Impacts of actions on CWHR Habitat Types (4M, 4D, 5M, 5D)

Fuels Treatments

Within the forested habitat types with the implementation of the action alternatives, the major direct effect to habitat is 1) removing the lower layers of vegetation (fuel ladder) composed of small trees, 2) reducing the ground fuels, 3) reducing the amount of snags and 4) opening up all stands with the removal of trees providing canopy cover, resulting in a post treatment canopy cover provided by conifers between 40-45%. All 4M, 4D, would become 4M and 5M, 5D would become 5M (Table 3.25).

Table 3.25 Changes in Freeman fuels treatment (DFPZ) pre and post action alternatives in 4M, 4D, 5M, 5D with action Alternatives 1, 3 & 4.

CWHR Type	Acres within Wildlife Analysis Area (NF Lands)	Alt. 1 Acres in DFPZ* changed to “M”	%Change in the Wildlife Analysis Area-Alt.1	Alt. 3 Acres in DFPZ* changed to “M”	%Change in the Wildlife Analysis Area-Alt.3	Alt. 4 Acres in DFPZ* changed to “M”	%Change in the Wildlife Analysis Area-Alt.4
4M	13,107	+543	+4.1	+581	+4.4	+630	+4.8
4D	5,577	-543	-9.7	-581	-10.4	-630	-11.3
Total 4M/4D	**18,684**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
5M	2,806	+151	+5.4	+151	+5.4	+252	+9.0
5D	3,500	-151	-4.3	-151	-4.3	-252	-7.2
Total 5M/5D	**6,306**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
Total All	**24,990**	**0**	**0**	**0**	**0**	**0**	**0**

* DFPZ acres changed include all DFPZ, DFPZ/WUI and WUI acres.

Thus, with Alternatives 1, 3 and 4, approximately 694 to 882 acres of 4D/5D habitat is modified to “M” with implementation of DFPZ while maintaining 40% canopy cover.

Group Selection and Aspen Extended Treatment Zone

With the implementation of up to 175 acres of group selection harvesting (All Action Alternatives) and approximately 400 acres of aspen extended treatment zones (Alternative 1), the major direct effect to habitat is creating gaps or openings within forested stands. Although not considered an action that results in a change in CWHR type for the stand as a whole (CWHR type changes for the gaps), removing a portion of the stand and leaving a dissimilar habitat in its place created these gaps. For the first few years after implementation, these gaps or openings result in early seral herb/grass and seedling shrub types, replaced through planting or natural seed establishment into seedling tree stages; these created openings would occur within the following CWHR types: (Note: changes in habitat as a result of implementing Group Selection and Aspen Extended Treatment Zones (ETZ’s) around aspen stands are estimates based on the proportion of each CWHR type present within each unit and the amount of planned treatment within that unit)(Table 3.26).

Table 3.26 Freeman Group Selection and Aspen Extended Treatment Zones Pre and Post Alternatives 1, 3, & 4.

CWHR Type	Acres within Wildlife Analysis Area (NF Lands)	Total Acres in groups*			Total Acres in ETZ*			% Change in the Wildlife Analysis Area		
		Alt. 1	Alt. 3	Alt. 4	Alt. 1	Alt. 3	Alt. 4	Alt. 1	Alt. 3	Alt. 4
4M	13,107	-90	-90	-89	-156	0	0	-1.9	-0.7	-0.7
4D	5,577	-32	-32	-44	-97	0	0	-2.3	-0.6	-0.8
Total 4M/4D	**18,684**	**-122**	**-122**	**-133**	**-253**	**0**	**0**	**-2.0**	**-0.7**	**-0.7**
5M	2,806	-5	-5	-5	-1	0	0	-0.2	-0.2	-0.2
5D	3,500	-9	-9	-9	0	0	0	-0.3	-0.3	-0.3
Total 5M/5D	**6,306**	**-14**	**-14**	**-14**	**-1**	**0**	**0**	**-0.2**	**-0.2**	**-0.2**
Total All	**24,990**	**-136**	**-136**	**-147**	**-254**	**0**	**0**	**-1.6**	**-0.5**	**-0.6**

* Additional acres of groups and ETZ are in other CWHR size classes or CWHR densities.

With the action alternatives, approximately 0.5 up to 0.6% of the total 4M, 4D, 5M, 5D habitat within the Wildlife Analysis Area would be converted to small gaps (average size 1.5 acres) of CWHR 1. An additional 1.1% of the total 4M, 4D, 5M, 5D habitat within the Wildlife Analysis Area would be converted to openings of CWHR 1 around aspen stands in Alternative 1.

Area Thinning

Within the forested habitat types with the implementation of the area thinning and biomass removal in the action alternatives, the major direct effect to habitat is 1) removing the lower layers of vegetation (fuel ladder) composed of small trees, 2) reducing the ground fuels, 3) reducing the amount of snags and 4) opening up all stands with the removal of trees providing canopy cover, resulting in a post treatment canopy cover provided by conifers between 50-55%. All 4D would become 4M and 5D would become 5M (Table 3.27).

Table 3.27 Changes in Freeman Area Thinning (AT) Pre and Post Action Alternatives in 4M, 4D, 5M, 5D with Action Alternatives 1, 3 & 4.

CWHR Type	Acres within Wildlife Analysis Area (NF Lands)	Alt. 1 Acres in Area Thinning changed to "M"	%Change in the Wildlife Analysis Area-Alt.1	Alt. 3 Acres in Area Thinning changed to "M"	%Change in the Wildlife Analysis Area-Alt.3	Alt. 4 Acres in Area Thinning changed to "M"	%Change in the Wildlife Analysis Area-Alt.4
4M	13,107	+427	+3.3	+428	+3.3	+598	+4.6
4D	5,577	-427	-7.7	-428	-7.7	-598	-10.7
Total 4M/4D	**18,684**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**
5M	2,806	+2	+0.1	0	0	+16	+0.6
5D	3,500	-2	-0.1	0	0	-16	-0.5
Total 5M/5D	**6,306**	**0**	**0**	**0**	**0**	**0**	**0**
Total All	**24,990**	**0**	**N/A**	**0**	**N/A**	**0**	**N/A**

Thus with Alternatives 1, 3 & 4 approximately 428 to 614 acres of 4D/5D habitat is modified to "M" with implementation of area thin treatments with biomass removal while maintaining 50% canopy cover.

Cumulative Effects

The cumulative changes in CWHR 4M, 4D, 5M and 5D types as a result of implementing DFPZs, GS and Area Thin treatments with biomass removal as per action alternatives are displayed for the Wildlife Analysis Area in Table 3.28.

Table 3.28 Approximate change in CWHR habitat types within wildlife analysis area (all acres NF acres)

CWHR Type	Pre-Project (Alt. 2)	Post-Project Alt. 1 (% Remaining)	Post Project Alt. 3 (% Remaining)	Post Project Alt 4 (% Remaining)
4M	13,107	13,829 (105.5%)	14,026 (107.0%)	14,246 (108.7%)
4D	5,577	4,480 (80.3%)	4,536 (81.3%)	4,305 (77.2%)
5M	2,806	2,953 (105.2%)	2,952 (105.2%)	3,069 (109.4%)
5D	3,500	3,338 (95.4%)	3,340 (95.4%)	3,223 (92.1%)
TOTAL	**24,990**	**24,600 (98.4%)**	**24,854 (99.5%)**	**24,843 (99.4)**

3.5.5.4 General Effects of Action Alternatives—Aquatic Habitat

Direct Effects

There would be no direct effects from the DFPZ, area thin treatments and GS harvest to TES herptofauna and fish habitat, as no vegetative activities would occur that would cause disturbance to individuals, nor any impacts to the existing habitat conditions. All riparian protection standards apply to action alternatives. SAT guidelines and associated RMO's will be met with both action alternatives (RMO, Appendix H). All applicable BMP's and Soil Standard Protection Measures are included into project design (Drake 2006).

Indirect Effects

The district hydrologist assured that the "action" alternatives met all ten RMOs of the Scientific Analysis Team's (SAT) guidelines (RMO analysis located in CWE). Applicable Best Management Practices (BMPs) and Soil Standard Protection Measures (Drake 2006) would be implemented with all land disturbing activities proposed in the three action alternatives. There is still some potential of sediment reaching the stream courses by ground disturbing activities, but this is greatly minimized by the implementation of the standards, management practices and guidelines as listed above.

The action alternatives provide partial or entire key aquatic and riparian habitat elements including: concentration of snags in the Riparian Habitat Conservation Areas (RHCAs) and Streamside Management Zones (SMZs) equipment exclusion zones and therefore recruitment of woody debris to aquatic habitats and the RHCA; shade along the perennial fish bearing and non-fish bearing streams by retention of vegetation; reduction in sediment delivery to aquatic habitats through retention of potential recruitment of woody debris near aquatic habitats and within portions of the RHCAs; and retention of nutrients and potential woody debris by leaving 10-15 tons per acre of moderate to large down wood.

No group selection is proposed within the RHCAs with the action alternatives. The buffer widths of the RHCAs vary from:

- to a distance equal to the height of two site potential trees or 300' horizontal distance per side if the stream is fish bearing; or one site potential tree or 150' horizontal distance per side if the stream is perennial, whichever is greatest, or
- to the outer edges of riparian vegetation.

The buffer widths for SMZs are 50' per side. Within these RHCAs and SMZs, proposed treatments include thinning conifers to identified appropriate fuel treatments based on RHCA characteristics and adjacent fuel treatments which could include mechanical treatments on slopes less than 15% (with the exception of aspen stand treatments in Alternatives 3 & 4 with slope limits of 35%), hand-thinning as described above, under-burning only and no treatment. Mechanical entry would occur within RHCAs and SMZs, except there would be an equipment exclusion zone within 25 feet in SMZs and aspen stands in RHCAs, 50 feet on non-fish bearing RHCAs and 100 feet on fish bearing RHCAs. The thinning proposed within RHCAs and SMZs would release the existing conifers to grow into larger diameter trees and thus be retained for future natural recruitment of LWD into the stream channel. Thinning within the RHCA and SMZs would also initially reduce the interception of precipitation thus increasing runoff in the short term. Yet, overall transpiration would be reduced by thinning within the RHCAs and SMZs, allowing for increased ground water retention. This is a benefit to TES amphibians and the coldwater fisheries habitat because of the reduced runoff and increased ground water retention providing cold water later into the summer and fall season.

Habitat will be maintained or restored to support well-distributed populations of TES herptofauna, fish, invertebrate populations and riparian plant communities. This would be accomplished with the action alternatives by the following: 1) retention of litter fall from the overstory trees providing forage for macro-invertebrates. 2) equipment exclusion zones (in RHCAs/SMZs), springs, seeps and bogs have been identified and protected from harvest activities using SAT guidelines. 3) impacts would further be reduced by the application of BMPs and standard management requirements (Drake 2006).

Activities proposed in the project area are not expected to negatively impact the timing and variability of water tables within meadows and wetlands. Positive effects derived from the project include increased water percolation and groundwater due to thinning of overstocked RHCAs and SMZs and the associated reduced transpiration at which water is made available to and moves through meadows and wetlands. Again, all sensitive riparian areas (springs, bogs, wetlands and meadows) will be protected by the SAT guideline buffers and the implementation of BMPs. Wet meadows and riparian vegetation will be maintained within the RHCAs. Ground based equipment will only be allowed on stable soils, slopes <15% in RHCAs.

The three action alternatives propose to decommission approximately 10 miles of roads within the Wildlife Analysis Area (6 miles of system roads, 1.9 miles of non-system roads & 1.8 miles from a previous decision). Decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope and/or seeding the affected area. These measures help initiate re-vegetation and recovery of the road area. Over time, decommissioned roads produce less sediment and surface runoff to adjacent stream courses (Drake 2006). A total of approximately 16 miles of roads will be reconstructed which consists of brushing, blading the road surface, improving drainage and replacing or upgrading culverts as needed. A total of approximately 1 mile of road in the Wildlife Analysis Area will be closed using earth and log barriers or gates. A total of 0.3 miles of roads will be constructed and another 0.7 miles will be made into single track. The existing road density of approximately 2.9 miles of open road per square mile within the Wildlife Analysis Area and associated stream crossings and culverts has caused fragmentation to the hydrology and aquatic habitat. Ecological processes that occur in the hyporheic zones (water and land meet in saturated sediments beneath and beside a river channel) have strong effects on stream water quality. Rivers with extensive hyporheic zones retain and process nutrients efficiently, which has a positive effect on water quality and on the ecology of the riparian zone. Scientific research emphasizes the importance of maintaining connectivity between the channel, hyporheic and riparian components of river ecosystems. When human actions, such as encasing streams in pipes, sever those connections, the result is poorer water quality and degraded fish and aquatic species habitat downstream (Meyer et al. 2003). The proposed decommissioning of 10 miles of roads (and the associated removal of culverts and/or road crossings over drainages) will restore connectivity between the hyporheic, riparian and river ecosystems.

Cumulative Effects

Past Activities

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on TES wildlife from the existing condition (existing condition reflects the changes of all activities that have occurred in the past) within the Wildlife Analysis Area. Past actions in the area include grazing, timber harvest and recreation use. See Appendix D for the cumulative effects list with specific project names, etc.

Resource use in the Wildlife Analysis Area prior to the mid 1800s was limited to subsistence hunting and gathering by the Mountain Maidu. Grazing (cattle and sheep) and dairy farms have been recorded as early as the 1860s. Most small dairies did not survive into the 1900s and by the mid 1880s the emphasis within Grizzly Valley appears to have been focused primarily on ranging beef cattle (Kliejunas and Elliott 2006). By 1920 R.T. Jenkins had acquired at least some of the lands formerly held by George Mapes. Jenkins established a camp and ran thousands of head of sheep from this time until at least the early 1960s (Kliejunas and Elliott 2006). During the mid 1920s, concerns of overgrazing lead to increased restrictions resulting in increased cattle grazing and allotments being managed by the PNF. Many of these allotments remain active today, although the numbers of cattle have been substantially reduced over the years. Currently, no sheep graze in Grizzly Valley but the overall pattern of seasonal range use has been continuously present for at least 130 years (Kliejunas and Elliott 2006). With this intensive grazing the meadowlands became compacted and experienced substantial surface erosion resulting in meadow stream systems that experienced degradation. Since the mid 1920s, most watersheds have experienced a slow recovery (Drake 2006). Since 1980 there has been continued watershed restoration work on Freeman and Cow Creeks in the form of livestock exclosures, bank stabilization, willow planting, road closures and reseeding of disturbed areas.

The history of logging in the project area is quite extensive and has been dated to the 1920s. When the Western Pacific Railroad was completed through Plumas County in 1909 many sawmills were developed along the new route. Among these was the Feather River Lumber Company (FRLC), who, in 1915, began using a narrow gauge railroad to bring logs to its mill located in Delleker. By the end of the decade, FRLC had penetrated the southwest end of Grizzly valley and had constructed miles of temporary railroad spurs throughout the area. The company used caterpillar tractors and big wheels rather than steam donkeys due, in larger part, to the comparatively gentle topography of much of the area (Kliejunas and Elliott 2006). Railroad logging operations ended in 1940 and by the early 1950s the old mainline grade along the western end of the valley was converted into the main road, today’s 24N10 road (Kliejunas and Elliott 2006). Between 1926 and 1990 it is estimated from BKRD Timber Atlases and sale contracts that 90 percent of the project area was harvested using a combination of overstory removal, single tree and group selection. Much of the area was salvage logged from 1990 thru 1996 (Table 3.29). More recent timber harvests (1990 – 2005) within the Wildlife Analysis Area have harvested approximately 66.6 million board feet of timber through regeneration harvests, overstory removal and sanitation silvicultural prescriptions (Table 3.29). Timber harvesting had impacts on soils in several ways; compaction resulting from road; skid and landing construction; removal or displacement of topsoil; loss of soil due to mass movement or surface erosion (Drake 2006). In addition to all of the timber harvest activities, we have implemented several Knutson–Vanderberg (KV) culture projects (site prep, planting and pre-commercial thinning), small fuelwood/sawtimber projects (meadow enhancement), Little Summit Lake Post and Pole and a special public fuelwood permit for Camp 5 (lakeside of FS road 24N10, no woodcutting allowed) for post harvest debris clean up, stand improvement, insect/disease problems and habitat enhancement.

Table 3.29 Harvest activities in the Freeman Project area and wildlife analysis area on National Forest Lands since 1980.

	project area				**Wildlife Analysis Area***			
	1980 - 1989	**1990 - 1999**	**2000 - 2005**	**Total mmbf**	**1980 - 1989**	**1990 - 1999**	**2000 - 2005**	**Total mmbf**
Green Sales - mmbf	47.5	0.0	0.2	**47.7**	81.4	15.0	3.2	**99.6**
Salvage - mmbf	0.0	35.0	2.0	**37.0**	11.1	48.4	0.0	**59.5**
Total—mmbf**	**47.5**	**35.0**	**2.2**	**84.7**	**92.5**	**63.4**	**3.2**	**159.1**

*Wildlife Analysis Area includes project area figures.
** Volumes are estimated (mmbf = 1 million board feet), only includes volume harvested.

In 2005, approximately 129 commercial woodcutting permits were issued for the Beckwourth RD allowing for the removal of 1 to 10 cords of wood per permit. An additional 702 personal woodcutting permits for 1 cord each have been issued in 2005 for the Beckwourth RD. Also, approximately 5,617 Christmas tree permits were sold on the Beckwourth RD for 2005. It is speculated that commercial woodcutting, personal woodcutting and Christmas tree cutting has occurred within the Wildlife Analysis Area but amounts are not quantifiable.

From 1970 through 1996 there were approximately 43 fires (20 human caused) that burned 7 acres, with the largest being 1 acre. The north facing slope and wind sheltering effect of Grizzly Ridge tend to keep fire size small. The high public use and presence of nearby Smith Peak Lookout are also factors, as fires are easily detected and suppression actions initiated quickly (Lane 2006).

Recreation in the form of hunting and fishing was a common activity within Grizzly Valley throughout the late 1800s and early 1900s. In the late 1960s, recreation took on a new and expanded form with the construction of Grizzly Dam and the formation of Lake Davis (Kliejunas and Elliott 2006). Immediately following the formation of Lake Davis the PNF established camping areas and fishing access points.

Most of the recreation use within the Wildlife Analysis Area consists of dispersed activities (concentrated around Lake Davis) by individuals and small groups, which include hiking, horseback riding, mountain biking, pleasure driving, ATV's, snowmobiles, swimming, ice skating, cross country skiing, snow play, wildlife watching, hunting, fishing, ice fishing, camping, picnicking and firewood gathering. There are three developed fee-use Forest Service Campgrounds (Grizzly, Lightning Tree and Grasshopper Flat Campground), four free-use boat launches (Lightning Tree, Mallard Cove, Honker Cove and Camp 5) and approximately 20 fishing access points within the Wildlife Analysis Area . One boat launch (Camp 5) and approximately eight fishing access points are in the project area. Approximately 206,000 visitors come to Lake Davis each year (Schaber 2006). Use in these campgrounds ranges from 20% to 30% in any given year. The fishing access points and boat launch in the project area see mostly moderate (20% -30%) and high (40%- 60%) use throughout the year with holidays showing the highest use (70%-80%). The Wildlife Analysis Area is also within deer hunting zones X6A and X6B, which allocated 380 (X6A) and 425 (X6B) deer tags in 2005. Since 1980 there has been continued recreation facilities maintenance and improvement in the form of fisherman access road improvements, vault toilets (sweet smelling) and barriers to keep vehicles from going off road. In 1997 CDF&G poisoned Lake Davis with rotenone in an attempt to eradicate pike and improve the trout fisheries.

Present or Reasonably Foreseeable Future Activities

Present and future HFQLG and non-HFQLG projects planned that overlap with the Wildlife Analysis Area may have cumulative impacts to wildlife, fisheries and amphibians (Table 3.30). After these HFQLG projects are implemented, the area will be guided by the direction described for the other Sierra Nevada national forests (USDA Forest Service 2004).

Table 3.30 Reasonably foreseeable projects on the Plumas National Forest within the wildlife analysis area

Reasonably Foreseeable Projects	Implementation Year	Status
Westside Lake Davis	2005-2006	On going
Humbug DFPZ	2003-2006	On-going
Long Valley KV	2005-2006	On-going
Hazard Tree Removal	2005	On-going
DFPZ maintenance	2016	-
Lake Davis Pike Eradication	2007	Planning

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels.

Future activities include on going work within the Humbug DFPZ, Long Valley KV projects and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the Wildlife Analysis Area.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report. However; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. A 10-year average (1991-2000) indicates that 3,273 permits were issued annually resulting in the annual sale of 10,417 cords of wood on the Plumas. Since 1993 there has been a declining trend in both number of permits and cords sold (for the year 2000, 2,227 permits issued selling 6,392 cords, while in 2003, 819 permits were sold for a total of 2,154 cords). Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads and reduction in habitat losses due to large, damaging wildfires.

The DFPZ is designed to be effective for a period of 10 years. The earliest maintenance treatment to maintain effectiveness is expected to be approximately 10 years from completion of the initial DFPZ, based on a review of similar projects completed since the mid 1990's. The direct, indirect and cumulative effects of the foreseeable maintenance (hand, mechanical and prescribed fire treatments) would be similar to those described in the HFQLGFRA FSEIS (pages 47–305).

The future maintenance for the Proposed Action is projected to include 1,594 acres of prescribed fire, 419 acres of hand treatment, 1,618 acres of mechanical treatment and 16 acres of herbicides. Alternative 3 was not analyzed separately due to the fact that it has only 22 fewer acres of treatment than Alternative 4. Alternative 4 is projected to include 1,576 acres of prescribed fire, 411 acres of hand treatment, 1,615 acres of mechanical treatment and 15 acres of herbicides. The herbicide treatment shows up due to isolated small acreages of shrubs within treatment units. Based on site-specific analysis of the vegetation types and slopes in the project area, reviews of other projects completed within similar types and slopes and current direction to avoid use of herbicides, the foreseeable maintenance would consist of prescribed fire, hand treatments and some mechanical treatments. Herbicide use is not planned as part of the reasonably foreseeable DFPZ maintenance. See Appendix E for the tables generated on DFPZ maintenance.

Viability determinations for threatened, endangered and old forest associated sensitive species, based on the effects of DFPZ maintenance, are found on pages 139 – 140 of the HFQLGFRA FSEIS, Chapter 3—Affected Environment and Environmental Consequences (determinations for aquatic/riparian associated species are found on pages 241 – 243).

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions.

Treatment to eradicate the pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate and water quality in all the streams within the Freeman Project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through National Forest lands to lake Davis and it's tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers.

3.5.5.5 General Effect of Alternative 2 (No-action)

No direct effects (disturbance or habitat changes) on TES species (both terrestrial and aquatic) are expected to result from the "No-action" alternative. Potential indirect effects relate to the long-term effects on stand structures, riparian areas and the increased possibility of catastrophic wildfire due to implementing the No-action alternative. The effects of a catastrophic wildfire are speculative, but a worst case situation of a high intensity, wind driven fire could result in the direct loss of 1-6 spotted owl Protected Activity Centers (PACs), 1-8 goshawk PACs, 1-4 potential great gray owl PACs, elimination of existing late seral habitat (5M, 5D, 6), as well as alteration of riparian zones with potential increases in soil erosion above normal levels. Direct mortality of wildlife would occur, but the magnitude of this mortality is unknown.

The BA/BE for HFQLGFRA FEIS (1999) stated that any alternative that would reduce the threat of large, stand replacement fires by creating conditions that would reduce the fire size and intensity will benefit forest and aquatic dependent species. Large fires create large-scale fragmentation across landscapes that removes suitable habitat, isolates habitat parcels and creates large openings that could prevent species occupancy, emigration and immigration. Alternative 2 does not move the habitat in a direction to reduce the threat of large stand replacement fires. There would be no action taken to close and/or decommission up to 9 miles of road or reconstruct up to 16 miles of road.

3.5.6 Threatened and Endangered Species

Table 3.31 describes all threatened & endangered species that could potentially occur within the project area. Species that have been located within the project area and/or suitable habitat is present in the project area and/or the project area is within the range of the species, will be analyzed further for potential impacts, even if surveys did not locate individuals.

Table 3.31 Potential Occurrence of Threatened, Endangered, or Proposed Species and their Habitats in the Wildlife Analysis Area

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis Synopsis
Birds						
Bald eagle *Haliaeetus leucocephalus* Threatened	Sea level – 7000	Throughout northern and central CA. Wintering and nesting habitat associated with lakes, reservoirs, rivers or large streams. Needs large, old trees near water for nesting.	Removal of nesting habitat, high recreation use on lakes, DDT in eggshells, disturbance near nest sites.	Yes	Yes	Analyzed in text. Present in Wildlife Analysis Area.

Primary Sources: California's Wildlife, Volumes I, II and III. CWHR. Zeiner et al. 1988, 1990a, 1990b, Jennings and Hayes 1994 BA/BE Reference Document, USDA Forest Service 1999, USDA Forest Service 1993.

3.5.6.1 Bald Eagle (*Haliaeetus leucocephalus*)

The PNF LRMP requires that the Forest determine trends in breeding populations of bald eagles by annually documenting occupancy and production of nest sites involving direct counts of adults and young and evaluate habitat trends in designated areas (PNF LRMP Chapter 5, page 5-7).

Affected Environment—Bald Eagle

Each bald eagle territory on the PNF is monitored a minimum of three times during the nesting season. In 1996, the PNF had 16 bald eagle territories documented. At that time forest personal predicted one new territory every 2.6 years. In 2006, there are currently 23 bald eagle nesting territories on the PNF which is a rate of one territory every 1.4 years, exceeding the prediction made in 1996. In 2006, sixteen bald eagle nesting territories are active. In three locations (Lake Davis, Antelope Lake, Little Grass Valley Reservoir) one pair occupies two different territories. Thus the resident population on the PNF is approximately 32 individual birds. Based on this information, the bald eagle population on the PNF appears to be stable at this time.

In California, bald eagles are not known to nest further than two miles from an open water body, (Lehman 1979, USFWS 1986). All nesting bald eagles on the PNF are associated with reservoirs or lakes. The only water body within the Wildlife Analysis Area which supports two nesting pairs is Lake Davis, Table 3.32. There is no other open water body within the Wildlife Analysis Area suitable for supporting nesting eagles. Bald eagle nest sites are present in the Wildlife Analysis Area and treatment area. Table 3.32 provides some information on nest site occupancy for territories within the Wildlife Analysis Area. All monitoring of nest sites has been conducted by the Forest Service biologist on the district and CDFG biologists.

Trees selected for nesting are characteristically one of the largest in the stand or at least co-dominant (20”-30”) with the overstory and usually have stout upper branches and large openings in the canopy that permit nest access (USFWS 1986). Nest trees usually provide an unobstructed view of the associated water body and are often prominently located on the topography (Ibid). A survey of nest trees used in California found that about 71 percent were ponderosa pine (*Pinus ponderosa*), 16 percent were sugar pine (*Pinus lambertiana*) and 5 percent were incense cedar (*Librocedrus decurrens*), with the remaining 8 percent distributed among five other coniferous species (Lehman 1979). See Table 3.33 for acres of suitable bald eagle nesting habitat within the Bald Eagle Habitat Management Area (BEHMA) in the Wildlife Analysis Area. Primary use areas provide current nesting, roosting and/or foraging habitat and protect historic/current nesting and roosting sites. Secondary use areas are managed for future nesting sites, roosting sites, foraging sites and population expansion. A total of three bald eagle territories (primary use areas with associated secondary use areas) are in the Wildlife Analysis Area (Figure 3.2) equaling approximately 5,823 acres of a total 6,256 acres in the BEHMA. There is also a winter roost within the Wildlife Analysis Area (Figure 3.2). Two bald eagle territories and a winter roost located within the project area could potentially incur direct habitat impacts.

Table 3.32 Bald Eagle Nesting History in the Wildlife Analysis Area

Year	Cow Creek	Mosquito Slough
1977	Discovered, status unknown	
1978	Occupied, 0 young	
1979	Occupied, 0 young	
1980	Not occupied	
1981	Occupied, 0 young	
1982*	Occupied, 2 young	
1983*	Occupied, 0 young	
1984	Occupied, 2 young	
1985	Occupied, 1 young	
1986	Occupied, 2 young	
1987	Occupied, 0 young	
1988	Occupied, 0 young	
1989	Occupied, 1 young	Discovered, 1 young
1990	Occupied, 2 young	Occupied, 2 young
1991	Occupied, 0 young	Occupied, 1 young
1992	Occupied, 1 young	Not occupied
1993	Occupied, 0 young	Occupied, 1 young
1994	Occupied, 2 young	Occupied, 0 young
1995	Occupied, 2 young	Not occupied
1996	Occupied, 0 young	Occupied, 0 young
1997	Status unknown	Occupied, 2 young
1998	Occupied, 0 young (Pike Eradication Effort—Rotenone)	Occupied, 0 young (Pike Eradication Effort—Rotenone)
1999	Occupied, 2 young	Occupied, 1 young
2000	Not occupied	Occupied, 2 young
2001	Not occupied	Occupied, 2 young
2002	Occupied, 1 young	Occupied, 1 young
2003	Occupied, 0 young (Pike Eradication Effort—Detonation Cord)	Occupied, 0 young (Pike Eradication Effort—Detonation Cord)
2004	Occupied, 0 young	Occupied, 2 young
2005	Occupied, 2 young	Occupied, 0 young

*Cow Creek bald eagles utilized an alternate nest near Bagley Pass

Table 3.33 Suitable Bald Eagle Nesting Habitat within the Bald Eagle Habitat Management Area in the Wildlife Analysis Area

Suitable Nesting Habitat	
CWHR Strata	**Acres**
EPN5D	13
EPN5M	166
EPN5P	15
SMC5D	21
SMC5M	6
SMC5P	4
Total	**225 (4% of Land Base)**
Potentially Suitable Nesting Habitat in 25 - 100 years	
CWHR Strata	**Acres**
EPN4D	703
EPN4M	1514
EPN4P	290
PPN4M	9
SMC4D	400
SMC4M	500
SMC4P	79
WFR4M	1
WFR4P	41
Total	**3,537 (61% of Land Base)**
Potentially Suitable Nesting Habitat in >100 years	
CWHR Strata	**Acres**
EPN3M	1
EPN3P	21
EPN4S	8
PPN4S	59
SMC3D	17
SMC3P	13
WFR2S	72
Total	**191 (3% of Land Base)**
Unsuitable Nesting Habitat	

CWHR Strata	Acres
AGS (Annual Grassland)	122
ASP (Aspen)	67
LPN (Lodgepole Pine)	492
MCP (Montane Chaparral)	48
PGS (Perennial Grassland)	1,054
SGB (Sagebrush)	40
WTM (Wet Meadow)	22
Water	25
Total	**1,870 (32% of Land Base)**
Total Land Base	**5,823 acres**

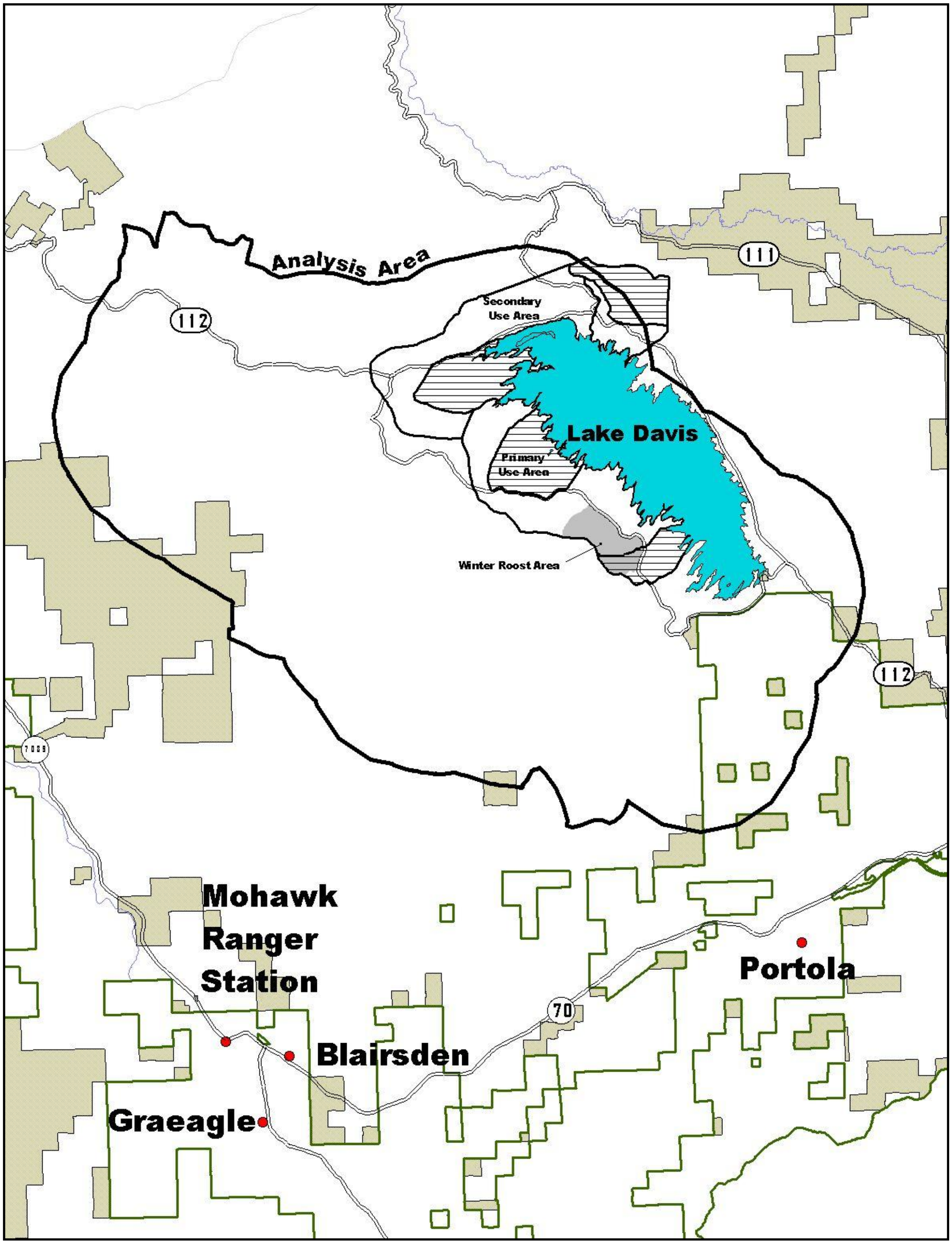

Figure 3.2 Freeman Wildlife Analysis Area with Bald Eagle Primary Use Areas (horizontal stripping), Secondary Use Areas (black outline) and Winter Roost Area (solid color) all make up the Bald Eagle Habitat Management Area (BEHMA).

Environmental Consequences—Bald Eagle

Effects of the Action Alternatives

Bald eagles exhibit great variation in response to human activity depending on the type, frequency and duration of activity, modification of the physical environment, time of reproductive cycle and individual bird accommodation to the disturbance (US Forest Service, Region 5, 1977). On the Chippewa National Forest, rather than habituating to repeated intrusion, eagles flushed at increasing distances with additional disturbances. Thus, it cannot be assumed that eagles will readily adapt to new stimuli. Although some may indeed adapt to changes, it appears that others will not, at least in the short run (Fraser et al, 1985). The variable effects of human activity on the reproductive performance of bald eagles (Grier 1969, Fraser 1985) imply a threshold for detrimental impact between pristine isolation and outright destruction. Disturbance in relation to eagle breeding chronology is important. Vulnerability is greatest during egg-laying, incubation, hatching and when eagles are small and downy. Nest-attending eagles are relatively sedentary, whereas foraging eagles are the most easily disturbed. Thus, eagles are more consistently flushed from perches than from nests (Grubb and King, 1991). Distance to disturbance is the most important aspect of human disturbance. Human activities that are distant, of short duration, out of sight, few in number, below and quiet have the least impact on nesting bald eagles.

Despite the multi-dimensional nature of human disturbances, any category of disturbance can, in excess or under the proper circumstances, disrupt normal behavior or cause nesting failure (Grubb and King, 1991). The five week period that includes egg laying and incubation is the most critical in terms of reproductive success. Disturbance at this time may cause the adults to leave eggs unattended. Interruption of incubation may cause heat loss to the point of nest failure. Unnatural exposure of young reduces the chances of survival, especially during times of inclement weather. Interruption of feeding visits by adults may also affect survivability of young nestlings. Disturbance may also cause young to leave the nest prematurely.

Several studies exist which examine bald eagle responses to various disturbances (Stalmaster and Newman 1978; Knight and Knight 1984; Fraser et al. 1985; McGarigal et al. 1991; Grub and King 1991). Most of the disturbances are from recreational activities. Experiments that determine flush response rate and flush distance of eagles to approaching disturbances are the most common tools used to evaluate impacts. There are some distinctive forms of recreational disturbance and patterns in eagle response behavior that are consistent in their effects. Mean flush distance was 197 m for breeding eagles responding to boating activities on the Columbia River estuary (McGarigal et al. 1991); 196 m for wintering adult eagles in response to pedestrians on the Nooksack River (Stalmaster and Newman 1978); 168 m and 150 m for wintering birds perched in trees when they responded to boating disturbances on the Skagit and Nooksack rivers, respectively (Knight and Knight 1984); 137 m for eagles responding to boating disturbances in North Carolina (Smith 1988); and 215 m for eagles of all ages and seasons responding to boats along Chesapeake Bay (Buehler et al. 1991). The overall similarity in these distances suggests that there may be a general tolerance threshold for foraging eagles. Incubating eagles flushed at greater distances when disturbed repeatedly (Fraser et al. 1985), whereas the flush distance of winter migrants did not change when disturbed repeatedly (Stalmaster and Newman 1978). Eagles flushed more often when boats approached slowly or were loud than when boats approached rapidly or were quiet (McGarigal et al. 1991). Slow-moving boats disrupted eagle feeding activity more than fast-moving boats (Stalmaster et al. unpublished report). McGarigal et al. (1991) noted that eagles were largely unaffected by fast-moving, land-based vehicles, but became increasingly agitated as vehicles slowed to a stop. Time of day also seems to influence flush response; eagles flushed more often in response to human activities before 1000 hours; therefore human activities during early morning were potentially more disturbing to foraging eagles (McGarigal et al. 1991).

Direct effects

Potential direct effects on the bald eagle may result from the modification or loss of habitat or habitat components (primarily large trees, snags and other perches) and rarely from direct mortality if nest trees are felled. The Proposed Action and alternatives will not cut or remove nest trees. All of the action alternatives treatments (thinning, group selection, etc.) within the bald eagle management area have been designed to enhance bald eagle habitat via the Lake Davis Bald Eagle Habitat Management Area (BEHMA) Plan by encouraging the regeneration of pine.

Approximately 5,823 acres of the 6,256 acre BEHMA are present in the Wildlife Analysis Area. Of the 5,823 acres of BEHMA present in the Wildlife Analysis Area approximately 225 acres are currently suitable bald eagle nesting habitat with another approximately 3,537 acres being potentially suitable for nesting in the next 25 to 100 years. No currently suitable nesting habitat would be impacted with the implementation of any of the action alternatives. Alternative 1 would release 191 acres of 1,032 acres in the primary use areas and 732 acres of 2,505 acres in the secondary use areas. Of the 923 acres being released, dominant and co-dominant (20”-30”) trees would average an inch of growth every 5 years (personal comm. S. Rakich). This means that a 20 inch dbh tree would reach suitable nesting size in 5 (21” dbh) to 50 years (30” dbh) instead of 25 to 100 years if the stand went untreated. The implementation of Alternative 1 would remove 20 acres in the primary use area and 69 acres in the secondary use area through GS and aspen ETZs of potentially suitable nesting habitat, rendering it unsuitable. Alternative 3 would release 209 acres of 1,032 acres in the primary use areas and 768 acres of 2,505 acres in the secondary use areas, for a total of 977 acres treated for release. The implementation of alternative 3 would also remove two acres in the primary use area and 25 acres in the secondary use area through GS of potentially suitable nesting habitat rendering it unsuitable. Alternative 4 would release 259 acres of 1,032 acres in the primary use areas and 857 acres of 2,505 acres in the secondary use areas, for a total of 1,116 acres treated for release. The implementation of Alternative 4 would remove 2 acres in the primary use area and 21 acres in the secondary use area through GS of potentially suitable nesting habitat, rendering it unsuitable. Based on the figures above, a total of

834-1,093 acres of the 3,537 acres of potentially suitable nesting habitat within the BEHMA in the Wildlife Analysis Area would be increased under Alternatives 1, 3 and 4.

In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and roosting activities. There is a low potential for smoke from burning piles, etc. to disrupt the normal behavior patterns of eagle using the area. Implementation of Limited Operating Periods (LOPs) around known bald eagle nests would remove the effects associated with direct disturbance on treatment units and temporary roads.

Indirect effects

Reconstruction of existing roads may result in roads that are more accessible to general passenger vehicles and thus lead to a minor increase in recreational use of the area. New road construction would be in the form of minor skid roads leading to treatment areas and thus would not likely result in an increase in recreational use, except perhaps by hunters in the fall. Construction of temporary roads would have no long term impacts in the form of increased human use and presence in the area, but could lead to minor, temporary impacts in the form of increased sedimentation in streams and thus a decrease in water quality, which could negatively affect bald eagle foraging. However, changes in the fishery production are not expected as a result of implementing proposed fuel treatments, groups and area thinning with biomass removal, due to implementation of BMPs and meeting all of the RMOs (Appendix H). Analysis located in CWE report within project record assures that there will be no indirect effects on the fisheries or fisheries habitat.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on TES wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to contribute to bank erosion and sedimentation of stream habitats thus potentially affecting the food source of bald eagles that forage on and around Lake Davis.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the habitat for the bald eagle's food source.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the Wildlife Analysis Area.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report. However; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to implement measures from the BEHMP, thus potentially improving habitat conditions for bald eagles.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed. The effect of this action would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover which would have a nominal affect on the bald eagle.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. This continued recreational use would have little to no effect on the bald eagles.

The CDFG is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to affect the food source and nesting success of bald eagles that forage on and around Lake Davis. The lake was treated in a similar way in 1997. Both the Cow Creek and Mosquito Slough eagles attempted nests in 1996 and both failed. In 1997, the Mosquito Slough pair fledged 2 young. No data exists for the Cow Creek pair in 1997. In 1998, again both territory pairs attempted nests and both failed. Then in 1999 both pairs attempted nests and both were successful, with the Cow Creek pairs fledging 2 young and the Mosquito Slough pair fledging 1.

Based on the direct, indirect and cumulative effects of the action alternatives, it is suspected that the overall potential nesting habitat in the Wildlife Analysis Area would be improved. Improving future nesting habitat on the PNF would contribute to the PNF LRMP goal of 26 bald eagle territories on PNF lands, thus contributing to the overall Forest and State populations.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on bald eagles or bald eagle habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable bald eagle nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. Thus suitable habitat for productive bald eagle territories could become patchy or unevenly distributed with this alternative and could lead to reduced or lower abundance of bald eagles within the Wildlife Analysis Area

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by bald eagles, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting. No roads would be closed or decommissioned with this alternative.

Cumulative Effects

The No-action Alternative for the Freeman Project would provide no long-term protection of bald eagle habitat from catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (2001), which could lead to lower eagle abundance from existing condition within the Wildlife Analysis Area. There would be no thinning that could enhance the growth of dominant and co-dominant (20"-30") trees that may provide future habitat availability.

Based on the direct, indirect and cumulative effects the no action alternative would not result in any change in population trends or future nesting habitat to meet the PNF LRMP goal of attaining 26 bald eagle territories.

Determination—Bald Eagle

It is my determination that the Freeman Project may affect but is not likely to adversely affect the bald eagle or its designated critical habitat. This determination is based on the following:

1. The affects may benefit bald eagles by recruiting larger diameter trees, thus increasing nesting opportunities;
2. retention of 97.5% to 99.3% of the future nesting habitat within the BEHMA in the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4);
3. creation of a network of fuel reduction areas designed to reduce the loss of habitat due to wildfire;
4. Implementation of SAT guidelines, meeting RHCA standards and compliance with Riparian Management Objectives would safeguard against any increased sedimentation that could have short-term affects to foraging habitat.

The USFWS has concurred with our "May affect, but is not likely to adversely affect" determination. The PNF received a letter of concurrence on August, 1st, 2006 (Consultation # 1-1-06-I-1410).

3.5.7 Sensitive Species

Table 3.34 describes all sensitive species that could potentially occur within the project area. Species that have been located within the project area and/or suitable habitat is present in the project area and/or the project area is within the range of the species, will be analyzed further for potential impacts, even if surveys did not locate individuals.

Table 3.34 Potential occurrence of USDA Forest Service Region 5 Sensitive Species and their habitats in the wildlife analysis area

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis synopsis
Amphibians						
Mountain yellow-legged frog *Rana muscosa* Forest Service R5 Sensitive Federal Candidate	4500 – 12000	Plumas to Tulare Co. Found in ponds, tarns (glacial lakes), lakes and streams with sufficient depth and adequate refuge for over wintering.	Fish stocking, UV radiation, deposition of airborne pollutants, recreation, grazing, chitrid fungus	Yes, but low potential due to Northern pike	No	Analyzed in text. Recent surveys (2004) have not located any individuals.
Foothill yellow-legged frog *Rana boylii* Forest Service R5 Sensitive Federal Species of Concern	< 6400	Sierran foothills. Breed in shallow, slow flowing water with at least some pebble and cobble substrate. Found in riffles and pools with some shading (>20%) in riparian habitats and moderately vegetated backwaters, isolated pools and slow moving rivers with mud substrate. Rarely found far from permanent water.	Altered stream flow regimes and introduced exotic predators (fish & bullfrogs), grazing, mining, recreation, chitrid fungus	Yes, but low potential due to Northern pike	No	Analyzed in text. Recent surveys (2004) have not located any individuals.

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis synopsis
Reptiles						
Northwestern pond turtle *Clemmys marmorata marmorata* Forest Service R5 Sensitive Federal Species of Concern	< 4700	Aquatic habitat in spring and summer. Adjacent upland habitat fall and winter. In rivers, needs slow flowing areas with deep underwater refugia and emergent basking sites. Migration, hibernation and nesting occur on land up to 330 feet from riparian area.	Non-native fauna, non-native turtles through competition and disease, bullfrogs and predatory fish, vehicles, timber harvest, mining, fire, grazing, water alteration and diversion, fishing.	Yes	No	Analyzed in text. Recent surveys (2004) have not located any individuals.
Birds						
American peregrine falcon *Falco peregrinus anatum* Delisted from Threatened Federal Species of Concern	Sea level – 7500	Western Sierra Nevada. Requires protected cliffs and ledges for cover.	Predators on young are golden eagles, great horned owls, raccoons and other animals. Ravens as nest competitors.	Yes	No	Analyzed in text. No known records in Wildlife Analysis Area but historic prairie falcon eyrie present. Nearest eyrie is approx. 7 miles from project area.
California spotted owl *Strix occidentalis occidentalis* Forest Service R5 Sensitive Federal Species of Concern	1000 – 7440	Sierra Nevada province in CA. Needs at least 40% canopy closure and an average dbh of 30 inches for nesting.	Timber harvest, fire suppression, excessive build-up of fuels, decline in snag density.	Yes	Yes	Analyzed in text. Present in project area. Surveyed for in 2004 & 2005.

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis synopsis
Northern goshawk *Accipiter gentilis* Forest Service R5 Sensitive Federal Species of Concern	2500 – 10000	Throughout northern CA and Sierra Nevada. Dense mature conifer and deciduous forests interspersed with meadows, other openings and riparian areas. Found in Mixed Conifer to Lodgepole Pine	Logging, catastrophic (stand replacing) fire	Yes	Yes	Analyzed in text. Present in project area. Surveyed for in 2004 & 2005
Great gray owl *Strix nebulosa* Forest Service R5 Sensitive	2500 – 9000	Western Sierra Nevada's with 60% in Mariposa and Tuolumne Co. Breeds in Yosemite NP area. Found in montane meadows surrounded by dense forest of medium to large mixed conifer and red fir.	Grazing, logging of suitable nest trees and buffer.	Yes	Yes	Analyzed in text. Present in project area. Surveyed for in 2004 & 2005
Willow flycatcher *Empidonax trailii brewsteri* Forest Service R5 Sensitive Federal Species of Concern	2000 – 8000	Western Sierra Nevada. Found in, willow-dominated riparian areas, including moist meadows with perennial streams and smaller spring-fed or boggy areas.	Grazing, adjacent land use, brown-headed cowbird parasitism, reduction in nesting habitat	Yes	No	Analyzed in text. Recent surveys (2005) have not located any individuals.

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis synopsis
Greater sandhill crane *Grus canadensis labida* Forest Service R5 Sensitive	–	Breeds in Siskiyou, Modoc, Lassen, Sierra Valley, Plumas and Sierra counties and winters primarily in the Central Valley; found in wet meadow, shallow lacustrine and fresh emergent wetland habitats	Loss of extensive wetland habitat required for breeding; human disturbance; grazing	Yes	Yes	Analyzed in text. Present in project area.
Mammals						
Pacific fisher *Martes pennanti pacifica* Forest Service R5 Sensitive Federal Species of Concern	4900 – 7900	Forests with high canopy closure and structural elements of late successional old-growth forest. Closely associated with water or riparian habitats (328 ft). Rest sites include large standing conifers or hardwoods. Dens occur in cavities of standing large diameter conifers or hardwoods (snags or live trees).	Forest fragmentation, logging, fire, climate, land use patterns, metapopulation (a group of spatially separated populations) dynamics	Yes	No	Analyzed in text. No known records in Wildlife Analysis Area. Surveyed for in 2005
American marten *Martes americana* Forest Service R5 Sensitive Federal Species of Concern	>6000	Found in mesic, late successional coniferous forests. Dens are in trees, snags, downed logs and rocks in structurally complex old forests.	Forest fragmentation, logging, fire, climate, land use patterns, metapopulation dynamics	Yes	No	Analyzed in text. No known records in Wildlife Analysis Area but possible in red fir along Grizzly Ridge. Surveyed for in 2005.

Species Name Species Status	Elev. Range (feet)	Habitat	Potential Threats	Suitable Habitat w/in Wildlife Analysis Area	Detection w/in Wildlife Analysis Area	Analysis synopsis
Sierra Nevada red fox *Vulpes vulpes necator* Forest Service R5 Sensitive Federal Species of Concern	5000 – 12000	Red fir and Lodgepole pine in subalpine and alpine fell-fields of the Sierra Nevada. Similar to marten and fisher. Dens seem to be in rock/talus slides or earthen excavations/holes.	Conversion of late seral stage forest to early seral stage forest, which favors competitors such as coyote and non-native red fox.	Yes	No	Analyzed in text. No historical sightings on the BCK RD. Surveyed for in 2005
California wolverine *Gulo gulo luteus* Forest Service R5 Sensitive Federal Species of Concern	6400 – 10800	Use a variety of habitats. Dens include snow-covered roots, standing or down logs with large cavities, holes under coarse woody debris, old beaver lodges, bear dens or rocky areas.	Recreation, vehicles, decrease in wild areas, logging, fires, mining, decrease in deer population.	Yes	No	Analyzed in text. No confirmed historical sightings on forest. Surveyed for in 2005
Pallid bat *Antrozous pallidus* Forest Service R5 Sensitive	< 6000	Uses a variety of habitats. Depends on oak woodlands for foraging. Roosts in mines, snags and in crevices in oaks	Roost disturbance, loss of oak habitat, pesticide use and grazing, loss of suitable nesting & roosting snags.	Yes	No	Analyzed in text. Nearest sighting is approx. 1 mile from project area.
Townsend's big-eared bat *Corynorhinus townsendii* Forest Service R5 Sensitive	< 10000	Found throughout the Sierra Nevada. Inhabits isolated areas with low human disturbance.	Human disturbance in caves, mines and historical buildings.	Yes	No	Analyzed in text. Nearest sighting is approx. 15 miles from project area.
Western red bat *Lasiurus blossevillii* Forest Service R5 Sensitive	< 3000	Dependent on edge habitats adjacent to riparian areas. Roosts in foliage.	Removal of riparian habitat, pesticides, water impoundments, fire. Loss of roosting trees, such as cottonwood/aspen.	Yes	No	Analyzed in text. Nearest sighting is approx. 5 miles from project area.

Primary Sources: California’s Wildlife, Volumes I, II and III. CWHR. Zeiner et al. 1988, 1990a, 1990b, Jennings and Hayes 1994 BA/BE Reference Document, USDA Forest Service 1999, USDA Forest Service 1993

3.5.7.1 Mountain Yellow-Legged Frog (*Rana muscosa*) & Foothill Yellow-Legged Frog (*Rana boylii*)

Affected Environment—Mountain Yellow-Legged Frog

The mountain yellow-legged frog historically inhabited ponds, tarns, lakes and streams from 4,500 to over 12,000 ft (Stebbins 1985 in SNFPA 2001). Adults are highly aquatic and are typically associated with near-shore areas of lakes for reproduction, cover, foraging and over-wintering and in low gradient (up to 4%) perennial streams with irregular shores and rocks (USDA Forest Service 2001). Streams in this category generally have the potential for deep pools (12-20") and undercut banks that provide suitable breeding and overwintering habitat. They prefer well illuminated, sloping banks of meadow streams, riverbanks and isolated pools with vegetation that is continuous to the waters edge (Martin 1993, Zeiner et al 1988). This species is seldom far from water. On the PNF, this species is found in a few small lakes in the Bucks Lake Wilderness, Lakes Basin and in several streams throughout the Forest.

There are no historical records of mountain yellow-legged frogs within the Wildlife Analysis Area identified in the Forest database or GIS coverage. In 2002, the Humbug Project, including the southeastern portion of the Freeman Wildlife Analysis Area was surveyed to protocol standards ("Standardized Protocol for Surveying Aquatic Amphibians" (Fellers and Freel 1995)), by contractor EcoSystems West Consulting Group. In 2003, the Happy Jack Project, including the southwestern portion of the Freeman Wildlife Analysis Area, was surveyed to protocol standards ("Standardized Protocol for Surveying Aquatic Amphibians" (Fellers and Freel 1995)), by contractor Mathews and Associates. In addition to the past ten years of surveys, site-specific amphibian surveys covering the remainder of the Freeman Wildlife Analysis Area, using established survey protocols (Fellers and Freel 1995), were conducted in all perennial streams, intermittent streams, springs and ponds that had potential amphibian habitat in 2004, specifically for the project area (WWC, 2005). No mountain yellow-legged frogs were found during any of the surveys conducted in the Wildlife Analysis Area. The closest known population is located about 11 miles south in Wade Lake, at the headwaters of Little Jamison Creek, downstream from the Wildlife Analysis Area.

A three-year MYLF telemetry study began in July 2003 with six frogs tagged with radio transmitters in Bean Creek and six in Lone Rock Creek, both on Mt. Hough Ranger District (Matthews 2003, personal com.). The objective of the study is to determine the dispersal behavior of the MYLF in relation to streams and adjacent terrestrial habitat. From this telemetry study, current findings found that the frogs are only associated directly within the drainage or immediately adjacent; in the summer months each adult frog has been located very close to the same pool/territory; and in the fall, as temperatures decline, female frogs have been found to be moving downstream within the stream channel towards male frogs.

While direct habitat degradation has not been cited as a cause of declines of this species, key management activities that the Forest Service can influence include: exotic fish stocking, pack stock use and access, recreation and locally applied chemical toxins (pesticides and herbicides) (USDA Forest Service 2001). The three action alternatives for the Freeman Project include borax treatment.

Affected Environment—Foothill Yellow-Legged Frog

The foothill yellow-legged frog historically occurred in foothill and mountain streams to 6,000 feet (USDA Forest Service 2001). Adults use both in-stream and riparian environments, though use of riparian areas and adjacent uplands is poorly understood (Ibid). This species is found in or near rocky perennial streams and rivers in a variety of habitats, including riparian, mixed conifer and wet meadow types. It inhabits areas with moving water but tends to avoid areas with steep gradients (Zweifel 1955). These frogs prefer partial shade, shallow riffles and cobble sized or greater substrate (Hayes and Jennings 1988). On the PNF, this species is found in a few of the larger riverine systems, such as lower portions of the South Fork, Middle Fork and North Fork Feather River (NFFR) and Spanish Creek, but has also been found in smaller tributary streams of these larger systems.

There are no historical records of foothill yellow-legged frogs within the Wildlife Analysis Area identified in the Forest database or GIS coverage. In 2002, the Humbug Project, including the southeastern portion of the Freeman Wildlife Analysis Area was surveyed to protocol standards (“Standardized Protocol for Surveying Aquatic Amphibians” (Fellers and Freel 1995)), by contractor EcoSystems West Consulting Group. In 2003, the Happy Jack Project, including the southwestern portion of the Freeman Wildlife Analysis Area, was surveyed to protocol standards (“Standardized Protocol for Surveying Aquatic Amphibians” (Fellers and Freel 1995)), by contractor Mathews and Associates. In addition to the past ten years of surveys, site-specific amphibian surveys covering the remainder of the Freeman Wildlife Analysis Area, using established survey protocols (Fellers and Freel 1995) were conducted in all perennial streams, intermittent streams, springs and ponds that had potential amphibian habitat in 2004, specifically for the project area (WWC, 2005). No foothill yellow-legged frogs were found during any of the surveys conducted in the Wildlife Analysis Area. The closest known population is located about 18 miles west on Spanish Creek, downstream from the Wildlife Analysis Area.

Key management activities which the Forest Service can influence are: dams and diversions, mining, livestock grazing, recreation, vegetation management and mechanical fuel treatment, roads and locally applied chemical toxins (pesticides and herbicides). In addition, fire can directly affect amphibians (USDA Forest Service 2001). The three action alternatives for the Freeman Project include vegetation treatment, mechanical fuels treatment, borax treatment, roadwork and use of prescribed fire.

Environmental Consequences—Mountain & Foothill Yellow-Legged Frogs

The analysis of effects of the alternatives for these two species has been combined as proposed treatments have similar impacts to the aquatic environments in which these species exist.

Effects of the Action Alternatives

Habitat in RHCAs is prescribed for treatment to reduce the potential for catastrophic wildfire and release the remaining vegetation.

The objective within the RHCAs (potential habitat for both species of yellow-legged frogs (YLFs)) is to maintain microclimate, protect stream banks from disturbance and retain key attributes such as riparian vegetation, down logs and LWD recruitment within slower gradient creeks capable of supporting habitat for these species.

To achieve the above objective, RHCAs will be designated on the ground and appropriate fuel treatments prescribed, based on RHCA characteristics and adjacent fuel treatments. All hardwoods will be retained in all units. Mechanical equipment would not enter the RHCA equipment exclusion zones (25 feet from SMZs and in aspen treatment units, 50 feet from non-fish bearing RHCAs and 100 feet from fish bearing RHCAs), thus potential for direct impacts is negligible and very low risk. Hand thinned material will be hand piled in the equipment exclusion zones and burned. A backing fire will be allowed within RHCAs to reduce the immediate removal of live vegetation.

Direct Effects

Thinning and Prescribed Fire

Direct effects include the killing or injuring of individuals from harvest machinery, hand thinning, construction of slash piles and burning activities. Harassment of individual frogs from thinning activity (e.g. noise disturbance and ground vibration) within or near habitat may also directly affect the species. Hand thinning within the RHCA equipment exclusion zones (25 feet from SMZs and in aspen treatment units, 50 feet from non-fish bearing RHCAs and 100 feet from fish bearing RHCAs), as well as the underburning could result in direct mortality of individuals if these activities are conducted during the period of time that overland movements may be going on. Use of riparian areas and adjacent upland movements of FYLF are not well understood (USDA Forest Service 2001). Dispersal of FYLF is unknown, yet dispersal may occur from the main stems up the tributaries in the fall and winter months (Tina Hopkins 2001 pers. comm.). Dispersal behavior and habitats may be similar to MYLF, although it is unknown as to what extent, if any, overland travel occurs.

In a recent telemetry study by Matthews and Pope (1999), mountain yellow-legged frog overland movements were restricted to the month of September and were thought to have been associated with seasonal migrations between summer and over-wintering sites. During this migrational period frogs were found in exposed rocky habitats significantly more. Frogs moved from their original capture lake an average distance of 145m (476 feet). These movements were often associated with stream corridors. However, overland movements in dry rocky terrain were observed for up to 66m (216 feet). Overland movements did not appear to be influenced by cover types. Movements were clearly destination driven and occurred in short bursts with one individual completing this 66m journey in only 44 minutes. This new information suggests that the use of upland habitat by the mountain yellow-legged frog is very limited in both space and time.

It is unknown if or to what extent overland movements occur with stream dwelling MYLFs. An ongoing telemetry study is currently investigating this subject with individual frogs on the PNF. Findings from the MYLF study show that the frogs are extremely territorial and found at or near the same pool after each visit. Findings also show that female MYLFs move downstream towards male frogs when temperatures drop. MYLFs occupying streams within the study areas on the Plumas do not seem to travel overland, but move within the confines of the aquatic environment. Based on the telemetry results of frogs within streams on the PNF, keeping activity from the riparian edge would not directly affect frogs or bank habitat. Thus previous concerns regarding direct mortality of MYLFs in the upland due to mechanical thinning, group selection, area thinning and burning are not warranted for MYLFs occupying streams. If MYLFs are found during the implementation of the project, an LOP would be implemented in the occupied drainages (Oct 1 through April 15th).

RHCAs with sensitive areas (springs, bogs, erosive soils etc.) and RHCAs > 15% slopes would not be entered with ground-based equipment per the SAT guidelines and project design. Within all RHCAs, burning intensities would be very light, due to restricted ignition within RHCAs and subsequent cool back burning that would occur, resulting in little consumption of LWD logs >12” dbh to meet the Soil Quality Standards and Guidelines to retain 10-15 tons per acre of LWD. Backburning would occur during times when there is increased moisture and potentially less consumption of LWD. Also, the “general burn plan” prescription is to consume fine fuels. Short-term sediment after burning will occur. A greater long-term benefit is the protection of the RHCAs from catastrophic wildfire. Again, applicable BMPs would be implemented.

While fire would not be ignited within the RHCAs, fire would be allowed to back into those riparian areas. There is a small potential for the modification of streamside vegetation and loss of duff layer due to prescribed fire in riparian areas. In addition, prescribed fire activities, when paired with past and future vegetation management activities, may result in some habitat loss through sedimentation and loss of riparian vegetation. However, any impacts from prescribed fires are expected to be short lived. Fire intensity should be low enough to allow some retention of duff layer and riparian vegetation that would prevent soil erosion and expedite recovery.

Group Selection

Group selections will not occur within the RHCAs, although they may be located immediately adjacent to RHCAs and certainly within the movement distances that MYLF may exhibit within lacustrine (lake) environments. The suitability of the lacustrine environment (Lake Davis) is questionable due to the presence of several predatory fish species.

Water Drafting

The use of water for dust abatement by drafting water from creeks especially during the summer months may cause changes in the flow regimes and water quality, especially within deeper pools and off channel waterholes. Changes in flow regimes can result in changes in surface water elevations, exposing egg masses to air drying for short periods (early summer) to potentially longer periods of exposure later in the summer, resulting in loss of egg viability. There is also the potential for individual tadpoles, egg masses, or amphibians to be taken up by the "drafting" process, resulting in mortality of individuals. New or existing water drafting sites would be evaluated by a biologist prior to changes and uses. As necessary, back down ramps will be maintained to ensure bank stability and minimize sedimentation. Amphibian/fish protection devices such as suction strainer (2mm gauge or less) will be used during drafting operations to prevent entrainment of tadpoles, egg masses or amphibians and, if necessary, post-project rehab will occur.

Indirect Effects

Vegetation management in the uplands can potentially change the hydrologic regime in the area. Soil erosion could direct sedimentation into streams that could create short-term unsuitable water quality that could disrupt habitat use by this species. However, with the implementation of SAT (Scientific Assessment Team) guidelines, RHCA buffers and Best Management Practices, it is anticipated that there would be no disruption in flows and minimal short-term sedimentation into streams (refer to CWE Report, Drake 2006).

Vegetative Treatments

Within the RHCAs, there is the potential for the following indirect effects: loss of sheltering habitat from backing fire and hand thinning, potential loss of riparian vegetation due to burning activities, changes in the microclimate (reduced humidity and increased air temperatures) due to the thinning and burning activities and increased sedimentation to the stream channel due to increased overland flows from the proposed project.

Again, the CWE analysis suggests that there is a moderate risk that the activities proposed in the action alternatives would lead to detrimental watershed effects (Drake 2006). Riparian vegetation could be enhanced and expanded as a result of thinning and underburning.

Backing fires in the RHCAs and underburning in the uplands can increase sediment production in streams if buffer strips are not maintained (Chamberlin et al. 1991, USDA-SNFPA-BO 2001). Annual water yields can be significantly increased after fire due to the reduction of transpiring vegetation (Agee 1993, USDA-SNFPA-BO 2001). Hand pile burning has essentially no direct effect on riparian vegetation since piles are typically not placed immediately adjacent to shrubs and other live vegetation. Some impact may occur to annual and perennial riparian plants that occur underneath or immediately adjacent to the pile. Riparian vegetation between piles would be unaffected. Since hand piles focus on removal of smaller sized fuels, existing larger diameter down woody debris would remain on site to provide for alternate sheltering and dispersal cover.

Road Management

Approximately 10 miles of roads are proposed for decommissioning, while another one mile is proposed for closing. This will decrease compaction, increase percolation into the roadbed, increase soil stability and limit concentrated flow as well as surface erosion derived from temporary roads. All temporary skid roads will be treated with water bars, in addition to being closed to traffic by installation of dirt berms. New road construction would increase the potential for soil movement and increased potential sedimentation into streams and aquatic habitats. Approximately two miles of new temporary road would be constructed but decommissioned upon completion of the proposed activities. The .3 miles of new system road construction would relocate two small segments of roads outside of RHCAs thus decreasing potential sedimentation into the streams and aquatic habitat.

Predation

Habitat modifications as identified above that are unfavorable to amphibians may favor their predators and increase the likelihood of further population declines due to unsustainable levels of predation (Knapp and Matthews 2000, Jennings and Hayes 1994). The perennial streams within the project area contain northern pike, rainbow, brown and brook trout; known predators of yellow-legged frogs. Implementation of RHCAs, BMPs and meeting Riparian Management Objectives would maintain suitable habitat conditions for trout in all streams they currently occupy.

All three species of garter snakes (*Thamnophis sp.*) that occur within the project area will feed on frogs, tadpoles and egg masses. Garter snake populations, especially those of the aquatic garter snake, are not expected to be affected by project activities.

Pesticides

Key management activities (identified in the SNFPA FEIS 2001 analysis for MYLFs) that the Forest Service can influence include: exotic fish stocking, pack stock use and access, recreation and locally applied chemical toxins (pesticides and herbicides). The three action alternatives for the Freeman Project include borax treatment. Certain key management activities (identified in the SNFPA FEIS 2001 analysis for FYLFs) which the Forest Service can influence are: dams and diversions, mining, livestock grazing, recreation, vegetation management and mechanical fuel treatment, roads and locally applied chemical toxins (pesticides and herbicides). The three action alternatives for the Freeman Project include vegetation treatment, mechanical fuels treatment, borax treatment, roadwork and use of prescribed fire.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot.

Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect MYLFs or FYLFs.

Cumulative Effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on TES wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Direct and indirect effects, as described above, on more than one stream can lead to larger effects downstream. Cumulative effects may occur from the historic vegetation and fuel management projects, road construction and densities, stream restoration projects, recreational use and grazing within the proposed project area. With reference to the Cumulative Watershed Effects Analysis (Drake 2005), the effects of the action alternatives are very similar and after full recovery (30 year period), these alternatives result in slightly lower ERA values of watershed condition, due to the road decommissioning in some subwatersheds.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to contribute to bank erosion and sedimentation of stream habitats.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the suitability of habitat for YLFs.

Future activities include ongoing work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the Wildlife Analysis Area.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to implement protection measures for YLFs.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed. The effect of this action would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover which would have a no affect on the YLF's.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. This dispersed recreation occurs throughout the project area and does not seem to be having any major impact to the steep riparian systems. However, due to a concentration of activity around Lake Davis several meadows have experienced some damage from OHV use. These activities around Lake Davis will continue to cause streambank disturbance and will have adverse effects to riparian vegetation.

The CDFG is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to improve habitat suitability for YLFs by removing northern pike from Lake Davis and its upstream tributaries while slightly reducing water quality with regards to a decline in taxa diversity of macroinvertebrates.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on YLF habitat, as no activities would occur that would cause disturbance to individual YLF, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of Riparian Habitat Conservation Areas (RHCAs) and suitable YLF habitat. Any acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and potential breeding habitat for the YLF.

Cumulative Effects

The No-action Alternative for the Freeman Project would not protect or enhance YLF habitat. There would be no actions designed to reduce the risk of high intensity wildfire. There is the potential for RHCAs to act like chimneys and carry fire up and down the watershed. Cumulative effects of livestock grazing would continue to create water quality problems, including sedimentation and bank cutting.

Determination—Mountain & Foothill Yellow-Legged Frogs

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the mountain & foothill yellow-legged frogs.

3.5.7.2 Northwestern Pond Turtle (*Clemmys marmorata marmorata*)

Affected Environment—Northwestern Pond Turtle

On the PNF, occupied Northwestern pond turtle habitat exists primarily on the westside (Feather River Ranger District) and central (Mt. Hough Ranger District) areas of the Forest, although a sighting was recorded in Sierra Valley on private land. The Plumas NF database contains 32 records for pond turtles. There are no records for this species within the Wildlife Analysis Area. In 2003, the Happy Jack Project, including the southwestern portion of the Freeman Wildlife Analysis Area was surveyed to standards ("Western Pond Turtle Survey Methods" (Reese 1993)), by contractor Mathews and Associates. In addition to the past ten years of surveys, site-specific northwestern pond turtle surveys, covering the remainder of the Freeman Wildlife Analysis Area using established standards (Reese 1993) was conducted in all perennial streams, intermittent streams, springs and ponds that had potential northwestern pond turtle habitat in 2004, specifically for the project area (WWC, 2005). No northwestern pond turtles were found during any of the surveys conducted in the Wildlife Analysis Area. The closest known population is located about 11 miles west in American Valley associated with Greenhorn Creek and the Quincy sewer ponds, downstream from the Wildlife Analysis Area.

Environmental Consequences—Northwestern Pond Turtle

Effects of the Action Alternatives

Direct Effects

Potential direct effects to upland habitats include thinning of stands and underburning, both removing vegetative cover and terrestrial structural components across the stand. If northwestern pond turtle are present, some individuals could be affected by harvest activities (crushed from tree falling and ground based equipment) during migrations to upland egg laying and overwintering sites. There is marginal to moderately suitable habitat for the northwestern pond turtle within the Wildlife Analysis Area. A few “ponded” areas exist within the riverine environments. There have been no detections of northwestern pond turtles within the Wildlife Analysis Area so the risk to the species is remote.

Indirect Effects

Indirect effects are similar to those described for FYLF and MYLF, except the predation factors identified do not apply (see page 193). Water temperatures would not be affected due to canopy cover retention along streams. Vegetation management in the uplands can potentially change the hydrologic regime in the area. Soil erosion could direct sedimentation into streams that could create short-term unsuitable water quality that could disrupt habitat use by this species. However, with the implementation of SAT (Scientific Assessment Team) guidelines, RHCA buffers and Best Management Practices, it is anticipated that there would be no disruption in flows and minimal short-term sedimentation into streams (Drake 2006).

Cumulative Effects

The same cumulative effects identified for YLFs apply to the WPT (see page 193 – 194). No pond turtle habitat has been directly affected by any similar projects on the Beckwourth RD.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on Western pond turtle habitat (WPT), as no activities would occur that would cause disturbance to individual WPT, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of Riparian Habitat Conservation Areas (RHCAs) and suitable WPT habitat. Any acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and potential breeding habitat for the WPT.

Cumulative Effects

The No-action Alternative for the Freeman Project would not protect or enhance WPT habitat. There would be no actions designed to reduce the risk of high intensity wildfire. There is the potential for RHCAs to act like chimneys and carry fire up and down the watershed. Watershed restoration through these fuel reduction projects would not occur to protect the sensitive watersheds from catastrophic wildfire.

Determination—Northwestern Pond Turtle

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Northwestern pond turtle.

3.5.7.3 American Peregrine Falcon (*Falco peregrinus anatum*)

The PNF LRMP requires that the Forest verify nest and reproductive success through field surveys on all existing occupied and high potential sites, documenting adults and young annually (PNF LRMP Chapter 5, page 5-8).

Affected Environment—American Peregrine Falcon

This species has been delisted from Threatened status and is now considered a Species of Concern by the USFWS, with populations to be monitored for 5 years post delisting. This species requires open habitats including savannahs, seacoasts, open forests and urban areas where tall buildings occur. There are no known peregrine territories within the Wildlife Analysis Area and no records of peregrine sightings within the Wildlife Analysis Area.

The peregrine falcon on the PNF has been documented at two of three sites from 1989 to present. From 1989 to 1992, peregrines were crossed fostered at the Dixie site. A total of 7 peregrine chicks fledged from Dixie during this time. Monitoring occurred at this site from 1993 to 1996. No Peregrines were seen at Dixie in 1993 and 1994. Peregrines were seen at Dixie in 1995 and 1996, but were not nesting. Although Peregrines have not been seen at Dixie since 1997, the Forest still maintains this site as a historic peregrine site. Prairie Falcons currently occupy the Dixie site.

The Bald Rock site has been used by peregrines consistently since development of the Forest Plan. Bald Rock has been occupied every year and is currently an active eyrie.

The Canyon Dam site became active eyrie in 1998. Monitoring of the Canyon Dam site has occurred sporadically from 1998 to 2005. This site is currently active in 2006 with a pair.

Both Bald Rock and Canyon Dam have been monitored in 2006. Based on known information and population monitoring the trend for peregrine falcons is stable. The population of peregrine falcons appears to be stable on the PNF. The PNF is currently maintaining the PNF LRMP objective of maintaining two peregrine falcon nest sites (USDA Forest Service 1988, Table 4-4).

The closest known peregrine eyrie (Beckwourth Peak, Tahoe NF) is approximately 7 air miles southeast of the project area. Within the Wildlife Analysis Area, there is one rock outcrop and/or cliff-like habitat that appears to be suitable nesting habitat. However, this suitable nest habitat is a historically documented prairie falcon eyrie. The one prairie falcon site within the Wildlife Analysis Area is approximately a half mile outside of the project area. No nesting activity has been observed at this sight in the last three years as a result of population monitoring. There is no known nesting activity within the Wildlife Analysis Area.

Environmental Consequences—American Peregrine Falcon

Effects of the Action Alternatives

Direct Effects

There are no known peregrine territories and no records of peregrine sightings within the Wildlife Analysis Area. An existing peregrine nest eyrie is located approximately 7 miles from the project area, which could be outside of the foraging distance used by this pair. The Wildlife Analysis Area generally lacks suitable cliff nesting habitat. Since there is no known or expected nesting activity in the Wildlife Analysis Area and no suitable nesting habitat within the project area, project activities would not affect peregrine falcons directly.

Indirect Effects

Opening up the forested stands through thinning and group selection may cause a shift of avian species diversity within the Wildlife Analysis Area (USDA Forest Service 1999) but no net decline in prey availability. As mentioned, the project area could be outside the used foraging radius by the known pair, thus any increase in prey availability may not affect peregrines.

Cumulative Effects

The proposed alternatives will have no affect on known nest sites, nor will it cause any change in population distribution across the PNF or the Sierra Nevada range. The Freeman Project will have no effect on peregrine falcon and will not contribute to any cumulative effects on populations of this species.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There are no Direct, Indirect or Cumulative effects to this species with this alternative.

Determination—American Peregrine Falcon

It is my determination that the Freeman Project will not affect the Peregrine Falcon.

3.5.7.4 California Spotted Owl—(*Strix occidentalis occidentalis*)

The PNF LRMP requires that the Forest monitor spotted owl populations and habitat trend in network territories annually to determine change in rate of occupancy and reproductive success (PNF LRMP Chapter 5, page 5-7). This would be accomplished through direct counts of breeding pairs and reproductive success in a sample of network territories, as well as conducting counts in a sample of sites containing a variety of habitats. An additional monitoring element involves checking project compliance with regional standards & guidelines and forest objectives.

Affected Environment—California Spotted Owl

On October 12, 2000, the U.S. Fish and Wildlife Service announced a 90-day finding on the petition to list the California spotted owl as threatened or endangered (Federal Register, Vol. 65, No. 198, 60605-60607). The USFWS found that the petition presented substantial information indicating that listing the species may be warranted. The USFWS 12-Month Findings for a Petition to List the California Spotted Owl (Strix occidentalis occidentalis) (Federal Register Volume 68, No. 31, 7580-7608) stated: After the USFWS reviewed the best available science and commercial information available the USFWS found that the petitioned action was not warranted. The Finding statement leaned heavily on the fact that the original SNFPA FEIS and ROD (2001) and its associated California Spotted Owl strategy set management direction to be implemented across the Sierra Nevada. The Findings did recognize two factors, "The first is a management review of the SNFPA (USDA Forest Service 2002) and the second is planning for implementation of an Administrative Study on the Lassen and PNF that would evaluate the effects of extensive fuels treatment on the California spotted owl (67 FR 72136)… "We will monitor the development of management direction, offer scientific assistance and review the effects at a later date, if necessary." (FWS 68 FR 7604).

Changes to the 2001 SNFPA spotted owl strategy were brought about by the 2004 SNFPA ROD. The 2004 SNFPA owl strategy includes the 5-year HFQLG pilot project, as implemented and directed on pages 66 – 69 of the 2004 ROD. Per that direction, the HFQLG Forests will consider owl PACs, SOHAs, Offbase/Deferred, LSOG 4 and 5 and CWHR classes 5M, 5D and 6 in project design and implementation of HFQLG vegetation projects. SNFPA Standards and Guidelines for Home Range Core Areas (HRCAs) do not apply to the HFQLG Pilot Project area and vegetation projects.

The comprehensive adaptive management strategy to investigate the effect of fuels treatments and group selection on California spotted owls, referred to as the "Plumas /Lassen Administrative Study", is still part of the owl strategy within the HFQLG Pilot Project area. No portions of the Freeman Wildlife Analysis Area occur within the administrative study area.

The latest published information regarding the California spotted owl, in terms of population status, distribution, population and habitat trends and species requirements can be found within the above mentioned Federal Register (Vol 70, No 118/June 21, 2005/Proposed Rules) and additional updated information was provided in Federal Register (Vol. 71, No.100/May 24, 2006). Based on this updated information, a total of 2,306 California spotted owl territories have been documented, 1,865 of which are known within the Sierra Nevada Range, including 1,399 territories on the Lassen, Plumas, Tahoe, Eldorado, Stanislaus, Sierra and Sequoia National Forests, 129 territories in national parks, 14 territories on BLM lands in the Sierra Nevada, four on California State Commission Land, three in State Parks, one on California Department of Forestry (CDF) land, one on Native American land and 314 on private land.

Five demography studies have been investigating the population trend of the California spotted owl within the Sierra Nevada range. These studies provide evidence that suggests that populations may be declining in some parts of the owl's range in the Sierra Nevada. On the Lassen National Forest, data suggests a 7.7% annual rate of population decline from 1990-1998 (Blakesley & Noon 1999). The population change from 1987-2000 on the Sierra NF shows a declining rate in spotted owl population of approximately 10% - 11%; population change on the Sequoia/Kings Canyon National Park study indicate a decline from 1988-2000 of 3% (Steger et al. 2000). These demographic studies suggest population declines in owls. These declines seem sufficient to warrant concern, even in light of uncertainties in the magnitude of the declines. These changes may be resulting from shifts in prey abundance, changes in regional weather patterns, or broad-scale land management practices (Steger et al. 1998).

The USDA Forest Service Pacific Southwest Research Station has released a “meta-analysis” of current California spotted owl population data (Franklin et al, 2003). This analysis re-examined all the demographic data for the owl since 1992 in an effort to assess population status and trends, as well as provide some insight into the methodology for estimating rates of population change. A meta-analysis is an analytical tool that combines information from several studies and provides additional information on status and trends. The final report for the study identifies a number of key points, as summarized by the Regional (R5) office memo dated 5/22/03:

- The population trend data is inconclusive, identifies a great deal of uncertainty regarding range-wide population trends (USDA Forest Service 2004) and statistical trends may or may not indicate a decline in overall California spotted owl population.
- Reproduction varied significantly from year to year and is likely attributable to annual fluctuations in weather and owl prey availability.
- Risk factors for California spotted owl populations revolve around four main points: habitat abundance and distribution, habitat quality, influence of climate and wildfire.
- Although the study results are inconclusive, caution is advised in managing habitats until additional data is available.

The authors of the meta-analysis (Franklin et al. 2003) concluded that current evidence suggests that California spotted owls are marginally stable or in a slow decline, that strong inferences about population decline could not be made because estimates of lambda (rate of population change) did not differ significantly from a stationary population. Thus the empirical information on spotted owl population trends is uncertain, with the uncertainty in whether populations are in fact declining or remaining stable, not whether they are increasing. If owl populations are declining, activities that further remove their habitat are likely to further contribute to their decline; if populations are in reality stable, activities that remove their habitat may or may not push the population from stable to declining, depending on the magnitude of habitat loss and how close to declining the population currently is (Dunk, 2005). The authors of the meta-analysis recommend that management actions that may compromise owl populations be initiated slowly and closely monitored.

A second petition to protect the spotted owl as an endangered species under the Endangered Species Act was filed with the USFWS on September 1, 2004. This resulted in a 90 day finding that listing the California spotted owl may be warranted (Federal Register/Vol. 70, No. 118, June 21, 2005/Proposed Rules) and initiated a 12-month status review to determine if listing the species is warranted. Substantial changes in information justifying further detailed study by the USFWS include: 1) revisions to the 2001 SNFPA in the 2004 SNFPA, 2) revisions to the California State Forest Practices Code, 3) possible changes to the draft meta-analysis of the population dynamics of spotted owl in the final, published meta-analysis, 4) impacts of recent fires and anticipated future fires in spotted owl habitat; and 5) further range expansion of the barred owl threatening site occupancy, reproduction and survival of California spotted owls.

The Draft 2006 Meta analysis "Demography of the California Spotted Owl in the Sierra Nevada: Report to the US Fish and Wildlife Service on the January 2006 Meta-Analysis" (referred to as Blakesly et al 2006) is the most current and comprehensive summary of population trends for the California spotted owl. It has been prepared to help in the decision process for the potential listing of the California spotted owl. The 2006 meta-analysis was similar to the 2001 meta-analysis (Franklin et al. 2004) but included 5 years of additional data (2001-2005), excluded the San Bernardino study and included a population viability analysis. This 2006 meta-analysis indicates that (1) there is no strong evidence for decreasing population trends from any of the demographic studies. In general lambda (λ), the finite rate of population change, where $\lambda <1$ indicates a declining population, was not different from that of a stationary population; (2) only the Lassen population decreased significantly based on the 95% confidence interval with steady decreases from 1995-1998 and 2002-2004, suggesting the Lassen owl population may be declining; (3) the population viability analysis (PVA) indicated two of the four study areas (Lassen and Sierra) are likely to experience population declines within 7 years and very unlikely to experience population increases under current population trends, but there was great uncertainty in the PVA analyses for time intervals of >10 years; (4) positive trend in adult survival in all studies and estimates of apparent survival increased with time; (5) spotted owl management needs to maintain a high survival rate of territorial owls in order to maintain spotted owl populations, but that management directed at increasing reproductive output and subsequent recruitment may be the most successful way to maintain or increase spotted owl populations in the Sierra Nevada, as long as these actions do not decrease adult survival. Population growth rate (lambda) can be viewed as the sum of apparent survival probability and the per capita recruitment rate. The study indicates high adult survival and that the majority of immigrating owls onto the study areas considered in the meta-analysis “were likely natal dispersers rather than breeding dispersers”.

In responding to this petition, the USFWS conducted a comprehensive study of the California spotted owl populations. It assessed the best scientific and commercial information available; reviewed comments and information received during two public-comment periods; and consulted with recognized spotted-owl experts and Federal and state resource agencies, including an interagency Science Team. On May 15, 2006, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA (Federal Register 50 CFR 17, Volume 71, Number 100 and May 24, 2006). The USFWS considered the information presented in the 2006 meta-analysis and found that populations of California spotted owl in the Sierras showed little evidence of a decline and concluded that the owls’ status in the Sierra Nevada is not deteriorating as is evidenced by the increasing adult survival and stationary trend of the populations.

The PNF LRMP EIS estimated habitat capacity for the spotted owl on the Plumas to be 125 pairs. The PNF LRMP set a minimum management objective of providing suitable habitat for a Forest-wide network of 54 spotted owl habitat areas. Prior to 2002, the Plumas NF supported 262 spotted owl Protected Activity Center's (PAC's) on National Forest, with an additional 20 located primarily on Private land. Owl surveys conducted across the Plumas since 2002 has resulted in additional owl PACs, resulting in a new total of 296 PACs. This is approximately 20% of the total within the Sierra Nevada. Approximately 34 PACs are located on the Beckwourth Ranger District.

There are no reliable total population estimates for the California spotted owl (70 Federal Register 35609, FR 71, No. 100). The number of spotted owl territories has been used as an index to indicate the range of the species and where they occur. “This number is actually a cumulative total of all sites known to be historically or currently occupied by at least one spotted owl. This total increases over time as owls move to new territories and as researchers survey new areas, even though many territories with sufficient suitable habitat are not occupied at the present and some territories no longer have sufficient suitable habitat to support spotted owls. … Thus, the number of territories should not be viewed as a population estimate for the taxon “(70 Federal Register 35609, FR 71, No. 100).

The Plumas Lassen Administrative Study (PLAS) spotted owl module has been gathering owl presence/occupancy information within specific survey areas (Treatment Units) on the PNF for the last three years. In 2004, the study located 50 spotted owl sites. Of these 50 spotted owl sites, 43 had pairs and 7 had single owls. Therefore, pairs occupied 86 % of the sites monitored in 2004, while single owls occupied 14%. In 2005, 103 spotted owl sites were located. Of the 103 sites, 76 contained pairs, 17 contained unconfirmed pairs (one member of pair confirmed as territorial single, plus single detection of opposite sex bird) and 10 single owls. Therefore, in 2005, pairs occupied 74% of the sites, 16% were occupied by unconfirmed pairs and 10% by single owls. The spotted owl population on the Plumas is currently (2005) estimated at 218 pairs, 49 unconfirmed pairs and 29 single owls, based on occupancy rates from the PLAS. This spotted owl population is well above the estimated number of owl pairs projected by the PNF LRMP during the 1st and 2nd decade. The Plumas actually exceeded these projected numbers in 1991. Based on the estimated number of pairs and singles from 1996 to 2005, the spotted owl population on the Plumas appears to have an upward trend (USDA Forest Service 2006).

Owl sites as identified in PLAS are not the same as designated PACs. Based on data collected from this study, a coarse summation on the percentage of PACs/HRCAs surveyed being occupied during the last three years can be made. Table 3.35 discloses that owl presence/occupancy within PACs/HRCAs within survey areas averages about 50% during any one year.

Table 3.35 Owl presence/occupancy within PACs/HRCAs in PLAS Treatment Units

Year	TU2			TU3			TU4		
	#PACS Surveyed	# PACs w/Owls	% PACs w/Owls	#PACS Surveyed	# PACs w/Owls	%PACs w/Owls	#PACS Surveyed	# PACs w/Owls	% PACs w/Owls
2003	19	13	68	19	8	42	24	12	50
2004	19	11	58	19	9	50	24	11	46
2005	19	13	68	19	10	52	24	12	50

This survey information indicates that certain PACs/HRCAs had owl presence/occupancy annually over the three years while many PACs remained vacant during this period.

Habitat requirements for this species (described below) can be found in the CASPO Technical Report (Verner, et al 1992), within the SNFPA FEIS and 70 Federal Register of June 21, 2005. Standards & Guidelines for owl habitat management, within the HFQLG Pilot project area, are found in SNFPA FSEIS ROD (2004) Table 2.

Spotted owls preferentially use areas with at least 70 percent canopy cover, use habitats with 40 to 69 percent canopy cover in proportion to their availability and spend less time in areas with less than 40 percent canopy cover than expected if habitat were selected randomly (70 Federal Register 35610).

Suitable nesting habitat on the west side of the Sierra Nevada is found in foothill riparian/hardwood forest (1.6% of known sites), ponderosa pine/hardwood forest (6.7% of known sites), mixed-conifer forest (81.5% of known sites) and red fir forest (9.7% of known sites). In general, stands typically have two or more canopy layers, dominant and co-dominant (20”-30”) trees in the canopy averaging at least 24 inches in dbh, at least 70% canopy closure and higher than average levels of very large, old trees and higher than average levels of snags and downed woody material (70 Federal Register 35610). Owls consistently use stands with significantly greater canopy closure, total live tree basal area, basal area of hardwoods and conifers, snag basal area and dead-and-downed wood when compared with random locations within forests (Verner et al, 1992) (Table 3.36). Nests and roosts within the Sierra Nevada occur within the following CWHR classes (USDA Forest Service 2001): 32% in CWHR 6, 18% in structural class 5M, 14% as 4D, 11% as 4M, 9% as 5D, 7% as 5P and 5% as 4P, with 2% or less of the 5S, 4S, 3D, 3M and 3P classes (USDA Forest Service 2001). Owl nests were consistently located in sites with 75% canopy cover, 300 stems/ha and 40,000 cubic meters/ha of foliage volume (USDA Forest Service 2001).

Table 3.36 Range of mean values of some attributes in suitable habitat for spotted owls in Sierra Nevada mixed-conifer forests (from Verner et al. 1992:96 and USDA Forest Service 2001)

Attribute	Nesting & Roosting Habitat	Foraging Stands
Percent Canopy Cover[1]	70-95	50-90
Total live tree basal area[2]	185-350	180-220
Total snag basal area[3]	30-55	15-30
Basal area of large snags[2, 3]	20-30	7-17
Downed woody debris[4]	10-15	10-15

[1] Mostly in canopy >30 feet high, including hardwoods;
[2] Square feet per acre;
[3] Dead trees >15 inches dbh and >20 feet tall;
[4] Tons per acre

The four nest types used regularly by the spotted owl are:

1. cavity nests placed in natural cavities resulting from decay;
2. broken-topped trees and snags;
3. platform nests placed on remnant platforms built by other species, or on debris accumulations; and
4. dwarf mistletoe brooms.

Data analyzed from 124 nest sites within the Sierra indicated that nest trees averaged 45 inches dbh and more than 70% of all nest trees surveyed were larger than 30 inches dbh (Verner et al. 1992). Sixty-three percent of nests were in live trees and 37% were in snags.

For purposes of this analysis, the following affected CWHR types provide high nesting habitat capability: Eastside Pine, Jeffrey Pine, Lodgepole Pine, Montane Hardwood-Conifer, Ponderosa Pine, Red Fir, Sierran Mixed Conifer and White Fir (6, 5D, 5M). These CWHR types have the highest probability of providing stand structures associated with preferred nesting, roosting and foraging. The threshold between canopy cover values that contribute to or detract from occurrence and productivity is a value near 50% (USDA Forest Service 2001, Hunsaker et al. 2002). For the Freeman Project, all 5M is considered owl nesting habitat.

Suitable foraging habitat is found in the same forest types listed above for nesting habitat (CWHR 6, 5D, 5M) as well as 4D and 4M. Stands considered to be suitable for foraging have at least two canopy layers, dominant and co-dominant (20”-30”) trees in the canopy averaging at least 12 inches in dbh, at least 40% canopy closure and higher than average levels of snags and downed woody material (70 Federal Register, June 21, 2005). Although canopy covers down to 40% are suitable for foraging, they appear to be only marginally so (based on owl occurrence and productivity threshold at around 50% canopy cover, Ibid). In the red fir type, stands with 30% or greater canopy cover should be considered suitable for foraging (USDA Forest Service 2001). For the Freeman Project, all 4M is considered owl foraging habitat while red fir (RFR) 4P is not considered owl foraging habitat.

The most common prey species for spotted owls are northern flying squirrel (*Glaucomys sabrinus*) and dusky-footed woodrat (*Neotoma fuscipes*). The common foods of northern flying squirrels (primarily fruiting bodies of underground fungi and arboreal lichens) are usually found in mature and older forests. The abundance of underground fungi is known to be strongly associated with the presence of well-developed soil organic layers and a large volume of decaying logs. In addition, higher snag densities may be important to flying squirrel densities, since flying squirrels often use old woodpecker cavities as den sites.

Woodrats are typically associated with brush fields, early successional habitats with a mixed conifer/oak component and in stands with a mix of overstory trees and brush. Brush is usually dominated by thick leaved evergreen species. Woodrats sometimes move from brush fields into the edges of forest where spotted owls forage (USDA Forest Service 1993). On the Plumas NF, woodrat density consistently responds in a linear fashion to the density of mature (>13” dbh), black oak trees; increase in density of black oaks results in increased density of woodrats (USDA Forest Service 2006).

Areas of Concern

The CASPO Technical Report (Verner et. al 1992) identified Areas of Concern (AOC) within the range and distribution of the California spotted owl. These AOC’s are identified simply to indicate potential areas where future problems may limit owl populations and where future problems may be greatest if the owl's status were to deteriorate. Two AOC's identified in the CASPO Report are adjacent to the PNF (page 46-49 of CASPO Report):

- Area of Concern 1: In Lassen County, within the Lassen National Forest and adjacent to the PNF. The reason for the concern is that the habitat in this area is discontinuous, naturally fragmented and poor in quality due to drier conditions and lava-based soils.
- Area of Concern 2: In Northern Plumas County, within the Lassen National Forest. The reason for the concern is a gap in known distribution, mainly on private lands, which extends east to west in a band almost fully across the width of the owl's range.

The Freeman Project is not located within these AOC’s; AOC 1 is approximately 28 miles to the north and AOC 2 is approximately 20 miles to the northwest. The factors identified for the 2 AOC’s above are not applicable to the Freeman Project area.

Wildlife Analysis Area

Protected Activity Centers (PACs) were established for owl activity centers based on criteria described in the CASPO Technical Report (Verner et al 1992) and CASPO IG EA (USDA, 1993), as well as within the SNFPA (2001). Home range cores were delineated for each of these PACs in

March-April 2001 based on criteria from the SNFPA. A total of six PACs with associated HRCAs are in the Wildlife Analysis Area (Figure 3.3). Three spotted owl PACs located within the project area could potentially incur direct habitat impacts to the associated Home Range Core Areas (HRCAs). There are an additional three PACs outside the project area (not directly affected by habitat change as a result of project implementation) supporting owls that could be indirectly affected by the Proposed Actions. There is one 1000-acre base SOHA located within the Wildlife Analysis Area (Figure 3.3). PACs and HRCAs have been delineated for this SOHA and are included in the total of six PACs and HRCAs in the Wildlife Analysis Area. Table 3.37 shows the PAC histories of the PACs in the Wildlife Analysis Area.

Spotted owl surveys have occurred within the Wildlife Analysis Area. In 2002 and 2003, the Humbug Project, including the southeastern portion of the Freeman Wildlife Analysis Area, was surveyed to the two-year protocol standards (“Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation areas”, 1991, revised 1993), by contractor Williams Wildland Consulting, Inc. In 2004 and 2005, the Happy Jack Project, including the southwestern portion of the Freeman Wildlife Analysis Area, was surveyed to the two-year protocol standards (“Protocol for Surveying for Spotted Owls in Proposed Management Activity Areas and Habitat Conservation areas”, 1991, revised 1993), by contractor Silva Environmental. The remainder of the Freeman Wildlife Analysis Area was surveyed to protocol in 2004 and 2005 by contractor MGW Biological, specifically for the project area. Approximately 149 stations were surveyed three times in 2004 and 2005. No new PACs were developed based on these survey efforts.

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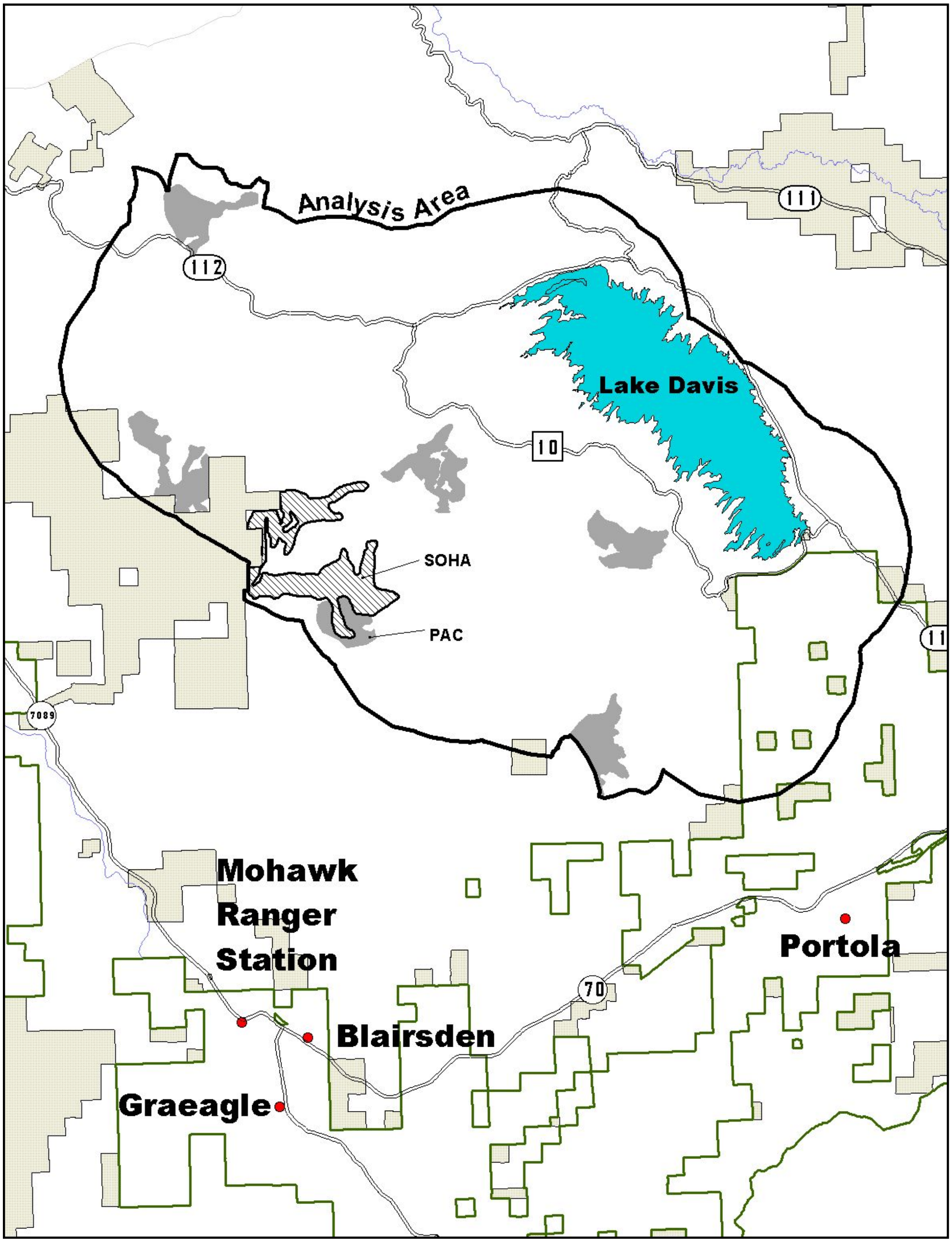

Figure 3.3 Freeman Wildlife Analysis Area with 300 acre California Spotted Owl Protected Activity Centers (PACs)(solid color) and 1,000 acre Spotted Owl Habitat Areas (SOHAs) (diagonal stripping).

Table 3.37 California Spotted Owl PAC History in the Wildlife Analysis Area.

Year	PL080 SOHA H2	PL203^	PL204^	PL205	PL242	PL274
1981	Discovered - Detection					
1982 - 1983	Not Surveyed					
1984	Vocal Detection					
1985 - 1986	Not Surveyed					
1987	Vocal/Visual Detection—Adult Pair					
1988	Vocal/Visual Detection—Adult Pair, Found Nest				Discovered - Detection	
1989	Vocal/Visual Detection—Adult Pair				Detection—Male	
1990	Detection				Vocal Detection—Male	
1991	Vocal/Visual Detection—Adult Pair	Discovered—Vocal Detection—Adult Pair	Discovered—Vocal/Visual Detection—Adult Pair	Discovered—Vocal Detection—Adult	Not Surveyed	
1992	Vocal Detection	Not Surveyed	Vocal/Visual Detection—Adult Pair	Vocal Detection	Not Surveyed	Discovered - Detection
1993	Not Surveyed	Not Surveyed	Vocal/Visual Detection—Adult Pair	Not Surveyed	Not Surveyed	Surveyed—No Detections
1994	Historic Visits—No Detections	Not Surveyed	Historic Visits—No Detections	Not Surveyed	Not Surveyed	Not Surveyed
1995	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed
1996	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed
1997	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed
1998	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed
1999	Not Surveyed	Surveyed—No Detections	Vocal/Visual Detection—Adult Female	Surveyed—No Detections	Detection—Adult Male	Not Surveyed
2000	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed
2001	Not Surveyed	Not Surveyed	Surveyed—No Detections	Vocal Detection—Male	Surveyed—No Detections	Not Surveyed
2002	Vocal/Visual Detection*—Adult Male, Cavity Roost	Not Surveyed	Surveyed—No Detections	Surveyed—No Detections	Not Surveyed	Not Surveyed

Year	PL080 SOHA H2	PL203^	PL204^	PL205	PL242	PL274
2003	Vocal/Visual Detection*—Adult Pair	Not Surveyed	Vocal/Visual Detection*—Adult Pair	Vocal/Visual Detection*—Adult Male	Vocal/Visual Detection—Adult Pair	Not Surveyed
2004	Vocal/Visual Detection*—Adult Pair	Surveyed—No Detections	Vocal Detection***—Adult Female	Not Surveyed	Vocal Detection*—Adult Male	Vocal/Visual Detection**—Adult Male
2005	Vocal/Visual Detection*—Adult Pair	Vocal Detection***—Adult Male	Vocal Detection***—Adult Female	Not Surveyed	Vocal Detection—Adult Female	Vocal Detection**—Adult Male

^PACs in project area
*Detections in HRCA associated with the PAC,
** Detections on Private Land immediately adjacent to HRCA associated with the PAC,
*** Detections outside of PAC/HRCA assumed associated to nearest PAC/HRCA.

Table 3.38 shows high capability suitable California spotted owl habitat in the Wildlife Analysis Area (41,388 NF acres). Within the Wildlife Analysis Area there is approximately 24,990 acres of suitable spotted owl nesting/foraging habitat (CWHR 5D, 5M, 4D and 4M).

Table 3.38 Acres of High Capability Suitable California Spotted Owl Habitat on National Forest Land within Wildlife Analysis Area

CWHR Type*	Habitat Type	Acres in Wildlife Analysis Area
4M	Foraging	13,107
4D	Foraging	5,577
5M	Nesting	2,806
5D	Nesting	3,500
Total	**Suitable**	**24,990**

*4=small 11-24” dbh, 5=medium/large >24” dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.

CWHR habitat vegetation layer used for the habitat analysis was derived from aerial photo interpretation. Forest Inventory Analysis (FIA) plot data gathered in the treatment area indicated that the derived Quadratic Mean diameter (QMD) for all trees (>1.0”) ranged from 6” to 11”, indicating a dominance of small trees in the inventory areas. Vegetation data from aerial photo interpretation uses crown diameter as a proxy for dbh, which is used to determine CWHR size class, which equates to the diameter of overstory trees (those visible in the photo). Stand inventory data utilizes a derived QMD to estimate size class, making it difficult to crosswalk between the vegetation data and the plot data because of different methods for quantifying size class. Stand Inventory considers stocking and diameter of smaller, subordinate canopy trees, thus providing a more conservative estimate of CWHR size class. This difference between the current CWHR classification and the stand exam plots represents uncertainty in the accuracy of the amount of each CWHR habitat type in the Wildlife Analysis Area. The FIA plot data was run through the Forest Vegetation Simulator model (FVS) and for the most part, all vegetation layer CWHR size classes matched the appropriate size class based on the QMD for all trees >10” dbh. But it is acknowledged that there are some disparities and that the acres reflected in Table 3.24 could be inexact estimates of habitat availability. The CWHR classification continues to be used as the habitat baseline for wildlife habitat analysis during the life of the HFQLG project as it maintains consistency for monitoring changes in species habitat over the life of the HFQLG Pilot Project. This includes the requirement to not cumulatively reduce old forest dependent species habitat (5M, 5D, & 6) more than 10% below 1999 levels (USDA Forest Service 1999).

Environmental Consequences—California Spotted Owl

Effects of the Action Alternatives

Direct Effects

Potential direct effects on the spotted owl may result from the modification or loss of habitat or habitat components. Direct mortality could occur if nest trees are felled but this would be exceedingly rare. The Proposed Action and alternatives will not cut or remove nest trees. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities. Implementation of Limited Operating Period (LOP) around known spotted owl nests would remove the effects to existing owl pairs associated with direct disturbance on treatment units and access routes.

Based on the vegetation layer and the CWHR model, about 15% or 6,306 acres within the Wildlife Analysis Area (41,388 NF acres) may be considered suitable spotted owl nesting habitat (5M, 5D and 6) and about 45% or 18,684 acres may be considered suitable foraging habitat (4M and 4D) (Table 3.24).

Changes to suitable habitat as a result of implementing fuels treatments in all action alternatives would occur due to the removal of large structural components and reduction in canopy cover to 40-50%. The more open canopied forested stands still retain the minimum canopy cover for suitable habitat but become unsuitable due to the removal of the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 3.36). The combined impacts of mechanical thinning of the understory and achieving the desired conditions for DFPZ by opening up the overstory would result in creating more open forest from dense forest (D stands decreasing to M) (open up to around 40% canopy cover). Area thinning with biomass removal also creates more open, lesser quality owl habitat and thus is analyzed as decreasing to M. There may also be some additional risk associated with isolated torching events during prescribed fire that could kill additional trees thus further opening up the canopy and reducing nesting opportunities. Table 3.39 show the above mentioned changes to California spotted owl nesting and foraging habitat by alternative.

Table 3.39 Comparison of Action Alternatives 1, 3 & 4 on Spotted Owl Nesting & Foraging Habitat (4M, 4D, 5M, 5D) within the Wildlife Analysis Area

Foraging Habitat	Alternative 1 (PA)			% (Alt. 1) Remaining in Wildlife Analysis Area	Alternative 3			% (Alt. 3) Remaining in Wildlife Analysis Area
	Acres				Acres			
	DFPZ	GS & Aspen ETZ's	Area Thinning w/biomass		DFPZ	GS	Area Thinning w/biomass	
4M*	-589	-246	-826	87.3%	-654	-90	-825	88.0%
4D	-543	-129	-427	80.3%	-581	-32	-428	81.3%
Total Foraging Change	**-1132**	**-375**	**-1253**	**85.2% retained (-14.8%)**	**-1235**	**-122**	**-1253**	**86.0% retained (-14.0%)**
Nesting Habitat								
5M*	-38	-6	-40	97.0%	-38	-5	-40	97.0%
5D	-151	-9	-2	95.4%	-151	-9	-0	95.4%
Total Nesting Change	**-189**	**-15**	**-42**	**96.1% retained (-3.9%)**	**-189**	**-14**	**-40**	**96.1% retained (-3.9%)**

Foraging Habitat	Alternative 4			% (Alt. 4) Remaining in Wildlife Analysis Area
	Acres			
	DFPZ	GS	Area Thinning w/biomass	
4M*	-797	-89	-879	86.5%
4D	-630	-44	-598	77.2%
Total Foraging Change	**-1427**	**-133**	**-1477**	**83.7% retained (-16.3%)**
Nesting Habitat				
5M*	-57	-5	-40	96.4%
5D	-252	-9	-16	92.1%
Total Nesting Change	**-309**	**-14**	**-56**	**94.0% retained (-6.0%)**

* Reductions shown here are due to the removal of understory structural components leading to unsuitable foraging and nesting habitat.

Based on figures in Table 3.39, Alternative 1 reduces foraging habitat on 2,760 acres of 18,684 acres and reduces nesting habitat 246 acres out of 6,306 acres; Alternative 3 reduces foraging habitat on 2,610 acres out of 18,684 acres and reduces nesting habitat 243 acres out of 6,306 acres; Alternative 4 reduces foraging habitat on 3,037 acres out of 18,684 acres and reduces nesting habitat 379 acres out of 6,306 acres. Thus the amount of habitat retained post project (84%-86% foraging and 94%-96% nesting) seems to allow opportunities for future dispersal, nesting and foraging within the Wildlife Analysis Area.

Irwin & Rock (2004) found that probability of stand use by spotted owl increased strongly as basal area rose from 80 to 320 square feet/acre (optimum range 160-320 square feet/acre) and was positively influenced by the number of trees/acre that were >26” dbh. With the implementation of alternatives 1, 3 and 4 in treatment areas (DFPZ & Area Thinning), the residual basal area in 4M would be approximately 123 square feet/acre, approximately 140 square feet/acre in 4D, approximately 175 square feet/acre in 5M and 5D based on FIA data put through the Forest Vegetation Simulator (FVS) model (see Freeman Forest Vegetation Report for data). Large tree (>24" dbh) density ranges from less than 1 to 12 per acre, averaging less than 2 large trees per acre, compared to 5-30 large trees per acre in the pre-European period (see Freeman Forest Vegetation Report). These figures represent what is projected to remain on site immediately after project implementation.

Protected Activity Centers (PACs) & Spotted Owl Habitat Areas (SOHAs)

There is one 1000 acre SOHA and six 300 acre PACs located within the Wildlife Analysis Area (Figure 3.3). PACs are designated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. PACs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 37. Where there is insufficient suitable habitat (6, 5D, 5M, 4D and 4M), to meet the 300 acres guideline for a PAC, the next best vegetation sizes and types are included. No fuels treatments, including DFPZ construction, group selection or area thin treatments with biomass removal would occur within the designated 1000 acre SOHA or 300 acre PACs. The SOHA and six PACs equal approximately 2,379 acres owl habitat that would be retained and remain suitable within the Wildlife Analysis Area.

Home Range Core Areas (HRCA)

Portions of three owl home range core areas (HRCAs) would be treated under the action alternatives (each HRCA is associated with an established PAC). HRCAs are delineated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. HRCAs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 39. Where there is insufficient suitable habitat (6, 5D, 5M, 4D and 4M) to meet the 700 acres guideline for a HRCA, the next best vegetation sizes and types are included.

Table 3.40 Action Alternatives 1, 3 & 4: DFPZ, Group Selection and Area Thinning harvest units within Spotted Owl HRCA (suitable habitat).

PAC ID # for HRCA	Total Acres of DFPZ Rx within HRCA			Total Acres of Groups and Aspen ETZs* within HRCA			Total Acres of AT within HRCA			Total Acres of Treatment within HRCA			Total Acres Reduction in Suitable Habitat in HRCA		
	1	**3**	**4**	**1**	**3**	**4**	**1**	**3**	**4**	**1**	**3**	**4**	**1**	**3**	**4**
PL203	81	81	81	35	14	15	187	191	191	303	286	287	270	276	287
PL204	0	0	0	23	23	23	320	320	320	343	343	343	343	343	343
PL274	1	1	1	0	0	0	25	25	0	26	26	1	1	1	1
TOTAL	**82**	**82**	**82**	**58**	**37**	**38**	**532**	**536**	**511**	**672**	**655**	**631**	**614**	**620**	**631**

* Aspen Extended Treatment Zones (ETZs) only in Alternative 1 (PA).

Based on Table 3.40 approximately 614 acres of suitable foraging and nesting habitat (CWHR 4M, 4D, 5M, 5D) could potentially be rendered unsuitable under Alternative 1, 620 acres under Alternative 3 and 631 acres with Alternative 4, based on DFPZ, area thin treatments w/biomass removal and Group Selection prescriptions within the 3 directly affected HRCAs (Table 3.40). Acres of habitat change ranges from a high of 343 acres in HRCA associated with PL204 (Alternative 1, 3 & 4) to a low of 1.0 acres in HRCA associated with PL274 (Alternative 1, 3 & 4); the average reduction in suitable acres for the 3 HRCAs would be 205 acres with Alternative 1, 207 acres with Alternative 3 and 210 acres with Alternative 4.

With Alternatives 1, 3 and 4, approximately 631-672 acres of the 4,418 acres or 14 – 15% of HRCA within the Wildlife Analysis Area would be impacted. Within the Wildlife Analysis Area there is approximately 6,281 acres of PAC and HRCA combined; thus approximately 89-90% of all PAC/HRCA combined acres would not be treated under the action alternatives.

Habitat alteration by the proposed action alternatives and the associated risks to known owl occupancy within individual HRCAs is displayed in Table 3.41.

Table 3.41 Habitat Impacts and Risks for 3 Directly Affected HRCAs associated with owl occupancy.

PAC	Occupancy*	HRCA Acres Treated^	Acres in HRCA	% HRCA Treated	Acres PAC & HRCA	% HRCA/ PAC** Treated	Suitable Habitat Reduction (acres) by alternative					Potential Risk to PAC viability
							1		**3**		**4**	
PL203	M	303	700	43%	1,000	30%	270		276		287	High
PL204	M	343	775	44%	1,076	32%	343		343		343	High
PL274	M	26	709	4%	1,058	2%	1		1		1	Low
		672	**2184**	**31%**	**3,134**	**21%**	**614**		**620**		**631**	

*High Occupancy: Reproduction documented the last two years and/or pair occupancy during the last two years,
Medium Occupancy: Reproduction in 1992 and/or pair occupancy after 1992; single owl found at least one of the last 2 years,
Low Occupancy: Reproduction and/or pair occupancy not documented since 1992, no owls found the last two years.
**HRCA/PAC is the combination of the minimum 300 acre PAC and 700 acre Core as a 1000+ acre unit; NO PAC IS TREATED WITH THE PROPOSED ACTION ALERNATIVES, only HRCAs are subject to treatment.
^HRCA treated acres reflect Alternative 1 (Proposed Action) which treats the greatest number of acres.

Table 3.42 displays the amount of suitable habitat present within 3 HRCAs and modified by each alternative. As we can see from Tables 3.41 and 3.42, as calculated from the best available vegetation layer, the HRCA associated with PL203 contains 85% suitable habitat, the HRCA associated with PL204 contains 61% suitable habitat and the HRCA associated with PL274 contains 94% suitable habitat.

Table 3.42 Suitable Habitat (4M/4D/5M/5D) impacted within each HRCA.

HRCA	Existing 4M/4D	Existing 5M/5D	Total Suitable	Reduction in Suitable Acres						% 4M/4D remaining*	% 5M/5D remaining*
				1		3		4			
				4M/4D	5M/5D	4M/4D	5M/5D	4M/4D	5M/5D		
PL203	436	161	597	231	39	239	37	252	35	42.2%	78.3%
PL204	467	9	476	343	0	343	0	343	0	26.6%	100.0%
PL274	307	357	664	0	1	0	1	0	1	100.0%	99.7%
			1,737	**574**	**40**	**582**	**38**	**595**	**36**		

*Figure displayed is for Alternative 4, as it creates the most reduction in suitable habitat within these HRCAs.

It appears that with the implementation of Alternative 4, approximately 17 more acres of 4M, 4D, 5M, 5D would be treated over what Alternative 1 treats in HRCAs. Alternatives 1 & 3 result in 17 and 11 less acres of suitable habitat being reduced when compared to Alternative 4 which reduces suitable habitat by 631 acres.

Potential risk to owl PAC viability is a subjective rating based on the relationship of total acres of PAC/HRCA, the percentage of the PAC associated HRCA acres being treated and the amount of suitable habitat potentially affected. It is speculated that PAC/HRCA viability (ability to be occupied by owls) for those PAC/HRCAs that are at or below 1,000 acres and incur more acres of treatment (>10% PAC/HRCA treated), especially within suitable habitat, are put at higher risk than those treatments on larger PACs/HRCAs with less acres treated. This speculation is based on the premise that removing suitable habitat within an owls home range tends to reduce the productivity and survivorship of resident owls (Bart 1995, Hunsaker 2002). As can be seen in Table 3.42, a few PAC/HRCA habitats exceed 1,000 acres and thus are buffered with additional acres over SNFPA standards & guidelines.

Table 3.41 indicates that PACs PL 203 and PL204 have the highest risk for potential PAC abandonment due to the direct habitat impacts associated with the action alternatives. Table 3.42 indicates that approximately 63.7% of the suitable habitat within HRCAs will be present post project implementation of action Alternative 4. These owl sites, with moderate occupancy history, are already at or just above 1,000 acres and PL204 appears to have lower than average amounts of suitable habitat (<75% HRCA is suitable). All action alternatives increase the risk and uncertainty of PAC viability as a result of habitat modification within HRCAs.

Owl populations may go through periodic declines with periods of non-breeding followed by breeding pulses (Verner et al. 1992: 72-73). The loss of available nest sites due to catastrophic events or as a result of habitat disturbance may preclude population expansion following breeding pulses. It is possible that owl use of these PACs/HRCAs may be “transitory” in nature; that is they are used by owls during periods of peak owl populations and possibly are empty during lower owl population periods or may provide areas for occupancy by dispersing juveniles and sub-adults. LaHaye et al (2001) reported that frequently vacant sites had records of successful reproduction and these frequently vacant sites supported high survival and reproduction when they were occupied. These authors felt that dispersal of individuals may be cued to the existence of suitable habitat, which individuals may preferentially disperse to occupied sites and thus take advantage of suitable vacant sites. This could be demonstrated through the findings of the administrative study.

Several researchers have evaluated the spatial scale at which northern spotted owls respond to habitat (Hunter et al 1995, Bingham & Noon 1997, Meyer et al 1998, Franklin et al. 2000 and Zabel et al. 2003). Blakesley (2003) has provided insight into spatial availability of habitat for California spotted owls. Each of these studies found that areas within ~200 ha (500 acres) of nests were influential in determining occupancy and/or fitness. Blakesley (2003) states that occupancy, apparent survival and nesting success all increased with increasing amounts of old-forest characteristics and that reproductive output decreased with increasing amount of non-habitat within the nest area (nest area = 203 ha scale, or 500 acres). These studies suggest that effects outside of the PAC may influence a site's "quality" for spotted owls. Based on these studies, one could argue that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area. There would be no activities within the 300-acre PACs with the Freeman Project. Table 3.43 shows the potential suitable habitat acres treated within the 500-acre area around an owl activity center for the owl activity centers directly affected with Alternatives 1, 3 and 4.

Table 3.43 Analysis of potential acres treated within 500-acre area of each directly affected activity center with Alternative 1, 3 & 4 (suitable habitat).

HRCA	Acres of HRCA in 500 acre area	% of HRCA in 500 acre area	Acres of DFPZ Rx in HRCA within 500 acre area			Acres of Area Thinning in HRCA within 500 acre area			Projected # acres of groups/ETZs* in HRCA within 500 acre area			Total Acres Reduction in Suitable Habitat in HRCA within 500 acre area		
			Alt. 1	Alt. 3	Alt. 4	Alt. 1	Alt. 3	Alt. 4	Alt. 1	Alt. 3	Alt. 4	Alt. 1	Alt. 3	Alt. 4
PL203	91	13.0%	6	6	6	57	60	60	7	3	3	70	69	69
PL204	103	13.3%	0	0	0	15	16	16	0	0	0	15	16	16
PL274	10	1.4%	0	0	0	0	0	0	0	0	0	0	0	0
Total	**204**	**9.3%**	**6**	**6**	**6**	**72**	**76**	**76**	**7**	**3**	**3**	**85**	**85**	**85**

* Alternative 1 (PA) is the only alternative with Aspen Extended Treatment Zones (ETZs).

With Alternatives 1, 3 and 4, approximately two HRCAs would have potential habitat reduction within the 500-acre area around the activity center. Table 3.43 indicates that acreage treated ranges from 69 to 70 acres in the 500-acre area surrounding the activity center of PL203, from 15 to 16 in the 500-acre area surrounding the activity center of PL204 and 0 acres in the 500-acre area surrounding the activity center of PL274. The largest amount of habitat treatment occurs in PL203, with potentially 6 acres of DFPZ, 60 acres of area thin treatments w/biomass removal and 7 acres of groups/ETZs occurring in the HRCA within the 500-acre area. To further reduce risk and uncertainty associated with spatial treatment of habitat near the vicinity of a nest or activity center, deferring placement of treatments, such as fuels treatments, group selection and area thin treatments within 500 acres of a nest site, including portions of HRCAs, would need to be incorporated into project layout and design.

The CASPO Technical Report concluded that management activities should avoid increasing the mean distances between suitable owl pair sites (defined in the BA/BE as PACs). The average distance, as measured from edge of one PAC to the edge of its neighbor for all PACs across the PNF is approximately 1.5 miles (USDA Forest Service 1999). Because PACs and SOHAs are not directly affected by resource management activities within the project area, there would be no change in the distances between PACs.

Fragmentation

Within the Freeman Project area, the action alternatives would result in an increase in low contrast fragmentation; that is that dense canopy closure would be reduced within the DFPZ and Area Thinning units but would maintain a continuity of large trees within treated stands and across the landscape. According to the 1993 CASPO IG EA (Page IV-81), within stand fragmentation of the small tree canopy (trees <20 to 30 feet) is less of a concern than large tree or old forest attribute removal because 1) historical understory densities were discontinuous; 2) this habitat component can return relatively quickly (versus large overstory layer) and 3) creating this type of fragmentation can help avoid larger scale, high contrast fragmentation of forested stands due to wildfire. The key to lessening impacts of fragmentation within DFPZs and Area Thinning is to maintain forest cover composed of the largest, fire resistant conifer species, while also providing structural attributes needed for prey species (snag/large logs). Removal of trees up to 29.9” dbh would occur, with the overall objective of leaving enough dominant and co-dominant (20”-30”) trees to provide from 40-50% canopy cover. This tree retention opens up the treated stand but does not isolate stands from surrounding forest or create habitat islands isolated by non-forest, thus increasing the likelihood for successful dispersal of wildlife. All action alternatives are designed to retain these attributes within DFPZs and area thin treatments w/biomass removal treated areas.

Group selection and Aspen ETZ openings would create low-high density openings within stands, but each group would retain structural elements (if present) such as conifers over 30” dbh, hardwoods and down logs up to 10-15 tons/acre, that would reduce within stand fragmentation and contribute to decreasing the size of the forest opening. Group selection openings up to two acres meet the definition of continuous forest cover with the retention of all conifers over 30” dbh, 30 to 40 percent of the basal area consisting of the largest of the healthy trees and the largest snags and eight snags per acre (minimum of 20 square feet basal area of snags per acre) (CASPO IG EA, page IV-62, 1993). “This interpretation is made because group selection tends to mimic natural regeneration patterns and other harvests (intermediate harvests), while variable in appearance, tend to leave sufficient forest vegetation that a perception of continuous forest cover is maintained" (CASPO IG EA, page IV-62, 1993). This is the assumption used in the programmatic analysis for the HFQLGFRA FEIS (1999), assuming group selection harvest at a ten-year treatment cycle (5.7% of the land base) up to a 20-year treatment cycle (11.4% of the land base). Groups at this level could mimic naturally occurring gaps within forested stands.

The density of groups within stands potentially increases edge effects, reduces forest interior habitat and creates a condition in which otherwise suitable owl habitat becomes less suitable because it is adjacent to and/or surrounded by, non-habitat. Franklin et al (2000) found a positive relationship with the amount of edge between owl habitat and non-habitat and that Northern spotted owls showed higher reproductive success in sites with intermediate numbers of owl habitat patches intermixed with non-habitat areas. Blakesley (2003) on the other hand reported a model of reproductive output showing a weak negative relationship with elevation and amount of non-owl habitat within the nest area. It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by old forest species, including spotted owls. In terms of acres treated, Alternative 1 treats 485 more acres of owl habitat with groups/ETZs than Alternative 4 and treats 507 more acres of owl habitat in groups/ETZs than Alternative 3.

All alternatives propose to construct approximately 2 miles of temporary road, all of which would be closed post harvest and .3 miles of new system road construction which would relocate two small segments of roads outside of RHCAs. Thus there would be a very slight increase in habitat fragmentation with new road construction. In addition, 10 miles of existing road would be decommissioned and another 1 mile would be closed. Actions including road closure and decommissioning would be implemented on this new temporary road construction as well as 11 miles of existing road, to create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings.

Indirect Effects

As part of a strategic system of defensible fuel profile zones, this project would reduce the potential for high-severity wildfires, which could eliminate vast tracts of habitat for this species. The fire history within the Freeman Project area indicates the area is not prone to large stand-replacing fires. However, the fuel loads indicate the area is ripe for a large fire (Lane 2006).

Home ranges of neighboring spotted owls commonly overlap (Verner et al. 1992: 149). The action alternatives that eliminate or modify habitat, possibly could cause a shift in owl home range use, increasing the potential for intraspecific competition between neighbors. The increased competition associated with using the same restricted habitat parcels could impact owl behavior, possibly affecting nesting and reproduction. Because of this, directly affected HRCAs could have an indirect affect on adjacent PAC/Home Ranges not directly affected by the Proposed Action, especially if the directly affected HRCA overlaps with another HRCA. There are a total of 6

PACs/HRCAs within the Wildlife Analysis Area (including one SOHA); 3 directly affected and 3 indirectly affected (Figure 3.3).

Based on acres affected within individual HRCAs displayed in Tables 3.42 – 3.44, it is difficult to predict if there would be a shift in owl use due to habitat alteration. Two HRCAs directly affected by habitat reduction as a result of this project are located within half mile of each other between Smith Peak and Threemile Rock (PL203 and PL204). Potential habitat reduction in PL203 is 253-287 acres and within PL204 is 342 acres. PL203 was discovered in 1991 and records indicate it was last recorded occupied in 2005. PL204 was discovered in 1991 and records indicate it was last recorded occupied in 2005. No nest sites or young have ever been recorded for PL203 or PL204. Potential habitat reduction in HRCA of PL274 is 1 acre. PL274 is based on a 1992 owl detection, with no detections until 2004 and 2005 when a single male was detected.

With an average reduction of 205 acres of suitable habitat per HRCA with Alternative 1 (derived from Table 3.41) and an average reduction of 207 and 210 acres of suitable habitat per HRCA with Alternatives 3 & 4 respectively, it is anticipated that owl behavioral and competitive interactions may increase, which could impact owl activity and occupancy of PAC/HRCAs, already low in suitable habitat. Although the HRCAs are well distributed across the Wildlife Analysis Area, they are also confined across the Freeman Project area by large blocks of unsuitable habitat as a result of extensive meadow systems and past timber activities.

It is uncertain as to whether the same number of owl sites occupied in 2005 (three) would be occupied within the Wildlife Analysis Area post project. Because PACs and SOHAs are avoided by treatments and the majority of the habitat within the 700 acre plus HRCAs would not be affected by treatments, it seems reasonable to assume that occupancy would be maintained. The remaining three sites would have no change to habitat within PACs and associated HRCAs would still be present that could support owl occupancy. Risks to owl occupancy are increased in PAC/HRCAs PL203, PL204 and PL274 due to changes in habitat in portions of HRCAs.

Fuel treatments including thinning and prescribed burning would result in a shift in stand microclimate that would have a negative impact to flying squirrels (Lehmkuhl et al 2006). These treated stands would have fewer trees, a less complex and more open canopy structure (<50% canopy cover), resulting in a higher variability stand microclimate, all of which create more xeric conditions that would likely lower availability and biomass of truffles. Retention of down woody material and the largest trees may retain some level of lichen and truffle diversity and biomass, providing flying squirrel forage resources within treated stands. With regular maintenance through prescribed burning every 10 or so years, downed wood retention would be hard to retain in the long term, resulting in lower density of truffles. These potential losses would be offset by the benefit that fuel treatment could have for reducing the large scale loss of habitat through wildfire. Less than 15% (5,456 to 5,792 of 41,388 acres) of the National Forest land within the Wildlife Analysis Area would be treated with the Freeman Project, while 35,596 to 35,932 acres of National Forest terrestrial forested habitat would not be treated. Location of treatment acres are constrained across the landscape for various resource reasons (PACs & SOHAS for example) such that this untreated habitat is spread across the Wildlife Analysis Area and thus would unlikely impact the distribution and viability of flying squirrel populations.

It is unknown as to how some of the important prey species preferred by spotted owls (woodrats and flying squirrels) would respond to group selection harvest units. With reforestation, as the brush/seedling habitat matures, woodrats may recolonize sooner as they are known to utilize earlier successional habitats (CWHR Version 8.0 and G.Rotta, personal communication). Downed logs created by the retention of snags would provide down woody structures that would provide habitat for prey species. Flying squirrels would likely be absent within the group selection openings but could possibly utilize the edges to their advantage and would eventually inhabit these areas as the forest matures. It is unknown if these small openings within the forest would be used for foraging by spotted owls. Reforestation should shorten the timeframe to develop forested stands as well as accelerate the development of old forest conditions that owls prefer when compared to natural succession.

Habitat modeling conducted for the SNFPA FEIS and subsequent FSEIS to project trends in woodrat and flying squirrel habitat as a result of implementing fuels reduction activities and group selection harvest within the Sierra Nevada range indicated that populations of both species would apparently increase slightly over current conditions, but the difference in populations in either the short or long-term would be very small.

In terms of acres treated, with the subsequent potential for snag removal, Alternative 1 treats approximately 215 more acres than Alternative 3; thus fewer snags could be removed (due to hazards, operability, etc) with Alternative 3. Alternatives 4 treat approximately 91 less acres than Alternative 3, thus this action alternative potentially retains the most snags of these three alternatives.

Edges created by groups within suitable owl habitat may reduce the use of foraging habitat by spotted owls and may increase use by great horned owls, an effective competitor and predator of the spotted owl. Responses of prey species, as well as spotted owl use of group openings, is one of the main objectives of the post implementation monitoring that would be conducted by PSW research through the administrative study. The post project monitoring would provide information as to the change in great horned owl use and occupancy and contribute knowledge as to the coexistence of these two species.

No new road construction would occur within PACs or HRCAs.

Cumulative Effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on TES wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to degrade riparian habitats through the browsing of aspen, willow, etc. thus potentially affecting the diversity within spotted owl habitat.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should have negligible affects on spotted owls.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the Wildlife Analysis Area.

No other vegetation or fuels type projects have occurred within the project area or Wildlife Analysis Area on National Forest lands since 2000.

Table 3.44 provides a cumulative total of the amount of suitable owl nesting habitat that has been reduced due to fuels treatments, group selection and Area Thinning projects implemented under HFQLG on the BKRD.

Based on Table 3.44, the three action alternatives in the Freeman Project could contribute to a cumulative reduction in spotted owl nesting habitat. It is unknown as to what influence these various reductions in habitat would have on owl activity and occupancy within the Wildlife Analysis Area. As noted in the direct/indirect effects section, spotted owl PACs/SOHAs would not be entered for Freeman Project activities, to conserve habitat for these species and additional PACs and HRCAs would be created in the future, if warranted by new site-specific owl information.

Table 3.44 Cumulative Reduction of Nesting Spotted Owl Habitat (5M, 5D, 6) on Beckwourth RD

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ
	Alt. 3*	**Alt. 2***	**Alt. 4***	**Alt. 4***	**Alt. 1***	**Alt. 3***
Nesting Habitat	0	0	0	1 acre	672 acres	0
Project	**Mabie DFPZ**	**Happy Jack DFPZ/GS**	**Freeman DFPZ/GS**			
	Alt. 3*	**Alt. 4***	**Alt. 1**	**Alt. 3**	**Alt. 4**	**Potential Cumulative Change**
Nesting Habitat	0	19 acres	246 acres	243 acres	379 acres	**935—1,071acres**

*Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. Site-specific analysis of direct, indirect and cumulative effects of this project would be documented in a separate analysis.

The cumulative effect of HFQLG pilot project actions, such as the Proposed Action and other vegetation management actions in the Sierra Nevada was assessed in the SNFPA FSEIS, to which this assessment is tiered. The habitat modeling used for this assessment was intended to indicate the direction, magnitude and time frames (general trends) of change and was not intended to provide precise information. The SNFPA FSEIS (pages 260-280) acknowledged that suitable foraging habitat provided by CWHR size class 4 stands would diminish in early decades under SNFPA, but would be offset by increases in acreage of CWHR size class 5 and 6 stands. According to projections (FSEIS Chapter 4, Table 4.3.2.3g, pg. 269); total spotted owl habitat in the HFQLG planning area would increase 11% twenty (20) years after SNFPA implementation. By year 50, the net gain would have dropped to 6% and by year 130 there would be a net reduction of 7% in the pilot project area. In the Sierra Nevada bioregion as a whole, however, total habitat would increase 13% by year 20, 18% by year 50 and 20% for year 130. Within the HFQLG planning area, full implementation of HFQLGFRA under SNFPA 2004 ROD is projected to result in roughly 65,000 fewer acres of suitable habitat in year 20 than with SNFPA 2001 ROD (Alternative S1 in 2004 SNFPA FSEIS). This is primarily due to 1) implementation of group selection harvest and 2) the fact that Standards and Guidelines for CWHR 4M and 4D do not have any minimum canopy cover requirements and have a 30% basal area retention standard.

Also, under the 2004 ROD, the canopy cover in CWHR class 5M, 5D and 6 stands are more likely to drop to 40% in DFPZs. (SNFPA FSEIS Chap 4, page 269). Because the spotted owl population is currently within the 95% confidence limits of a stable population (Franklin et al 2003 in SNFPA FSEIS 2004), the SNFPA FSEIS and BA/BE concluded that these cumulative habitat changes (within the range of the California spotted owl within both the Sierra Nevada and the HFQLG planning area) would not result in a trend toward listing or loss of viability of the California spotted owl.

Forest Inventory & Analysis (FIA) data collected from the Freeman Project area run through the Forest Vegetation Simulator (FVS) growth and yield model appear as if tree growth and subsequent habitat recovery follows the trends projected in the SNFPA FSEIS. Modeling indicates that all action alternatives that implement fuels treatments and area thinning w/biomass removal in the Freeman Project result in providing suitable owl habitat over time (year 20) (see Silviculture report in Project Record). Individual groups are also expected to be CWHR 3 by 20 years with structurally suitable habitat occurring beyond year 40.

Large scale changes in owl habitat as a result of recent wildfires and anticipated future fires in spotted owl habitat has been identified as a potential threat affecting spotted owl distribution (70 Federal Register, 35613, June 21, 2005). An annual average of 4.5 PACs have been lost or severely modified by wildfire since 1998 in the range of the California spotted owl (SNFPA FSEIS Chapter 3, page 145). Table 3.2.2.3b within the SNFPA FSEIS indicates that approximately 7 PACs on the PNF are considered lost due to fire effects. None of these PACs have been removed from the Plumas designated PAC network. At least three have been re-designated around the periphery of the Stream Fire and owls have been found in all three sites. Approximately 2,300 acres of suitable owl habitat (CWHR 4M, 4D, 5M, 5D, & 6) was lost with the Stream Fire. Spotted owls may have re-located in habitat outside of the fire perimeter, which could have resulted in increased crowding and competition with established owls, resulting in lower owl numbers and occupancy in the general area. None of these large scale fires have occurred within the Freeman Project area.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed. The effect of this action would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover which would have a nominal affect on the California spotted owl.

The petition to list the California spotted owl identified West Nile Virus (WNV) as a serious potential threat to owls and stated that its effects on owls should be monitored (70 Federal Register, June 21, 2005). West Nile Virus has not yet been detected in a wild spotted owl (Ibid). In 2004 researchers tested for WNV (California spotted owls in the Eldorado study area, Northern spotted owls in the Willow Creek Study area) and in 2005 blood samples were taken from California spotted owls on the Plumas and Lassen National Forests. None of these owls tested positive for WNV exposure (Ibid, J. Keane, personal communications, 2005). The USFWS found there was no substantial information that WNV may threaten the continued existence of spotted owl (70 Federal Register, 35612, June 21, 2005 and 71 Federal Register, 29886, May 24, 2006).

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in Northern spotted owls, through both hybridization as well as replacing the Northern spotted owl in some areas. It is thought that this range expansion and subsequent Northern spotted owl displacement is related to forest fragmentation and the barred owls ability to adapt better to a mosaic of habitats. The latest information regarding barred owls versus Northern spotted owls can be found in Pearson and Livezey (2003). Some of the key points that this paper identifies are summarized here: 1) Northern spotted owls are more likely to abandon a site if barred owls take up residence close to that site, 2) the authors suggest that a combination of habitat lost due to timber harvest and the presence of barred owls may work together to put (northern) spotted owl pairs at risk of losing their territories; 3) there is an increasing amount of evidence that barred owls may kill Northern spotted owls and 4) barred owl's can cause a reduction in the Northern spotted owl populations by physically excluding them from historic sites and making those sites unavailable for recolonization.

Barred owls have expanded their range in California as far south as Sequoia National Park and in the last two years (2004/2005) the known range of barred owls has expanded 200 miles southward in the Sierras (70 Federal Register, 35613, June 21, 2005). The USFWS has concluded that barred owls constitute a potential threat to site occupancy, reproduction and survival of the California spotted owl, but that there currently is not enough information to conclude that hybridization with barred owls poses a threat (Ibid). In their May 15, 2006 finding of the 12 month status review, the USFWS concluded that the California spotted owl should not be listed as a threatened or endangered species under the ESA (FR, Vol 71, N0. 100, May 24, 2006). This conclusion was based in part on the fact that barred owl movements into the Sierra Nevada have been at much slower rates than their movements into other parts of western North America.

According to Keene (2005) in a presentation of the Plumas Lassen Administrative Study (PLAS) spotted owl module, there have been 33 barred owl detections in the northern Sierra Nevada (El Dorado NF north) since 1989, twenty of which have been in the last three years. Of these twenty most recent detections, 9 have been barred owls and 11 have been sparred (barred X spotted hybrid). Within the PLAS study area inside of the HFQLG area, there have been 10 detections in the last three years (6 barred and 4 sparred). A barred owl was detected twice in Butterfly Valley (approximately 18 miles west of the Freeman Wildlife Analysis Area) in 2005. This is the closest sighting of a barred owl to the Freeman Wildlife Analysis Area.

Barred owls readily respond to spotted owl calls (Forsman et al. 1984, McGarigal and Fraser 1985, Hamer 1988, Reid et al. 1999; all referenced in Pearson & Livezey 2003). Since 2001 approximately 111,843 acres have been called to the two year protocol on the BKRD. No barred owls were found. No barred owls were discovered in either the spotted owl or great gray owl surveys conducted within the Freeman Project area in 2004 and 2005. Based on the studies that have been conducted in the northern spotted owl range, barred owls seem to be more adaptable to habitat perturbations within suitable spotted owl habitat than spotted owls themselves. The potential for the barred owl to establish and compete with spotted owls within the Freeman Project area is a possible additional cumulative effect.

The Freeman Project is not located within any CASPO identified Areas of Concern (AOC). This project would not improve or exacerbate any of the habitat conditions within these two AOC.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on spotted owl or spotted owl habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire occurred, suitable owl habitat could become patchy and could lead to reduced or lower abundance of owls within the Wildlife Analysis Area.

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by spotted owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting. No roads would be closed or decommissioned with this alternative.

Cumulative Effects

The No-action Alternative for the Freeman Project would not provide for the long-term protection of spotted owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (2001), which could lead to lower owl abundance from existing condition within the Wildlife Analysis Area. There would be no thinning that could enhance the growth of dominant and co-dominant (20"-30") trees that may provide future habitat availability.

Determination—California Spotted Owl

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the California spotted owl. This determination is based on the following:

1. PAC avoidance;
2. retention of 83.7% to 86.0% of existing foraging habitat and 94.0% to 96.1%% of existing nesting habitat on National Forest within the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4). This retention of nesting and foraging habitat outside existing PACs would provide opportunities for future occupancy and population expansion;
3. at least 78% of all PAC and HRCA combined acres would not be treated with action alternatives;
4. with an average suitable habitat reduction within HRCAs ranging from 614 to 631 acres within 2 of the 3 HRCAs within the Wildlife Analysis Area (Alternatives 1, 3 & 4), owl occupancy of each established PAC within the Wildlife Analysis Area should remain the same as pre-treatment;
5. the greatest risk to owl occupancy occurs within two PAC/HRCAs that have been occupied by owls within the last two years but have no documented reproductivity;
6. creation of a network of fuel reduction areas (DFPZs) designed to reduce the loss of habitat due to wildfire.

It is acknowledged that implementation of alternatives involve some risk to habitat and subsequent uncertainty with regards to owl activity. Alternative 4 poses greatest risk and uncertainty, with 1 and 3 having less risk respectively. Alternative 2 is not without risk to spotted owl habitat, as no action is taken to reduce existing fuel levels, create areas that could allow for better and more efficient fire suppression efforts and leaves existing owl habitat vulnerable to large scale fragmentation as a result of wildfire.

3.5.7.5 Northern Goshawk (*Accipiter gentilis*)

The PNF LRMP requires that the Forest monitor goshawk populations and habitat trends in designated areas. This involves survey of designated habitat to determine occupancy and reproductive success, designation of nest groves and monitoring for occupancy 25 percent of established nest groves annually (PNF LRMP Chapter 5, page 5-7). Trends in territory occupancy and reproductive success will be determined over a five year period. An additional monitoring element involves checking project compliance with regional standards & guidelines and forest objectives.

Affected Environment—Northern Goshawk

The latest published information regarding the goshawk, in terms of population status, distribution, population and habitat trends and species requirements can be found within SNFPA FEIS (Chapter 3, Part 4.4.2.2) and in Chapter 3.2.2.4 of the SNFPA FSEIS 2004. A total of 588 northern goshawk breeding territories have been reported from Sierra Nevada National Forests. As of June 2006, the Plumas NF corporate GIS coverage includes 144 goshawk PACs (Table 3.45). This is approximately 19% of the total within the Sierra Nevada. These numbers represent goshawks that have been found as a result of both individual project inventories to standardized protocols, as well as nest locations found by other incidental methods. The increase in the number of goshawk PACs from 2000 to 2005 (Table 3.45) is indicative of the increased intensity in survey effort.

Table 3.45 Existing Northern Goshawk Nest Territories or PACs, Plumas NF

Total Goshawk Nesting Territories as per SNFPA (2000)	Total Goshawk Nesting Territories as of 6/2006
75	144

The PNF LRMP EIS stated that the Plumas has the capacity for 100 Goshawk pairs. The 1988 PNF LRMP calls for a network of 60 nesting territories to provide for the viability of the goshawk. It is uncertain as to whether this figure is accurate; the Forest has been developing territories (pre-SNFPA) and now 200 acre PACs (USDA Forest Service 2004) for all newly discovered goshawk-breeding sites. The current 2005 numbers of 144 PACs exceeds the minimum objectives by more than double and the predicted capacity of 100 PACs by 44 PACs. So it is believed that the current density of goshawk territories is contributing to goshawk viability within the PNF.

Population trends of northern goshawks in the Sierra Nevada are unknown, although numbers are suspected to be declining due to habitat reductions and loss of territories to timber harvest (Bloom et al. 1986 in SNFPA FEIS). Based on several studies (Bloom et al., 1986, Reynolds et al. 1992, Kennedy 1997, Squires and Reynolds 1997, Smallwood 1998, DeStefano 1998, all in SNFPA FEIS) there is concern that goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality. Monitoring of nest sites on the Mt. Hough RD from 1998 to 2002 indicates that over the last 5 years nesting activity occurred at approximately 36% of monitored sites annually.

The Redwood Science Lab (RSL), of the Pacific Southwest Research Station, is currently conducting a Goshawk OHV study on the PNF where they are annually evaluating and monitoring the effects of OHV noise on goshawks. In 2004, the RSL monitored 38 active nests on the Plumas NF. Of the 38 active nests monitored, 24 successfully reproduced (young >30 days old), 8 nests failed and 6 resulted in an unknown status. In 2005, the RSL monitored 28 active nests on the Plumas NF. Of the 28 active nests, 16 successfully reproduced, 3 nests failed and 9 resulted in an unknown status. Five of the nests monitored by the RSL occur within the Freeman Wildlife Analysis Area (Table 3.46). The data collected by RSL is showing a reproductive success rate of 63% and 57% for the number of active nests monitored in 2004 and 2005. 2006 monitoring is currently ongoing and a complete data set is not available. As of June, 2006, the RSL has located 15 active nests on the PNF. Overall, this data indicates that the goshawk population on the Plumas appears relatively secure (USDA Forest Service 2006).

Northern goshawk surveys have occurred within the Wildlife Analysis Area. In 2002 and 2003, the Humbug Project, including the southeastern portion of the Freeman Wildlife Analysis Area, was surveyed to the two-year protocol standards (“Survey Methodology for Northern Goshawks in the Pacific Southwest Region” (USDA Forest Service 2000)), by contractor North State Resources, Inc. In 2004 and 2005, the Happy Jack Project, including the southwestern portion of the Freeman Wildlife Analysis Area, was surveyed to the two-year protocol standards (“Survey Methodology for Northern Goshawks in the Pacific Southwest Region” (USDA Forest Service 2000)), by contractor Williams Wildland Consulting, Inc. The remainder of the Freeman Wildlife Analysis Area was surveyed to protocol in 2004 and 2005 by contractor Williams Wildland Consulting, specifically for the project area. Three new goshawk-nesting sites were located resulting in three new protected activity centers (PACs) with this effort (WWC 2005). A total of eight PACs are in the Wildlife Analysis Area (Figure 3.4). Table 3.46 provides PAC history for Northern goshawks within the Wildlife Analysis Area.

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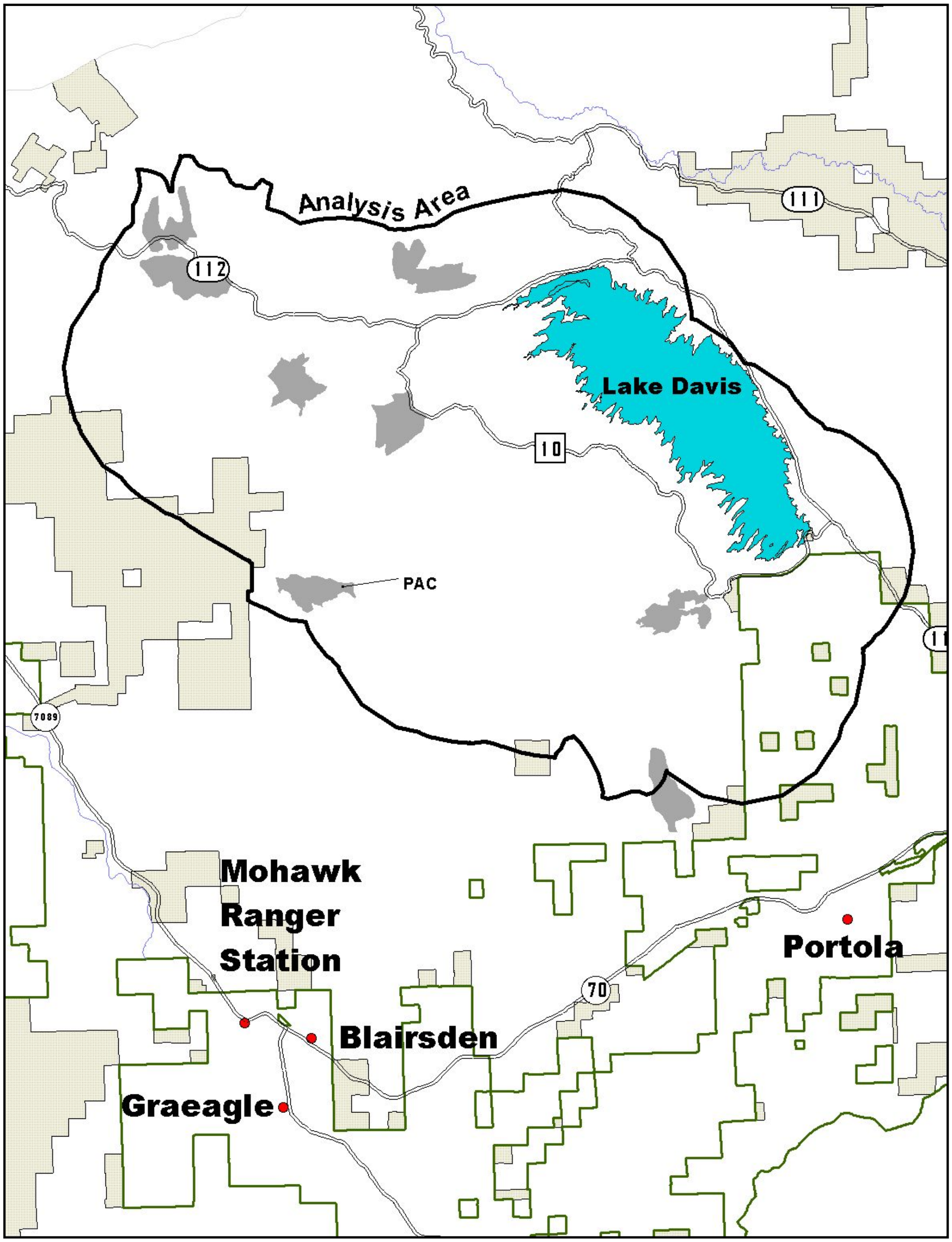

Figure 3.4 Freeman Wildlife Analysis Area with 200 acre Northern Goshawk Protected Activity Centers (PACs) (solid color).

Table 3.46 PAC History for Northern Goshawks within Wildlife Analysis Area.

Year	†Lovejoy	Oldhouse	West Humbug	†Little Summit	Happy Valley	†Smith^ Peak	†Midway^ House	†Freeman^ Creek
1985	Discovered—Nest Site 3 young							
1986	Surveyed—No Detections							
1987	Not Surveyed							
1988	Surveyed—No Detections		Discovered—Nest Site 2 young					
1989	Not Surveyed		Detection—Nest Site 1 young					
1990	Detection—Nest Site 1 young	Discovered—Nest Site 2 young	Surveyed—No Detections					
1991	Not Surveyed	Detection—Nest Site 1 young	Surveyed—No Detections					
1992	Surveyed—No Detections	Surveyed—No Detections	Detection—Nest Site 1 young					
1993	Not Surveyed	Not Surveyed	Surveyed—No Detections					
1994	Not Surveyed	Surveyed—No Detections	Surveyed—No Detections					
1995	Not Surveyed	Not Surveyed	Detection—Nest Site 0 young					
1996	Surveyed—No Detections	Detection—Nest Site 2 young	Surveyed—No Detections					
1997	Not Surveyed	Surveyed—No Detections	Not Surveyed					
1998	Not Surveyed	Not Surveyed	Not Surveyed	Discovered—Nest Site 3 young				
1999	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed				
2000	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed				
2001	Not Surveyed	Not Surveyed	Not Surveyed	Not Surveyed				
2002	Not Surveyed	Not Surveyed	*Visual Detection—Adult	Not Surveyed	Discovered—**No Nest Site 2 young			
2003	Not Surveyed	Not Surveyed	Surveyed—No Detections	Not Surveyed	Surveyed—No Detections	Discovered—**Nest Site 2 young		

Year	†Lovejoy	Oldhouse	West Humbug	†Little Summit	Happy Valley	†Smith^ Peak	†Midway^ House	†Freeman^ Creek
2004	Not Surveyed	Not Surveyed	Not Surveyed	Surveyed—No Detections	Detection—Nest Site 2 young	Detection—Nest Site 2 young	Discovered—Nest Site 3 young	Discovered—Nest Site 3 young
2005	Surveyed—No Detections	Not Surveyed	Not Surveyed	Surveyed—No Detections	Detection—Nest Site 3 young	Detection—Nest Site 2 young	Detection—Nest Site 2 young	Detection—Nest Site 2 young
2006	Surveyed—No Detections	Not Surveyed	Not Surveyed	Surveyed—No Detections	Detection—Nest Site	Detection—Nest Site	Surveyed	Surveyed

†RSL monitored PACs
^PACs in Freeman project area
*Detection outside of PAC
**Discovery by Humbug Project Spotted Owl Surveyors

Data sets from studies in the western US (Woodbridge and Detrich 1994, DeStefano et al. 1994, Reynolds et al. 1994, Reynolds and Joy 1998) establish a range of crude densities from 1 territory/2,123 acres to 1 territory/4,003 acres; territory centers are roughly 1.9 to 2.3 miles apart. These crude densities include both suitable and unsuitable habitat within the study areas. The crude densities for goshawk territories in the Freeman Wildlife Analysis Area, based on PACs identified in Table 3.46, are much lower than these figures: 1 territory/5,755 acres in the entire Wildlife Analysis Area, 1 territory/5,174 acres on national forest acres in the Wildlife Analysis Area, or 1 territory/3,123 acres based on total suitable nesting habitat on national forest lands in the Wildlife Analysis Area. Territory centers range from dense (0.75 to 1.5 mile apart in the Little Summit Lake area) to scattered (3-6 miles apart). Based on the density and spacing of known goshawk territories, it appears that the crude density of goshawk territories within the Freeman Project may be less than what has been reported in the literature. The large blocks of unsuitable habitat created by past activities and the extensive meadow network may contribute to lower densities and increased spacing.

Northern goshawks are currently being managed under the PNF LRMP guidelines as amended by the SNFPA FSEIS ROD (2004), pages 66-67 and Table 2. Habitat requirements for this species can be found within the SNFPA FEIS and summarized below.

The northern goshawk requires mature conifer and deciduous forest with large trees, snags, downed logs and dense canopy closure for nesting. Forests with moderately open overstories, open understories interspersed with meadows, brush patches, other natural or artificial openings and riparian areas are preferred for foraging. Recent studies indicate that goshawks typically select for canopy closures greater than 60% for nesting (Hall 1984, Richter and Callas 1996, Keane 1997). The following affected CWHR types provide high nesting habitat capability: Sierran Mixed Conifer, White Fir, Montane Hardwood-Conifer and Montane Riparian (6, 5D, 5M, 4D, 4M), Ponderosa Pine, Jeffrey Pine Lodgepole Pine (5D, 5M, 4D, 4M) and Red Fir (5D, 5M). The following CWHR types are rated as providing moderate nesting habitat capability: Aspen (6, 5D, 5M, 4D, 4M), Eastside Pine (5D, 5M, 4D, 4M, 3D, 3M), Red fir (4D, 4M) and Lodgepole Pine (3D, 3M) (SNFPA FEIS Vol3, Chap.3, part 4.4 pg 116).

Within the Wildlife Analysis Area there are approximately 19,645 acres of habitat providing high nesting habitat capability (Table 3.47).

Table 3.47 Acres of High & Moderate Capability Northern Goshawk Nesting Habitat on National Forest Land within Wildlife Analysis Area

CWHR Type*	Habitat capability	Acres in Wildlife Analysis Area
4M	High nesting	9,804
4D	High nesting	4,447
5M	High nesting	2,023
5D	High nesting	3,371
Total	**High nesting**	**19,645**
3M	Moderate nesting	105
3D	Moderate nesting	29
4M	Moderate nesting	3,303
4D	Moderate nesting	1,130
5M	Moderate nesting	783
5D	Moderate nesting	129
Total	**Moderate nesting**	**5,479**
Total All	**All nesting**	**25,124**

*3=pole 6-11" dbh, 4=small 11-24" dbh, 5=medium/large >24" dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.

As explained above under Table 3.38 for spotted owl, it is acknowledged that the acres reflected in Table 3.47 could be inexact estimates of habitat availability.

Environmental Consequences—Northern Goshawk

Effects of the Action Alternatives

Direct Effects

Potential direct effects on the Northern goshawk may result from the modification or loss of habitat or habitat components and rarely from direct mortality if nest trees are felled. The Proposed Action and alternatives will not cut or remove nest trees. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities (Richardson and Miller 1997). Implementation of Limited Operating Periods (LOPs) around known goshawk nests would remove the effects associated with direct disturbance on treatment units and access routes.

Project activities could occur within ¼ mile from known nest sites within all but five of the designated PACs within the Wildlife Analysis Area. Proposed activities could cause short-term displacement and disruption during the time equipment is present and underburning activities are taking place if there are unknown nest sites unprotected by PACs.

Based on the California Wildlife Habitat Relationships (CWHR) model, about 25,124 acres or 61% within the Wildlife Analysis Area may be considered suitable goshawk nesting habitat (3M, 3D, 4M, 4D, 5M, 5D)(Table 3.47). Dunk and Keane (unpublished analyses) found that the probability of a stand being a nest site increased with increasing amounts of 4D and 5D. In the Freeman Wildlife Analysis Area, 9% of the afore mentioned nesting habitat is composed of 5D, 7% is composed of 5M, 13% is composed of 4D and 32% is composed of 4M. An additional 12% or 5,000 acre (derived from Appendix B) may be considered suitable foraging habitat (ASP, EPN, JPN, LPN, MHC, PPN, RFR, SMC and WFR in 3M, 3D, 4P and 5P). This Wildlife Analysis Area encompasses 41,388 National Forest acres and was chosen in order to put habitat treatments within the context of the surrounding landscape. As mentioned under Table 3.47, uncertainty exists in the amount of nesting habitat that is actually available within the Wildlife Analysis Area, but using vegetation layer mapped data provides consistency throughout this analysis.

In a recently published monograph on northern goshawks in the interior Pacific Northwest (McGrath et al, 2003), it was reported that goshawk nests occurred in the lower 1/3 of slopes and in drainage bottoms more than expected based on availability (and less than expected on the upper 1/3 slopes and ridgetops, although the upper 1/3 was not completely avoided but used half as often as would be expected based on the availability of such areas). The goshawk habitat for the Freeman Wildlife Analysis Area was not stratified or analyzed using McGrath method because it is uncertain as to its application to goshawks in the Sierra Nevada, nor is the data available for the goshawk nest sites on the Plumas that would indicate whether nest sites fall into the McGrath parameters. This is pointed out to identify that the availability of goshawk habitat within the Wildlife Analysis Area may potentially be overestimated.

Changes to suitable habitat as a result of implementing fuels treatments as per action alternatives 1, 3 & 4 would occur where large structural components would be removed and canopy cover would be opened up to 40 - 50%, resulting in open canopied forested stands which are still considered suitable habitat based on canopy cover retention, but deemed unsuitable due to the removal of the needed understory structural components (snags, vertical and horizontal layering, down woody debris, etc.) (see Table 3.36). Canopy cover reductions are expected to occur with the removal of some trees ≤29.9 inches dbh. The combined impacts of mechanical thinning of the understory and achieving the desired conditions for DFPZ by opening up the overstory would result in creating more open forest from dense forest (D stands decreasing to M) (open up to around 40% canopy cover). Area thinning with biomass removal also creates more open, lesser quality goshawk habitat and thus is analyzed as decreasing to M. There may also be some additional risk associated with isolated torching events during prescribed fire which could remove trees, opening up the canopy and reducing nesting opportunities. Table 3.48 shows the above mentioned changes to Northern goshawk nesting and foraging habitat by alternative.

Table 3.48 Comparison of Action Alternatives 1, 3 & 4 on Northern Goshawk Nesting (4M, 4D, 5M, 5D) and Foraging Habitat within the Wildlife Analysis Area

Forage Habitat	**Alternative 1 (PA)**			**% (Alt. 1) Remaining in Wildlife Analysis Area**	**Alternative 3**			**% (Alt. 3) Remaining in Wildlife Analysis Area**
	Acres				**Acres**			
	DFPZ	**GS/ Aspen ETZs**	**AT w/biomass removal**		**DFPZ**	**GS**	**AT w/biomass removal**	
3M	-44	-16	+45	97.7%	-23	-1	+48	103.7%
3D	0	-2	-64	88.2%	-23	-2	-64	84.1%
4P	0	-68	0	98.0%	0	-33	0	99.0%
5P	0	-7	0	98.1%	0	-3	0	99.2%
Total Foraging Change (acres)	**-44**	**-93**	**-19**	**96.9% retained (-3.1%)**	**-46**	**-39**	**-16**	**98.0% retained (-2.0%)**
Nesting Habitat								
4M*	-589	-246	-826	87.3%	-654	-90	-825	88.0%
4D	-543	-129	-427	80.3%	-581	-32	-428	81.3%
5M*	-38	-6	-40	97.0%	-38	-5	-40	97.0%
5D	-151	-9	-2	95.4%	-151	-9	0	95.4%
Total Nesting Change (acres)	**-1321**	**-390**	**-1295**	**88.0% retained (-12.0%)**	**-1424**	**-136**	**-1293**	**88.6% retained (-11.4%)**
Forage Habitat	**Alternative 4**			**% (Alt. 4) Remaining in Wildlife Analysis Area**				
	Acres							
	DFPZ	**GS**	**AT w/biomass removal**					
3M	-20	-1	+68	107.2%				
3D	-26	-2	-84	80.0%				
4P	0	-24	0	99.3%				
5P	0	0	0	100.0%				
Total Foraging Change (acres)	**-46**	**-27**	**-16**	**98.2% retained (-1.8%)**				
Nesting Habitat								
4M*	-797	-89	-879	86.5%				
4D	-630	-44	-598	77.2%				
5M*	-57	-5	-40	96.4%				
5D	-252	-9	-16	92.1%				
Total Nesting Change (acres)	**-1736**	**-147**	**-1533**	**86.3% retained (-13.7%)**				

* Reductions shown here are due to the removal of understory structural components leading to unsuitable nesting habitat.

Based on figures in Table 3.48, Alternative 1 reduces foraging habitat on 156 acres of 5,000 acres, reduces nesting habitat on 3,006 acres of 25,124 acres; Alternative 3 reduces foraging habitat on 101 acres of 5,000 acres and reduces nesting habitat on 2,853 acres of 25,124 acres; Alternative 4 reduces foraging habitat on 89 acres of 5,000 acres and reduces nesting habitat on 3,416 acres of 25,124 acres. In terms of habitat changes to 4D and 5D (assuming higher probability of goshawk use of these types based on the findings of Dunk and Keane's unpublished analyses), 92.1 to 95.4 percent of the CWHR 5D would be retained with all action alternatives and 77.2 to 81.3 percent of CWHR 4D would also be retained.

Protected Activity Centers (PACs)

Implementation of the action alternatives during the nesting season around known nest sites could cause disturbance that could disrupt nesting behaviors and potentially lead to nest failure. The risk of this occurring is tempered by the delineation of a PAC around known nest sites and/or implementation of an LOP prohibiting disturbing activities from occurring within ¼ mile from nest sites.

Portions of two goshawk PACs would be entered with the proposed action alternatives. These entries would be to thin a total of approximately 11 acres of aspen with an 18 inch upper diameter limit. This limitation was designed to maintain nesting habitat for goshawks, while encouraging the habitat diversity provided by aspen within the PAC boundaries. Based on Table 3.49, no suitable habitat within PACs is reduced with any of the proposed action alternatives.

PACs are designated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. PACs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 38. Where there is insufficient suitable habitat (6, 5D, 5M, 4D and 4M), to meet the 300 acres guideline for a PAC, the next best vegetation sizes and types are included. Habitat alteration by the proposed action alternatives and the associated risks to known goshawk occupancy within individual PACs is displayed in Table 3.49.

Table 3.49 Habitat Impacts and Risks for 2 Directly Affected PACs Associated with Northern Goshawk Occupancy.

PAC	Occupancy*	PAC Acres Treated	Acres in PAC	% PAC Treated	Suitable Habitat Reduction (acres) by alternative					Potential Risk to PAC viability
					1		**3**		**4**	
Freeman Creek	H	2	261	0.8%	0		0		0	Low
Midway House	H	9	220	4.1%	0		0		0	Low
		11	**481**	**2.3%**	**0**		**0**		**0**	

*High Occupancy: Reproduction documented the last two years and/or pair occupancy during the last two years,
Medium Occupancy: Reproduction in 1992 and/or pair occupancy after 1992; single territorial goshawk found at least one of the last 2 years,
Low Occupancy: Reproduction and/or pair occupancy not documented since 1992, no territorial goshawk found the last two years.

Indirect Effects

No new road construction would occur within PACs. As part of a strategic system of defensible fuel profile zones, this project would reduce the potential for high-severity wildfires, which could eliminate vast tracts of habitat.

It is an unknown as to how some of the important prey species preferred by goshawks (small mammals, birds) would respond to opening up forested stands with DFPZ and group selection harvest units. Based on CWHR modeling, it is known that several bird species respond favorably to either less dense forested stands and/or openings within forested stands, while some do not (HFQLGFRA FEIS, Appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. Responses of prey species, including small mammals and passerine bird use of group openings is one of the main objectives of the post implementation monitoring that would be conducted by PSW research through the administrative study. Post project monitoring would provide information as to the response by these prey species to DFPZ and group selection harvesting.

Cumulative Effects

Cumulative effects on the Northern goshawk are similar to those described for the California spotted owl on pages 219 – 224.

Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires and the firefighting practices (dozer lines, etc.) used by land managers to control them, have contributed and would continue to contribute to loss of habitat for this species.

Table 3.50 provides a cumulative total on the amount of suitable goshawk nesting habitat that has been impacted by the fuels treatments, group selection and area thinning projects implemented under HFQLG on the BKRD.

Table 3.50 Cumulative Changes (Reduction) in Nesting Goshawk Habitat on Beckwourth RD

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ
	Alt. 3*	**Alt. 2***	**Alt. 4***	**Alt. 4***	**Alt. 1***	**Alt. 3***
Nesting Habitat	1,574 acres	0	25 acres	35 acre	1,051 acres	0
Project	**Mabie DFPZ**	**Happy Jack DFPZ/GS**	**Freeman DFPZ/GS**			
	Alt. 3*	**Alt. 4***	**Alt. 1**	**Alt. 3**	**Alt. 4**	**Potential Cumulative Change**
Nesting Habitat	0	2,355 acres	3,006 acres	2,853 acres	3,416 acres	**7,893 – 8,456 acres**

*Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.

Based on Tables 3.48 and 3.50, the Freeman Project potentially contributes to a cumulative reduction in goshawk nesting habitat. It is uncertain as to what influence these various reductions in habitat would do to goshawk activity and occupancy within the Wildlife Analysis Area. However, it is not anticipated that this cumulative habitat reduction would result in loss of occupancy or productivity of known goshawk PACs, based on very limited entry into PACs, the location of project activities to known PACs, distribution of known PACs across the Wildlife Analysis Area and retention of at least 86% of available suitable nesting habitat distributed across the Wildlife Analysis Area post project implementation.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on goshawk or goshawk habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable goshawk nesting habitat and other important prey habitat attributes such as large trees, large snags and down woody material.

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by goshawks, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting.

Cumulative Effects

The No-action Alternative for the Freeman Project would not provide for the long-term protection of goshawk habitat from catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. The total acres of wildfire and acres of high intensity wildfire are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (2001). There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30”) trees that may provide future habitat availability.

Determination—Northern Goshawk

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the northern goshawk. This determination is based on the following:

1. PAC habitat diversity improvement (minimal activity);
2. retention of 86.3% to 88.6% of existing nesting habitat on National Forest within the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4). This retention of nesting habitat outside existing PACs would provide opportunities for future occupancy and population expansion;
3. creation of a network of fuel reduction areas designed to reduce the loss of habitat due to wildfire.

3.5.7.6 Great Gray Owl (*Strix nebulosa*)

Affected Environment—Great Gray Owl

Historic sightings are recorded for all counties in the Cascade Range in California and the Sierra Nevada as far south as Tulare Co. The present known population is centered in Yosemite National Park. Nesting activity on the Stanislaus National Forest has been documented at five distinct locations. There have also been several recent sightings on the Sierra National Forest, including a successful nest site in 2002. Recent sightings of great gray owls have also been recorded in or near the Modoc, Lassen, Tahoe, Eldorado and Toiyabe NFs. Recent great gray owl sightings on the Plumas include two adults found on the Feather River Ranger District of the Plumas (8/97), although subsequent site visits and surveys have not relocated these birds (Roberts, personal comm. 2002).

Potentially suitable habitat for the great gray owl is scattered across the Forest. The great gray owl requires the following for nesting and foraging (USDA FS 2000):

1. Mid- or late-succession conifer forests containing large, broken-top snags (> 24 in. dbh, particularly red and white firs) in the forest matrix in sufficient numbers

(5-6 snags/acre) to provide nest sites. Old and decadent black oaks have been used for nesting at lower elevations.

2. Suitable nest sites located <300 yards from montane meadows or grass-forb forage types between 2,000 and 8,000 feet in elevation.
3. Canopy closure greater than 60% in, at least portions, of the forest stands adjacent to meadows or other openings.
4. Meadows or openings that have sufficient herbaceous cover to support pocket gophers and microtine rodents. There should be a minimum of 5-10 inches of residual cover at the end of the summer to maintain suitability. Meadows with standing water remaining at mid-summer are not suitable.

Within the Wildlife Analysis Area there are approximately 8,668 acres of habitat providing suitable nesting habitat capability and approximately 5,563 acres of habitat providing suitable foraging habitat capability (Table 3.51).

Table 3.51 Acres of Suitable Great Gray Owl Nesting and Foraging Habitat within the Wildlife Analysis Area on National Forest System Lands

CWHR Type*	Habitat Type	Acres in Wildlife Analysis Area
Other (SGB and S/P forested stands)	Foraging	2,375
Meadows (AGS, PGS & WTM)	Foraging (optimal)	3,188
Total	**Foraging**	**5,563**
4M	Nesting	4,493
4D	Nesting	2,346
5M	Nesting (optimal)	1,000
5D	Nesting (optimal)	829
Total	**Nesting**	**8,668**

*4=small 11-24” dbh, 5=medium/large >24” dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, P= Open Canopy 25-39%, S= Sparse Canopy 10-24%, AGS= Annual Grasslands, PGS= Perennial Grasslands, SGB= Sagebrush, WTM= Wet Meadow. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.

As explained previously under Table 3.38 for spotted owl, it is acknowledged that the acres reflected in Table 3.51 could be inexact estimates of habitat availability.

Surveys for great gray owls were conducted in portions of the Wildlife Analysis Area in 2004 and 2005 to the two year protocol (“Survey Protocol for the Great Gray Owl in the Sierra Nevada of California, May 2000” (USDA FS 2000)) by Klamath Wildlife Resources. Thirteen vocal and/or visual detections of great gray owls (adults and juveniles) were reported by KWR during the 2004 season. An additional 20 vocal and/or visual detections of great gray owls (adults) were reported by KWR during the 2005 season with three of these detections confirmed by Forest Service Wildlife Biologist Russell Nickerson. An additional confirmation of presence (vocal detection) came from the CDFG (Stermer, CDF&G, personal comm. 2005. None of the detections or confirmations has provided any hard proof photos, feathers, or nest sites). Based on these detections and confirmations, three large preliminary PACs have been established for the Freeman Project (Figure 3.5). These preliminary PACs encompass the majority of the detection made in 2004 and 2005. Further surveys will be necessary in order to better define these preliminary PACs which range from 338 acres to 1,053 acres in size. For the Freeman Project, these PAC boundaries will be used for the analysis of effects (direct, indirect and cumulative).

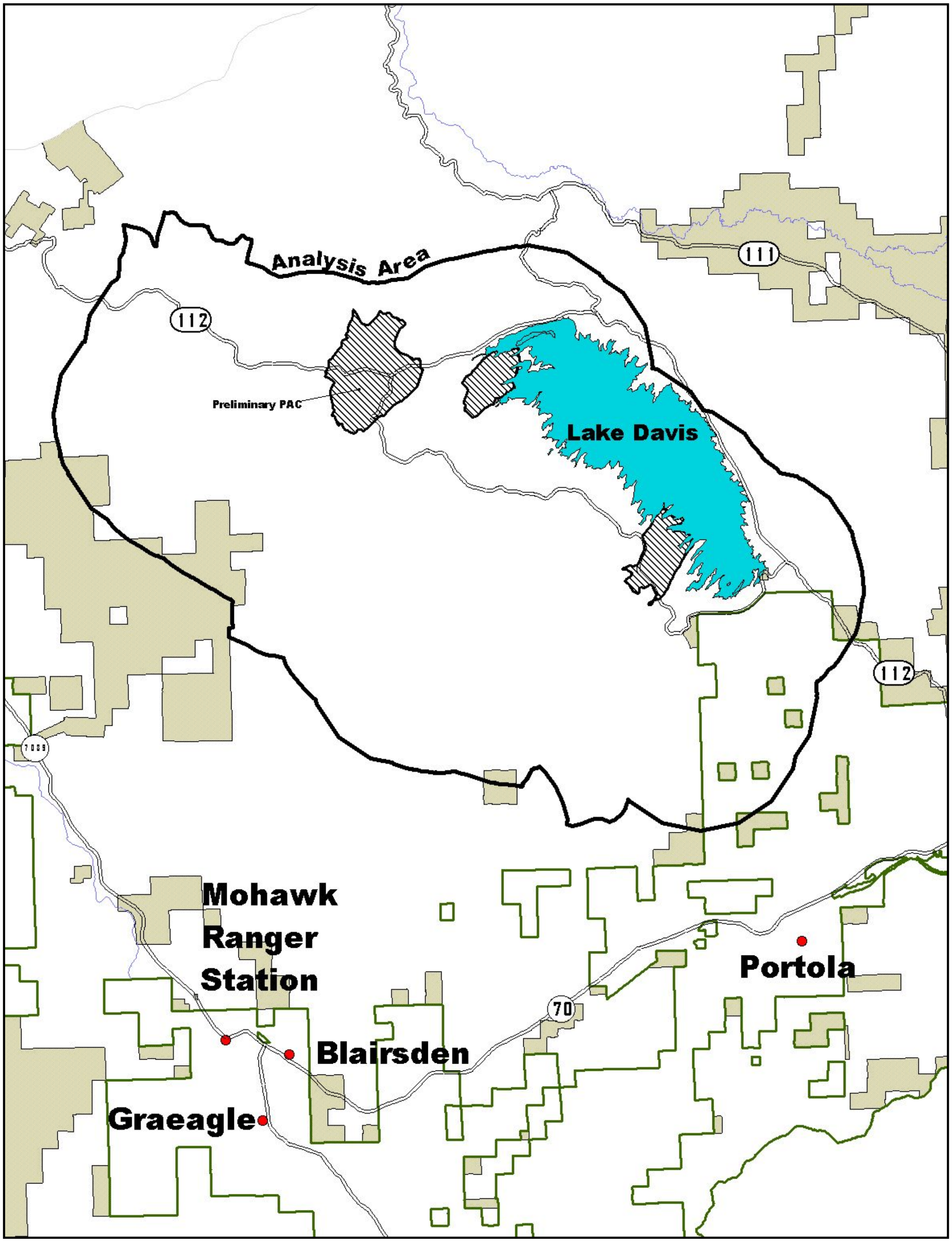

Figure 3.5 Freeman Wildlife Analysis Area with Preliminary at least 50 acre Great Gray Owl Protected Activity Centers (PACs) (diagonal stripes).

Environmental Consequences—Great Gray Owl

Effects of the Action Alternatives

Direct Effects

Potential direct effects on the great gray owl may result from the modification or loss of habitat or habitat components through thinning (reduce canopy cover and availability of future nest trees) and through underburning (snag/log and tree removal (safety hazards, etc.)). Disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities. Implementing limited operating periods within 600 feet of occupied meadow habitats and restricting harvest activity within ½ mile of nest sites (if discovered) will reduce or completely eliminate potential disturbance impacts to this species from the Proposed Action.

There are three preliminary great gray owl PACs within the Wildlife Analysis Area, based on surveys of suitable habitat conducted in 2004 and 2005. Approximately 52 acres of the 1,836 acres of preliminary PACs will be treated. There will be approximately 18 acres of hand thinning and 34 acres of mechanical thinning (aspen treatment, etc.). No reduction in suitable habitat is expected with the above mentioned treatments. Aside from the 52 acres of treatment, no suitable meadow/conifer habitat within these preliminary PACs would be impacted.

Based on the vegetation layer and the CWHR model, about 21% or 8,668 acres within the Wildlife Analysis Area (41,388 NF acres) may be considered suitable great gray owl nesting habitat (4M, 4D, 5M, 5D and 6 within 300 yards of a meadow) (USDA Forest Service 2004) and about 13% or 5,563 acres may be considered suitable foraging habitat (meadows and open forested stands (CWHR S and P)). In the Freeman Wildlife Analysis Area, 2% or 829 acres of the above nesting habitat is composed of 5D (optimal), 2% or 1,000 acres is composed of 5M (optimal), 6% or 2,346 acres is composed of 4D and 11% or 4,493 acres is composed of 4M. Additionally in the Freeman Wildlife Analysis Area, 8% or 3,188 acres of the above foraging habitat is composed of meadow (optimal) and 6% or 2,375 acres is composed of other (sagebrush and CWHR S/P stands) (Table 3.51).

Changes to suitable habitat as a result of implementing fuels treatments as per action alternatives 1, 3 & 4 would occur where large structural components would be removed and canopy cover would be opened up to 40 - 50%, resulting in open canopied forested stands which are still considered suitable habitat based on canopy cover retention, but deemed unsuitable due to the removal of the needed understory structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 3.36). Canopy cover reductions are expected to occur with the removal of some trees ≤29.9 inches dbh. The combined impacts of mechanical thinning of the understory and achieving the desired conditions for DFPZ by opening up the overstory would result in creating more open forest from dense forest (D stands decreasing to M) (open up to around 40% canopy cover). Area thinning with biomass removal also creates more open, lesser quality owl habitat and thus is analyzed as decreasing to M. There may also be some additional risk associated with isolated torching events during prescribed fire removing trees, opening up the canopy and reducing nesting opportunities. Table 3.52 shows the above mentioned changes to great gray owl nesting habitat by alternative.

Table 3.52 Comparison of Action Alternatives 1, 3 & 4 on Great Gray Owl Nesting Habitat (4M, 4D, 5M, 5D) within the Wildlife Analysis Area

Nesting Habitat	Alternative 1 (PA) Acres			% (Alt. 1) Remaining in Wildlife Analysis Area	Alternative 3 Acres			% (Alt. 3) Remaining in Wildlife Analysis Area
	DFPZ	GS & Aspen ETZs	Area Thinning w/biomass		DFPZ	GS	Area Thinning w/biomass	
4M*	-419	-131	-242	82.4%	-465	-27	-240	83.7%
4D	-449	-114	-397	59.1%	-470	-31	-403	61.5%
5M*	0	-3	-37	96.0%	0	-2	-36	96.2%
5D	-23	-0	-2	97.0%	-23	0	0	97.2%
Total Nesting Change	**-891**	**-248**	**-678**	**79.0% retained (-21.0%)**	**-958**	**-60**	**-679**	**80.4% retained (-19.6%)**

Nesting Habitat	Alternative 4 Acres			% (Alt. 4) Remaining in Wildlife Analysis Area
	DFPZ	GS	Area Thinning w/biomass	
4M*	-525	-27	-266	81.8%
4D	-471	-37	-495	57.2%
5M*	0	-2	-36	96.2%
5D	-23	0	0	97.2%
Total Nesting Change	**-1,019**	**-66**	**-797**	**78.3% retained (-21.7%)**

* Reductions shown here are due to the removal of understory structural components leading to unsuitable nesting habitat.

Based on figures in Table 3.52, Alternative 1 reduces nesting habitat on 1,817 acres of 8,668 acres or 21%; Alternative 3 reduces nesting habitat on 1,697 acres of 8,668 acres or 19.6%; Alternative 4 reduces nesting habitat on 1,882 acres of 8,668 acres or 21.7%.

Indirect Effects

Group selection openings created within the same watersheds as the existing suitable habitat could provide additional foraging habitat. Project activities are not expected to result in indirect effects, nor are they expected to create conditions that would not allow for occupancy and establishment of a great gray owl territory around the suitable meadow habitat within the project area.

Cumulative Effects

Cumulative effects on the great gray owl are similar to those described for the California spotted owl on pages 219 – 224.

Cumulative effects on the great gray owl could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires and the firefighting practices (dozer lines, etc.) used by land managers to control them, have contributed and would continue to contribute to loss of habitat for this species.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to impact meadow vegetation thus potentially affecting prey species (voles and pocket gophers) abundance and availability due to the lack of suitable breeding, foraging and hiding cover.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should improve the meadow hydrology thus potentially improving great gray owl foraging habitat.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on great gray owls or great gray owl habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable goshawk nesting habitat and other important prey habitat attributes such as large trees, large snags and down woody material.

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by great gray owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting.

Cumulative Effects

The No-action Alternative for the Freeman Project would not provide for the long-term protection of great gray owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. The total acres of wildfire and acres of high intensity wildfire are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (2001). There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30”) trees that may provide future habitat availability.

Determination—Great Gray Owl

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the great gray owl. This determination is based on the following:

1. Minimal activity in preliminary PACs;
2. retention of 78.3% to 80.4% of existing suitable nesting habitat on National Forest Lands within the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4);
3. creation of a network of fuel reduction areas designed to reduce the loss of habitat due to wildfire.

3.5.7.7 Willow Flycatcher (*Empidonax trailii brewsteri*)

Affected Environment—Willow Flycatcher

The willow flycatcher (WIFL) (*Empidonax trailii*) is a Neotropical migrant that breeds in riparian and mesic upland thickets in the United States and southern Canada (AOU 1983). In California, it is a rare to locally uncommon summer resident in wet meadow and montane riparian habitats at 2,000 to 8,000 feet and a common spring (mid-May to early June) and fall (mid-August to early September) migrant at lower elevations, primarily in riparian habitats, throughout the state exclusive of the North Coast (Zeiner et al. 1990a). Most (88% of known sites) Sierra Nevada meadows used by breeding willow flycatchers occur between 4,000 to 8,000 feet (Green et al, 2003).

The southwestern WIFL (*E. t. extimus*) is a federally endangered species that occurs in southern California, north to the south fork of the Kern River. This sub-species does not occur in Plumas County. The other two subspecies that could occur within the project area are *E. t. brewsteri*, which occurs from Fresno County north, from the coast to the Sierra Nevada crest and *E. t. adastus* which occurs east of the Sierra/Cascade axis, from Oregon into Modoc County and possibly to northern Inyo County.

Wet meadows and willow shrubs appear to be the most common habitat, but other riparian deciduous shrubs along streams are also used. Habitat typically includes moist meadows with perennial streams and smaller spring fed or boggy areas with willow (*Salix spp.*) or alders (*Alnus spp.*). Willow flycatchers have also been found in riparian habitats of various types and sizes ranging from small lakes or ponds surrounded by willows with a fringe of meadow or grassland, to willow lined streams, grasslands or boggy areas.

Willow flycatchers forage by either aerially gleaning insects from trees, shrubs and herbaceous vegetation, or they hawk larger insects by waiting on exposed forage perches and capturing them in flight (Ettinger and King 1980, Sanders and Flett 1989). In Perazzo Meadow (Tahoe NF), willow flycatchers usually flew less than 3.3 feet from a perch when hawking (to pursue or attack on the wing) insects, but occasionally flew as far as 33 feet (Sanders and Flett 1989).

The presence of water during the breeding season appears to be an important habitat component (Fowler et al. 1991). All known breeding territories have water present in one of the following forms: running water, standing pools or saturated soils (Harris et al. 1988, Sanders and Flett 1989, Green et al, 2003). Water is not necessarily present during the later stages of the breeding cycle, but is always available during the early stages of breeding and pair formation. The minimum size meadow useable for willow flycatchers is assumed to be 0.62 acres (Fowler et al. 1991). Two Statewide surveys found most (more than 80%) willow flycatchers on meadows greater than 19.8 acres in size (Serena 1982, Harris et al. 1988). More than 95% of the breeding meadows are greater than 10 acres and most successful meadows (>1 territory fledged young) are greater than 15 acres (Green et al, 2003). The breeding season begins in late May to early June with adults and fledglings generally staying in the breeding areas through August. Nests are open cupped, usually 3.7 to 8.3 feet above the ground and mostly near the edge of deciduous, riparian shrub clumps (Sanders and Flett 1989, Valentine et al. 1988, Harris 1991). The selection of nest sites near water appears to be related to increased densities of aerial insects. Willow flycatcher nests are frequently parasitized by brown-headed cowbirds, although within the Sierra Nevada brood parasitism rates are low relative to other areas of the west (USDA Forest Service 2001). Neither nest disruption by livestock or brood parasitism by cowbirds appears to be a prevalent impact in the Sierra Nevada population of willow flycatchers (Green et al, 2003).

Most of the known breeding populations of these two subspecies in California occur in isolated mountain meadows of the Sierra Nevada (up to 8,000 foot elevation) (Serena 1982, Harris et al. 1988). Current estimates of the willow flycatcher population within the SNFPA FEIS planning area range from 300-400 individuals. Records compiled from National Forests, researchers, scientific literature and museum collections dating from 1910 to 2000 document 135 known locations within the SNFPA planning area boundary (USDA Forest Service 2001).

A few willow flycatcher territories occur in meadow and willow associated habitat areas scattered across the PNF. Nesting has been documented in Plumas-Eureka State Park and near Mabie. Most territories consist of single individuals or a pair. However, up to 4 territorial males were identified near Mabie along the Middle Fork of the Feather River (MFFR) near Delleker in 2002. Additional sightings of singing males on the Beckwourth RD occurred in the following areas: Chase (1999, 2005), Delleker (1990, 2001, 2002, 2003), Doyle Crossing (1998, 1999), West Doyle Crossing (2005), Mabie (2002, 2003, 2005), East Mabie (2002, 2003, 2005), East Portola (1998), Ramelli Ranch (1995), East Ramelli Ranch (2002, 2005), Grass Lake (1993, 2002, 2005), Gray Eagle Lodge (1994, 1997, 2002, 2003), McRae Meadow (1982, 1986, 1993, 1994, 2003), East Nelson Creek (2005) and Rocky Point (1998). Within the Wildlife Analysis Area there are approximately 574 acres of riparian habitat that could potentially provide nesting habitat capability for willow flycatchers.

One willow flycatcher site has been documented within the Wildlife Analysis Area. This site is located along Freeman creek. Surveys for willow flycatchers were conducted in portions of the Wildlife Analysis Area in 2005 to the protocol ("A Willow Flycatcher Survey Protocol for California, May 29, 2003" (Bombay, et. al.)) by Klamath Wildlife Resources. No willow flycatchers were detected during this survey effort (KWR 2005). In 2006 portions of the Wildlife Analysis Area were resurveyed for Range Allotment NEPA to protocol ("A Willow Flycatcher Survey Protocol for California, May 29, 2003" (Bombay, et. al.)) by Williams Wildland Consulting, Inc. Willow flycatchers were detected during this survey effort in the Wildlife Analysis Area along Freeman creek.

Environmental Consequences—Willow Flycatcher

Effects of the Action Alternatives

Direct and Indirect effects

Potential direct effects on the willow flycatcher may result from the modification of habitat or habitat components through aspen thinning (reduction of canopy cover and increased riparian plant growth). Thinning conifers in RHCAs would favor growth of riparian hardwoods and potentially benefit willow flycatchers. Disturbances associated with logging, temporary road building or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities. Implementing limited operating periods within occupied meadow habitats will reduce or completely eliminate potential disturbance impacts to this species from the Proposed Action.

There is one known willow flycatcher site and approximately 590 acres of suitable willow flycatcher habitat within the Wildlife Analysis Area. The only proposed treatment planned in or adjacent to willow flycatcher habitat in this area is aspen restoration which is expected to improve meadow hydrology. The known willow flycatcher sites located north of the Wildlife Analysis Area at Chase and south at Delleker/Mabie are not located in any watersheds where there would be any potential influences from project activities.

Cumulative Effects

Cumulative effects on the willow flycatcher could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to degrade riparian habitats through the browsing of aspen, willow, etc. thus potentially affecting the nesting suitability of the willow habitat for willow flycatchers.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should improve the meadow hydrology thus potentially improving willow flycatcher habitat.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct or indirect effects on willow flycatchers or willow flycatcher habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Cumulative Effects

Since there are no direct or indirect effects to willow flycatchers or their habitat, this project would not contribute to cumulative effects.

Determination—Willow Flycatcher

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the willow flycatchers.

3.5.7.8 Greater Sandhill Crane (*Grus canadensis labida*)

Affected Environment—Greater Sandhill Crane

The greater sandhill crane is found in medium to large wetlands and short grass valley bottoms. It requires marshes or grain fields near a shallow body of water used as a communal roost site; irrigated pastures, used as loaf (hang out) sites, are suitable habitat. The California Central Valley population nests from British Columbia to northeastern California and winters in the Central Valley. A total of 276 greater sandhill cranes at 60 sites were recorded in California during a 1988 breeding pair survey, all in six counties in northeastern California and mostly within Modoc and Lassen Counties; 7 of the sites were in Plumas County. Of these 276 pairs, 5% were on lands administered by the National Forest System (Littlefield and Ivey, 1994). Current estimates are approximately 30 - 50 breeding pairs could occur on the Lassen and Modoc National Forests. The data from the 4 National Forests with greater sandhill crane shows that there were only 5 successful nesting attempts in 1997 and 6 in 1998 (USDA Forest Service 2001).

The greater sandhill crane occurs on the PNF during the summer breeding season and during migration. The majority of sightings within Plumas County consist of migrating flocks flying overhead in the spring and fall. In Plumas County, nesting cranes have been documented at several locations on private land in American Valley around Quincy, Indian Valley and Sierra Valley. The eastside of the Plumas has numerous meadows with suitable habitat and several sightings, but no documented nesting success. Cranes have also been documented in Red Clover Valley and around Lake Davis. No nesting attempts on PNF lands have been documented. Sandhill cranes have been observed foraging within the Wildlife Analysis Area (Nickerson, pers. obs.).

Environmental Consequences—Greater Sandhill Crane

Effects of the Action Alternatives

Direct and Indirect effects

There is suitable foraging habitat and potentially suitable nesting habitat within the Wildlife Analysis Area. However, direct habitat modification is not expected because sandhill cranes use wetland habitats that would not be treated. Disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities. Implementing limited operating periods within occupied meadow habitats or within ½ mile of nesting sites would reduce or completely eliminate potential disturbance impacts to this species from the Proposed Action.

There have been sandhill crane sightings within the Wildlife Analysis Area. Sandhill cranes also fly over the Wildlife Analysis Area during the annual migrations. The only proposed treatment planned in or adjacent to sandhill crane habitat in this area is aspen restoration which is expected to improve meadow hydrology thus improve potential nesting and foraging habitat.

Cumulative Effects

Cumulative effects on the sandhill cranes could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs are authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to impact meadow vegetation thus degrading potential nesting habitat and potentially affecting prey species abundance/availability due to the lack of suitable breeding, foraging and hiding cover.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should improve the meadow hydrology thus potentially improving sandhill crane habitat.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct or indirect effects on sandhill cranes or sandhill crane habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Cumulative Effects

Since there are no direct or indirect effects to sandhill cranes or their habitat, this project would not contribute to cumulative effects.

Determination—Greater Sandhill Crane

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the Greater sandhill crane.

3.5.7.9 Mesocarnivores (Medium-sized Carnivores)

Affected Environment—Mesocarnivores

Habitat requirements for forest carnivores can be found in California WHR (Zeiner et al, 1990), habitat capability models (Freel, 1991) and in Ruggerio et al (1994). Habitat requirements and risks are further described within the SNFPA.

The PNF has mapped a draft forest carnivore network that consists of scattered known marten sightings, large habitat management areas and wide dispersal or connecting corridors. The intent of the network is to provide a continuously connected system of habitats focused on the needs of marten and fisher. This corridor is designed to provide a habitat connectivity corridor linking the Tahoe NF with the Lassen NF. The Plumas draft forest carnivore network is comprised of four components:

1. the riparian zone;
2. old-forest habitat, including California spotted owl PACs and SOHAs, Northern goshawk PACs;
3. connectors, such as Special Interest Areas, Bucks Lake Wilderness, Wild & Scenic River;
4. and known marten sightings.

Much of the draft forest carnivore network is in areas reserved from harvest for other reasons (e.g., Lakes Basin, Bucks Lake Wilderness). However, there is a need for corridors between these reserves that allow immigration and emigration to maintain healthy populations. Approximately 10,923 acres of the draft forest carnivore network (4.0%) are within the Wildlife Analysis Area (Figure 3.6).

The SNFPA Standards and Guidelines for mesocarnivore habitat do not speak to carnivore networks, allowing each Forest to decide on the management need for the network. The PNF network is not incorporated into its PNF LRMP as a land allocation with standards & guidelines; it is a “plan to project” analysis tool designed to maintain future options. The network is used as a tool to evaluate impacts of specific projects on habitat connectivity. The Sierra Nevada Ecosystem Project (SNEP Report) (University of California, Davis 1996) ranked areas for their contribution to old growth function (LS/OG), with 0 contributing the least and 5 contributing the greatest. There are no areas with high (4 and 5s) LSOG ranking within the proposed project area.

Approximately 50% of the PNF has been systematically surveyed, by the Pacific Southwest Research Station (PSW), District Biologists/Wildlife Technicians and contractors, to protocol (“American Marten, Fisher, Lynx and Wolverine: Survey Methods for Their Detection” (Zielinski and Kucera 1995)) for mesocarnivores using track plates and camera stations (Plumas GIS database). To date, there have been no fisher, Sierra Nevada red fox or California wolverine detections associated with these surveys. On the PNF, all but about 5 sightings of marten occur within two areas: the Lakes Basin-Haskell Peak area or around Little Grass Valley Reservoir. All of these 5 sightings outside of the two areas are unverified reports (verified report consists of photograph, tracks, hair sample, sighting by reputable biologist).

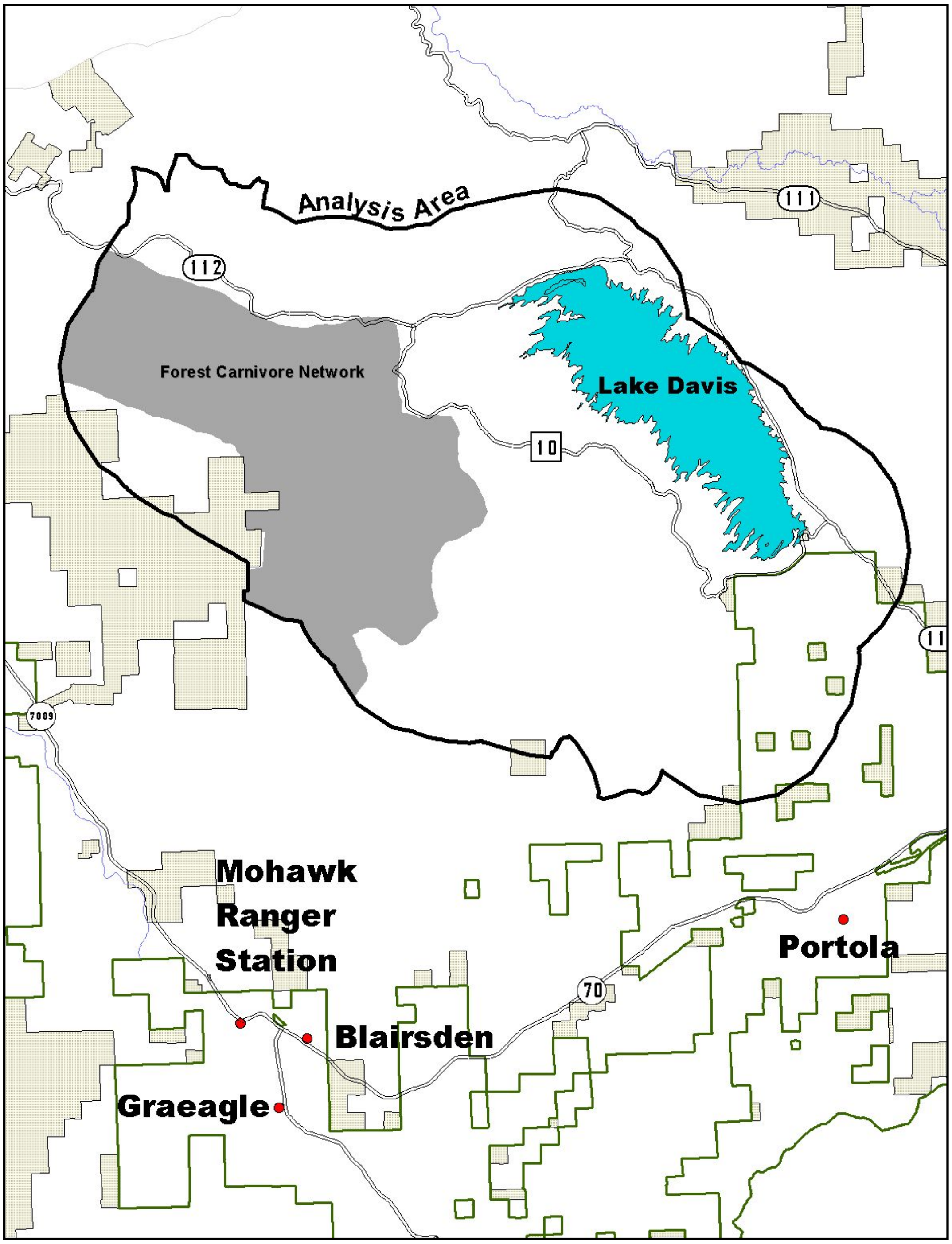

Figure 3.6 Freeman Wildlife Analysis Area with Draft Forest Carnivore Network (solid color).

The Freeman Wildlife Analysis Area has been surveyed several times over the years for mesocarnivores using both camera stations and track plates as detailed in Zielinski and Kucera (1995). This includes survey efforts by USFS crews in 1994, contractor surveyors Garcia and Associates in 2002 and contractor surveyors Arroyo Chico Resources in 2004. To date no target mesocarnivores have been detected in the Wildlife Analysis Area using these methods. The Freeman Wildlife Analysis Area was surveyed to protocol ("American Marten, Fisher, Lynx and

Wolverine: Survey Methods for Their Detection" (Zielinski and Kucera 1995)) using baited photo stations, from January 18th to March 7th, 2005, by contractor Mathews and Associates. Thirty-two camera stations were monitored for a total of 1,309 survey days. No target mesocarnivores were found (Mathews 2005).

Open roads and improperly closed roads adversely affect mesocarnivores by:

1. allowing access to areas and causing disturbance to these animals from human intrusion and removal of snags and downed logs through wood gathering activities;
2. increasing vehicle/animal encounters resulting in roadkill;
3. potentially fragmenting habitat and affecting the ability of animals to use otherwise suitable habitat on opposing sides of the road (Duncan Furbearer Interagency Workgroup 1989).

There may be a threshold value for road density (miles of open road per square mile) above which the habitat cannot sustain certain wildlife species but studies specifically addressing these effects on marten or fisher have not yet been addressed (USDA Forest Service 2001). Early habitat models (Freel, 1991) indicated that to provide high habitat capability for marten, open road densities should be less than 1mile/square mile, while 1-2 miles/square mile provided moderate habitat capability; more than 2 miles was providing low-no habitat capability. Models indicate that open road densities should be less for fisher. The current road density within the Wildlife Analysis Area is approximately 2.9 miles of open road per square mile. The action alternatives call for the decommissioning of 7.9 miles of existing system road and 1.9 miles of non-system road, as well as closing 1.1 miles of existing system roads. The action alternatives also call for the relocation of 0.3 miles of existing system road and 0.7 miles of existing system road reduced to single track. Two miles of new temporary road would be constructed, all of which would be closed at project completion and 15 miles of existing road would be reconstructed.

Forest carnivores use snags and down wood for cover and denning as well as foraging. One of the objectives of the action alternatives is to reduce fuel loading. High densities of snags and down logs are unfavorable for fuels management. However, snags and logs are important habitat elements for forest carnivores and their prey. Larger snags and logs provide more habitats per piece and last longer (Ruggiero et al 1994). The SNFPA FSEIS ROD provides guidelines which call for the retention of between three and six snags per acre over 15" dbh and maintaining between three large down logs per acre (eastside) or 10-15 tons of large downed woody material per acre (westside).

3.5.7.10 Pacific Fisher (*Martes pennanti pacifica*)

Affected Environment—Pacific Fisher

The USFWS completed an initial 90-day review of a petition submitted by 20 groups seeking to list the pacific fisher as endangered in Washington, Oregon and California. After reviewing the best available scientific information, the USFWS found that substantial information indicated that listing the pacific fisher as endangered in its West Coast range may be warranted (USFWS news release July 10, 2003). After a 12-month status review, the West Coast population of the fisher is designated as a candidate species by USFWS (Federal Register April 8, 2004 Volume 69, #68), but listing under the Endangered Species Act is precluded by other, higher priority listing actions.

In the Pacific States, fishers were historically more likely to be found in low to mid-elevation forests up to 8,200 feet (Ibid). In the southern Sierra Nevada, pacific fisher most often occur at elevations between 4000-8000 feet (Freel 1991, USDA Forest Service 2004). The current distribution of fisher within California suggests that the once continuous distribution is now apparently fragmented into two areas separated by a distance that greatly exceeds reported fisher dispersal ability. Methodologies used to detect fisher in numerous survey efforts have failed to detect this species in an area between Mt. Shasta and Yosemite National Park (Zielinski et al, 1995). These authors strongly suggest that the absence of fisher detections within this large 240-mile area is because they do not occur in the areas surveyed. This gap in distribution may be effectively isolating the southern Sierra Nevada population from the rest of the fisher range in Northern California. Since 1990 there have been no detections or confirmed sightings of fisher within this 240 mile gap of the Sierra Nevada (Note: gap is identified as 240 miles in SNFPA FEIS 2001, 260 miles in Federal Register 2004). The Freeman Project area is located within this "gap".

Reintroduction of fisher to the central and northern Sierra has been proposed and has strong support in the scientific and research community. The Pacific Southwest Region Forest Service supports reintroduction and will actively pursue partnerships in this effort as a feature of the SNFPA management strategy (USDA Forest Service 2004).

The loss of structurally complex forest and the loss and fragmentation of suitable habitat by roads and residential development has likely played a significant role in both the loss of fishers from the central and northern Sierra Nevada and its failure to recolonize these areas (USDA Forest Service 2001). Elimination of late-successional forest from large portions of the Sierra Nevada and Pacific Northwest has probably significantly diminished the fisher’s historical range on the west coast (Fed Register, 2004). Additional factors identified in the range reduction of fisher include a combination of legal trapping in the first half of the 20th century and occasional incidental trapping since 1954, timber harvest and associated road building, development of trans-Sierran highways, increased recreational use of the Sierra Nevada and porcupine poisoning campaigns conducted during the 1950’s and 1960s (Lamberson, et al. unpublished report 2000).

The only two verified (verified = trapped animal, photo, track or sighting by reliable observer) fisher observations on the PNF are from 1940's trapping records. One was from the central portion of the Forest and the other on the eastside. Four unconfirmed reports of fisher were located within the central portion of the forest (Rotta 1999). A 1995 fisher detection in Plumas County is identified in The Federal Register (2004).

There have been no good population estimates for fisher in California, Oregon and Washington, so it is unknown precisely how many fishers exist but indications are that the likely extant fisher populations are small (Ibid). Lamberson et al (unpublished report 2000) states that the Sierra Nevada fisher population is “likely to be no less than 100 and probably no more than 500 individuals”.

The 2004 SNFPA FSEIS ROD identifies large trees, large snags, large down wood and higher than average canopy closure as habitat attributes important to fisher. CWHR types 4M, 4D, 5M, 5D and 6 are identified as being important to fisher. A vegetated understory and large woody debris appear to be important for their prey species. Preferred fisher forest types include montane hardwood conifer, mixed conifer, Douglas fir, redwood, montane riparian, Jeffrey pine, ponderosa pine, lodgepole pine, subalpine conifer, aspen, eastside pine and possibly red fir. The higher elevation forests are less suitable for fishers because of the deep snowpacks (USDI Fish and Wildlife Service 2004). Table 3.53 displays the acres of suitable fisher habitat present in the Wildlife Analysis Area.

Table 3.53 Acres of Suitable Fisher Habitat on National Forest Land within Wildlife Analysis Area

SPECIES	CWHR Type*	Wildlife Analysis Area (Acres)
Fisher	4D, 5D, 6	9,077
	4M, 5M	15,913
Total		**24,990**

*4=small 11-24” dbh, 5=medium/large >24” dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, EPN=Eastside Pine, JPN=Jeffrey Pine, LPN=Lodgepole Pine, MHC=Montane Hardwood-Conifer, PPN=Ponderosa Pine, RFR=Red Fir, SMC=Sierran Mixed Conifer, WFR = White Fir. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.

The physical structure of the forest and prey associated with forest structures are thought to be the critical features that explain fisher habitat use. Powell (Fed. Register 2004) states that forest type is probably not as important to fishers as the vegetative and structural aspects and fishers may select forests that have low and closed canopies. Numerous studies, as referenced in the 2004 SNFPA FSEIS, indicate that canopy closure over 60% is important and fishers preferentially select home ranges to include high proportions of dense forested habitat. The fisher’s need for overhead cover is very well documented in the April 8, 2004, Federal Register. Fishers select stands with dense canopy cover which provides security cover from predators, increases snow interception, lowers the energetic costs of traveling between foraging sites and preferred prey species may be more abundant and vulnerable in areas of higher canopy closure (Ibid). A number of studies have shown that fishers avoid areas with little forest cover or significant human disturbance and prefer large areas of contiguous interior forest (Ibid).

Rest site structures used by fishers include: cavities in live trees, snags, hollow logs, fallen trees, canopies of live trees, broken top trees, platforms formed by mistletoe or large and deformed branches. Trees used for resting were among the largest diameter trees available, including conifers, snags and hardwoods. Standing trees (live and dead) were the most common resting structures, with black oak the most frequent species used in a Sierra study (Zielinski, et al, 2004). Most den sites are found in live trees. Of 19 tree den sites documented in California, the average diameter was 45-inch dbh for conifers and 25-inch dbh for hardwoods (April 8, 2004 Federal Register).

Fishers in the Pacific States appear to be dietary generalists and may be flexible in their requirements for foraging habitat (Ibid). Stands supporting a complex of down woody material including large down logs and multi-layered vegetative cover are important in foraging habitat. This high structural diversity is associated with prey species richness and abundance. Shrubs also provide food (fruits and berries) for both prey and for fishers. Fishers can be found where the shrub cover is 40-60%, but fishers can also avoid areas with too much low shrub cover because it may adversely affect the hunting success of fishers (Ibid).

Habitat fragmentation has contributed to the decline of fisher populations because they have limited dispersal distances and are reluctant to cross open areas to re-colonize historical habitat (Ibid). There is no evidence that fishers are successfully dispersing outside known population areas in California and Oregon. This is possibly due to the extent of habitat fragmentation, developed or disturbed landscapes and highways/interstate corridors (Ibid). Based on studies of home range sizes, estimates of potentially suitable and contiguous habitat that must be present before an area can sustain a population of fishers range from 31,600 acres in California, 39,780 acres in the northeastern United States and 64,000 acres in British Columbia (April 8, 2004 Federal Register). These same studies also showed a positive association between fisher presence and forest stand area, detecting fishers more frequently in stands over 247 acres and in stands 126 to 247 acres than in smaller stands (Ibid).

Numerous and heavily traveled roads are not desirable in order to avoid habitat disruption and/or animal mortality. Roads may decrease prey and food availability for fisher (Allen 1987) due to decreases in prey populations resulting from road kills and/or behavioral barriers to movement. The access provided to forested areas by roads leads to increased human disturbances from resource use and extractive activities resulting in an overall degradation of habitat.

3.5.7.11 American Marten (*Martes americana*)

The PNF LRMP requires that the Forest monitor changes in habitat capability and distribution of martens. Sightings will be reported, distribution will be monitored through sighting information, surveys and incidental sightings of animals and sign. Sightings will be reported annually (PNF LRMP Chapter 5, page 5-10).

Affected Environment—American Marten

The distribution of American marten, a mature-forest specialist, has substantially changed since the early 1900’s and this distribution appears to have decreased in the northern Sierra Nevada and southern Cascade region and populations appear to be discontinuous. Comparing the historical and contemporary locations centered on Plumas County indicate large gaps between detections that were not present historically. Zielinski points out that these gaps are largely areas composed of National Forests that have received more impacts from humans, including timber harvest, road building and – until the mid-1950’s – trapping. The reduction in marten distribution is probably more closely linked to the influence of timber harvest and forest management during the historical and the contemporary periods. Based on Zielinski (2005), trends in marten detections in Plumas County and by inference PNF, from the early 1900's to the late 1900's are downward, primarily due to relatively small amounts of late seral/old-growth forest attributes.

In the Sierra Nevada, marten are most often found above 7,200 feet, but the species core elevation range is from 5,500 to 10,000 feet (USDA Forest Service 2001). Martens prefer coniferous forest habitat with large diameter trees and snags, large down logs, moderate-to-high canopy closure and interspersion of riparian areas and meadows (USDA Forest Service 2001). Martens generally avoid habitats that lack overhead cover; they select stands with 40% canopy closure for both resting and foraging and usually avoid stands with less than 30% canopy closure (Ibid). Foraging areas are generally in close proximity to both dense riparian corridors (used as travel ways), forest meadow edges and include an interspersion of small (<1 acre) openings with good ground cover used for foraging (Ibid).

Important forest types include mature mesic forests of red fir, mixed conifer-fir, lodgepole pine, Jeffrey pine and eastside pine (USDA Forest Service 2001). CWHR types 4M, 4D, 5M, 5D and 6 are identified as moderately to highly important for the marten (Ibid). The red fir zone forms the core of marten occurrence in the Sierra Nevada (Ibid). Table 3.54 displays the acres of habitat present in the Wildlife Analysis Area.

Table 3.54 Acres of Suitable Marten Habitat on National Forest Land within Wildlife Analysis Area

Species	CWHR Types*	Wildlife Analysis Area (Acres)
Marten	4D, 5D, 6	9,077
	4M, 5M	15,749
Total		**24,826**

*4=small 11-24" dbh, 5=medium/large >24" dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, EPN=Eastside Pine, JPN=Jeffrey Pine, LPN=Lodgepole Pine, RFR=Red Fir, SMC=Sierran Mixed Conifer, WFR = White Fir. CWHR size class 6 was lumped into CWHR 5D due to small amount of this type present in Wildlife Analysis Area.

Small openings and regenerating stands (including plantations) are used by marten as foraging habitat (Ibid). These openings are of optimum value when they occupy a small percent of the landscape and occur adjacent to mature forest stands (CWHR 4D, 5M, 5D and 6). Small openings within a forested matrix may be more conducive to marten populations than large contiguous openings (Ibid).

Numerous and heavily traveled roads are not desirable in order to avoid habitat disruption and/or animal mortality. Roads may decrease prey and food availability for marten as well as fisher (Allen 1987) due to prey population decreases resulting from road kills and/or behavioral barriers to movement.

There are over 40 records of marten observations/detections on the PNF dating back to 1975. One of these observations/detections was up on Grizzly Ridge near Brady's Camp within 4.75 miles of the Wildlife Analysis Area (unverified detection), but as mentioned, subsequent survey efforts on Grizzly Ridge have failed to detect the presence of marten. Numerous surveys conducted within the Wildlife Analysis Area beginning in 1994 have not detected the presence of marten. Extensive surveys using both soot covered track plates and baited photo stations have been conducted since the early-90s across the majority of the Beckwourth District landscape with marten only having been found in the Lakes Basin area, approximately 9.5 miles south of the Wildlife Analysis Area (documented survey results on file). Based on surveys conducted within and adjacent to the Wildlife Analysis Area over the last 8 years that have not detected marten, it is suspected that marten are not present in the Wildlife Analysis Area.

3.5.7.12 Sierra Nevada Red Fox (*Vulpes vulpes necator*)

Affected Environment—Sierra Nevada Red Fox

Sierra Nevada red fox inhabit forested areas interspersed with riparian and meadow habitat and brush fields. Preferred forest types include red fir, lodgepole pine and sub alpine fir in the higher elevations of the Sierra Nevada (Schempf and White 1977). In the northern Sierra Nevada, most records occur in fir and mixed conifer types, with a large number of sightings also in pine and lodgepole. In the southern Sierra, most sightings were in mixed conifer forests, although lodgepole pine and fir were also important (Schempf and White 1977).

Sierra Nevada red fox are found between 4,000 and 12,000 feet in elevation but are seldom seen below 5,000 feet and are most often found above 7,000 feet, (USDA Forest Service 2001) inhabiting the Hudsonian and Canadian life zones (Schempf and White 1977). They move seasonally from the higher elevations in the winter to mid-elevation forests during the summer. This species historically occurred at low densities, averaging perhaps one per square mile and it is unlikely that it was ever common (USDA Forest Service 2001).

Sierra Nevada red fox may be more tolerant of openings than either marten or fisher, as they would hunt in open areas. Predator avoidance in the open may not be a problem for this native fox (Duncan Furbearer Interagency Working Group 1989). Opportunistic hunters, their diet is omnivorous over most of the year, but meat is the most prevalent food in winter (Schempf and White 1977).

As of 1977, Sierra Nevada red fox populations were thought to be maintaining themselves at a low level or perhaps declining (Schempf and White 1977). There is little information presently available to either justify or counter that assumption. There are very few recent sightings (1980-2001) of this species within its current range. A red fox was photographed near the Bogard Station on the Eagle Lake RD of the Lassen NF in the early 1990's. The most recent California locations center on Lassen National Park and the Lassen NF. Almanor RD personnel followed two foxes with radio collars in 1998/1999. This revealed that these individual foxes had very large home ranges, that they stayed above 5000 feet, regardless of snow depths (up to 18 feet) and that these individuals did not cross paths often. A third fox was identified within this study area (Rickman, personal comm. 1998). A total of 5 collared foxes have been followed with this Lassen study (Williams, personal comm. 2002), but data is not yet available on findings. In addition to these detections, red foxes have been photographed during winter in recent years on the Lassen NF, primarily south of highway 44 and west of county road A-21 near the Caribou Wilderness area. All of these detections are within the historic range of the species, but there is no way to determine if these detections are of actual indigenous Sierra Nevada red foxes or dispersing introduced red foxes wandering up from the Central Valley. This species has not been verified on the PNF.

3.5.7.13 California Wolverine (*Gulo gulo luteus*)

Affected Environment—California Wolverine

The USFWS completed an initial 90-day review of a petition submitted by 6 organizations seeking to list the wolverine in the contiguous United States as threatened or endangered under the Endangered Species Act of 1973, as amended. After reviewing the best available scientific information, the USFWS found that there was not substantial scientific or commercial information indicating that listing the wolverine as endangered may be warranted (USFWS news release October 21, 2003 and Federal Register Vol. 68, No. 203, October 21, 2003). The USFWS will not be initiating any further status review in response to this petition.

The wolverine is considered a scarce resident of California. Its historic habitat is distributed from Del Norte and Trinity counties east through Siskiyou and Shasta Counties and south through the Sierra Nevada to Tulare County (Zeiner et al. 1990). Most sightings in the North Coast mountains fall within the 1600 to 4800 ft. elevational range. In the northern Sierra Nevada, most sightings fall between 4300 to 7300 ft. and in the southern Sierra Nevada, from 6400 to 10,800 ft. (Zeiner et al. 1990).

In the North Coast region, wolverines have been observed in Douglas fir and mixed conifer habitats and probably also use red fir, lodgepole, wet meadow and montane riparian habitats (Schempf and White 1977, Zeiner et al. 1990). Habitats used in the northern Sierra Nevada include mixed conifer, red fir and lodgepole pine. The species probably also uses subalpine conifer, alpine dwarf-shrub, wet meadows and montane riparian (White and Barrett 1979, Zeiner et al. 1990). In the southern Sierra Nevada, habitat preference includes lodgepole pine, red fir, mixed conifer, subalpine conifer, alpine dwarf-shrub, barren and probably wet meadows, montane chaparral and Jeffrey pine (Zeiner et al. 1990).

Wolverines are wide ranging species with very large home ranges. Researchers have generally agreed that wolverine “habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations" (Ruggerio et al 1994). Wolverines are generally considered a solitary species, with adults apparently associating only during the breeding season (Butts 1992). Home ranges of opposite sexes overlap (Powell 1979, in Ruggiero 1994). However, partial overlap of home ranges of some wolverines of the same sex is common (Ruggiero et al. 1994). Studies indicate that home ranges in North America may vary from less than 38.6 square miles to over 347.5 square miles. Males have larger territories than females. Individuals may move great distances on a daily basis; 15 to 30 miles a day is common for males and some individuals have moved 60 to 70 miles in a single day. Except for females providing for offspring, or males seeking mates, movement is generally motivated by food (Ruggiero et al. 1994). Although wolverines are primarily nocturnal, diurnal movement is often recorded. During summer, long distance movements appear to be restricted to night when temperatures are cooler (Hornocker and Hash 1981).

Forest cover may be an important habitat requirement but they "are found in a variety of habitats and do not appear to shun open areas..." (Ibid 1994). Hornocker and Hash (1981) indicated that wolverines may be reluctant to cross openings, i.e.: clearcuts, burned areas, meadows but also noted that wolverines "occasionally crossed clearcuts...usually crossed in straight lines and at a running gait...,". These researchers also noted that "...no difference in movements, habitat use, or behavior was noted between wolverines occupying the half of the area that was logged and the half that was not." Winter cover is not as critical for wolverines as for marten and fishers because they move down in elevation following prey. Wolverines are solitary animals that avoid human contact and are rarely seen. Management actions such as roads, recreational activities, mineral extractions and other activities that decrease wild, isolated refugia, continue to threaten wolverine habitat, as well as disrupt habitat use patterns within an individual's home range.

The current wolverine range in California is unknown, largely because it has been over 50 years since verifiable evidence has been collected in California (USDA Forest Service 2001). Despite systematic attempts to detect wolverines, no empirical evidence was obtained that wolverines were present in sampled habitats. Occasional sightings by reliable observers continue to be reported statewide. Most "sightings" within the Tahoe/Plumas/Lassen NF’s are unverified. The majority of sightings on the Plumas NF occur in the Lakes Basin area. Incidental sightings of wolverines have been reported on the Tahoe National Forest. Schempf and White (1977) reported three recorded sightings in the Weber Lake area of Sierra County. Sightings on the Downieville District adjacent to or within the Lakes Basin area include: one in 1989 in the Haskell Peak area, one in 1990 in the Upper Sardine Lake area, one in 1993 along the Gold Lake Road and Salmon Lakes Road area and one in 1998 near Basset's Station. All of these Downieville Ranger District sightings have the potential to be within the home range of a single individual. A sighting, which occurred in 1994 on the Sierraville Ranger District, Tahoe NF, was located in sagebrush/eastside pine habitat near Sierra Valley (Youngblood, 1994 pers. comm. w/ Wilson). A sighting of an adult male wolverine (Hopkins, 1993), which occurred in November of 1993 on the Lassen NF, was located in late seral old growth mixed conifer adjacent to a large opening.

The Freeman Wildlife Analysis Area is well roaded, has been logged in the last 50 years, receives a high degree of human use and essentially does not provide “sparsely inhabited wilderness”. There have been no sighting reports of wolverine within or near the Wildlife Analysis Area.

Environmental Consequences—Mesocarnivores

Effects of the Action Alternatives

Direct Effects

A population is defined as a group of individuals of the same species occupying a defined area at the same time (Hunter, 1996). Regarding Sierra Nevada Red Fox, wolverine and possibly the fisher, all of which have very large home ranges, the PNF would probably contribute to the population within the Sierra Nevada mountain range, if individuals were found on the Forest. Numerous systematic surveys using various accepted methodologies, spatially conducted over 50% of the PNF since the mid 1980's, indicate that the Plumas does not now contribute to the Sierra Nevada populations of these three forest carnivores; they are either non-existent or in such small numbers that the known detection methodologies are inadequate to determine presence. A small population of marten exists on the Plumas, located within the Lakes Basin area on the Plumas/Tahoe NF border. Martens have not been detected anywhere else on the Plumas for 10 years. Based on known detections of marten on the PNF, no changes in marten occupancy or distribution on the PNF would occur as a result of the Freeman Project.

Potential direct effects on these carnivores from vegetation management activities consist of modification or loss of habitat or habitat components, especially in regards to denning/resting habitat and foraging/travel habitat. Additional direct effects are possible behavioral disturbance to denning from logging, road-building or other associated activities (refer to HFQLGFRA BA/BE).

Changes to suitable habitat as a result of implementing fuels treatments as per action alternatives 1, 3 & 4 would occur where large structural components would be removed and canopy cover would be opened up to 40 - 50%, resulting in open canopied forested stands which are still considered suitable habitat based on canopy cover retention, but deemed unsuitable due to the removal of the needed understory structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 3.36). The combined impacts of mechanical thinning of the understory and achieving the desired conditions for DFPZ by opening up the overstory would result in creating more open forest from dense forest (D stands decreasing to M) (open up to around 40% canopy cover). Area thinning with biomass removal also creates more open, lesser quality forest carnivore habitat and thus is analyzed as decreasing to M. There may also be some additional risk associated with isolated torching events during prescribed fire removing trees, opening up the canopy and reducing denning/resting opportunities.

Based on the vegetation layer, about 22% or 9,077 acres within the Wildlife Analysis Area (41,388 NF acres) may be considered suitable denning habitat for fisher (4D, 5D and 6) and about 38% or 15,913 acres may be considered suitable foraging habitat (4M and 5M) (Table 3.53). About 22% or 9,077 acres within Wildlife Analysis Area (41,388 NF acres) may be considered suitable denning and resting habitat for marten (4D, 5D and 6) and about 38% or 15,749 acres may be considered suitable foraging habitat (4M and 5M) (Table 3.54).

For fisher and marten habitat, based on figures in Tables 3.55 and 3.56, Alternative 1 reduces 4D and 5D (denning habitat) on 1,261 acres of 9,077 acres, reduces 4M and 5M (foraging habitat) quality on 1,745 acres of 15,749 to 15,913 acres; Alternative 3 reduces 4D and 5D habitat on 1,201 acres of 9,077 acres and reduces 4M and 5M quality on 1,652 acres of 15,749 to 15,913 acres; Alternative 4 reduces 4D and 5D quality on 1,549 acres of 9,077 acres and reduces 4M and 5M quality on 1,867 acres of 15,749 to 15,913 acres. Projected activities within red fir habitat (habitats proposed for entries are Red Fir 2S, 3P, 3M, 3D, 4S, 4M and 5D) indicate the following:

- Alternative 1: up to 14 acres in group selection, 3 acres of aspen extended treatment zones (ETZs), 369 acres of DFPZ and 133 acres of Area Thinning with biomass removal
- Alternative 3: up to 14 acres in group selection, 369 acres of DFPZ and 133 acres area thin treatments with biomass removal
- Alternative 4: up to 14 acres group selection, 367 acres of DFPZ and 110 acres area thin treatments with biomass removal

Retention of conifer trees >30” dbh and retention of all hardwoods would provide structural attributes selected by fisher for denning and resting sites. Down woody debris would be retained at 10-15 tons/acre in the largest logs. Snags would be retained at three to six snags per acre. Adjacent to meadows, scattered conifers would be retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the meadow; mistletoe brooms higher than 20’ from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc.

The Plumas draft forest carnivore network is within the western portion of the Wildlife Analysis Area, running southeast to northwest along Grizzly Ridge and is composed primarily of white fir and red fir habitat. This section of the network provides connectivity from the Lakes Basin and Middle Fork of the Feather River to the south and connects with the Mt. Jura area to the northwest. This draft forest carnivore network was designed to allow for unimpeded corridors for travel between home ranges and for habitat/population connectivity between the Tahoe NF and the Lassen NF. Approximately 10,923 acres of the 275,000 acre draft forest carnivore network are present in the Wildlife Analysis Area. Of the 10,923 acres of draft forest carnivore network present in the Wildlife Analysis Area approximately 7,365 acres may be considered suitable fisher and marten habitat. Table 3.55 displays projected changes to CWHR types within draft forest carnivore network in the Wildlife Analysis Area.

Table 3.55 Comparison of Action Alternatives 1, 3 & 4 on Pacific Fisher and American Marten Suitable Habitat (4M, 4D, 5M, 5D) within the Draft Forest Carnivore Network in the Wildlife Analysis Area.

Suitable Habitat	Alternative 1 (PA) Acres				% (Alt. 1) Remaining within the Draft Forest Carnivore Network (7,364 acres) in the Wildlife Analysis Area	Alternative 3 Acres				% (Alt. 3) Remaining within the Draft Forest Carnivore Network (7,364 acres) in the Wildlife Analysis Area
	DFPZ	GS/ ETZs	AT w/Biomass	Total		DFPZ	GS	AT w/ Biomass	Total	
4M	-133	-69	-113	-315	95.7%	-151	-24	-115	-290	96.1%
4D	-57	-30	-97	-184	97.5%	-60	-18	-103	-181	97.5%
5M	-38	-6	-40	-84	98.9%	-38	-5	-40	-83	98.9%
5D	-129	-9	0	-138	98.1%	-129	-9	0	-138	98.1%
Total Change	**-357**	**-114**	**-250**	**-721**	**90.2%**	**-378**	**-56**	**-258**	**-692**	**90.6%**

Suitable Habitat	Alternative 4 Acres				% (Alt. 4) Remaining within the Draft Forest Carnivore Network (7,364 acres) in the Wildlife Analysis Area
	DFPZ	GS	AT w/ Biomass	Total	
4M	-207	-24	-115	-346	95.3%
4D	-84	-8	-103	-195	97.4%
5M	-57	-5	-40	-102	98.6%
5D	-229	-9	-16	-254	96.6%
Total Change	**-577**	**-46**	**-274**	**-897**	**87.8%**

Based on figures in Table 3.55, it is estimated that with Alternative 1, 114 acres of group selection and aspen extended treatment zones (ETZs) acres would create gaps within 4M, 4D, 5M, 5D forested stands within the draft forest carnivore network, with the maximum size of group selection gaps being two acres. It is estimated that approximately 357 acres of DFPZ and 250 acres of Area Thinning with biomass removal would occur within 4M, 4D, 5M forested stands within the draft forest carnivore network. With Alternative 3, 56 acres of group selection acres would create gaps within 4M, 4D, 5M, 5D forested stands within the draft forest carnivore network. It is estimated that approximately 378 acres of DFPZ and 258 acres of area thin treatments with biomass removal would occur within 4M, 4D, 5M forested stands within the draft forest carnivore network. With Alternative 4, 46 acres of group selection acres would create gaps within 4M, 4D, 5M, 5D forested stands within the draft forest carnivore network. It is estimated that approximately 577 acres of DFPZ and 274 acres of area thin treatments with biomass removal would occur within 4M, 4D, 5M, 5D forested stands within the draft forest carnivore network. Thus a total of 692-897 acres of the 7,365 acres of suitable habitat within the draft forest carnivore network in the Wildlife Analysis Area would be treated under Alternatives 1, 3 and 4. Table 3.26 indicates a higher risk to maintaining forest interior habitat between group selection openings and ETZs (Alternative 1) with Alternative 1 than with Alternatives 3 & 4.

Zielinski et al. (2004) reported that fisher used large trees, large conifer snags and large hardwoods supporting cavities or platforms for rest sites and suggested that fishers require multiple resting structures distributed throughout their home ranges. Zieleinski et al. suggested that “managers can maintain resting habitat for fishers by favoring the retention of large trees and the recruitment of trees that achieve the largest sizes”. With all action alternatives no trees over 30” dbh would be removed, four of the largest snags per acre would be maintained (except group selections), all hardwoods would be retained and adjacent to meadows, scattered conifers would be retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the meadow; mistletoe brooms higher than 20’ from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc. Leaving a few such trees in units would decrease the risk of deleterious effects to old-forest related wildlife over the Freeman Project area in the long term (Dunk 2005).

Indirect Effects

All alternatives propose to construct approximately 2 miles of temporary road, all of which would be closed post harvest and .3 miles of new system road construction which would relocate two small segments of roads outside of RHCAs. Thus there would be a very slight increase in habitat fragmentation with new road construction. In addition, 10 miles of existing road would be decommissioned and another 1 mile would be closed. All new temporary roads, as well as 11 miles of existing road, would be decommissioned to create conditions to allow for vegetation recovery and to reduce gaps created by road openings. This should also reduce human activities that often lead to decreased habitat capability for carnivores (snag and log removal thru woodcutting and disturbance). Open road density within the Wildlife Analysis Area would decline under all action alternatives from the existing approximately 2.9-miles/square mile to about 2.7-miles/square mile, which is still providing for low habitat capability for forest carnivores. As part of a strategic system of defensible fuel profile zones, this project would reduce the potential for high-severity wildfires, which could eliminate vast tracts of habitat for this species.

It is an unknown as to how some of the important prey species preferred by marten and fisher (small mammals, birds) would respond to group selection harvest units. The increased diversity and edges created by groups within forested stands may provide increased foraging opportunities for marten and fisher. Responses of prey species, including small mammals and passerine bird use of group openings and DFPZs is one of the main objectives of the administrative study conducted by PSW.

Cumulative Effects

Cumulative effects on the mesocarnivores are similar to those described for the California spotted owl on pages 219 – 224.

Cumulative effects on forest carnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires and the firefighting practices (dozer lines, etc.) used by land managers to control them, have contributed and would continue to contribute to loss of habitat for these species.

Table 3.56 provides a cumulative total on the amount of suitable fisher and marten habitat that has been impacted by the fuels treatments, group selection and area thinning projects implemented under HFQLG on the BKRD.

Table 3.56 Cumulative Change (Reduction) of Suitable Fisher and Marten Habitat (4M, 4D, 5M, 5D, 6) on Beckwourth RD

Project	**Red Clover DFPZ/GS**	**Dotta DFPZ/GS**	**Last Chance DFPZ/GS**	**Poison DFPZ/GS**	**Crystal-Adams DFPZ/GS****	**Humbug DFPZ**
	Alt. 3*	**Alt. 2***	**Alt. 4***	**Alt. 4***	**Alt. 1***	**Alt. 3***
Suitable Habitat	1,562 acres	0	549 acres	2 acres	814 acres	127 acres
Project	**Mabie DFPZ**	**HappyJack DFPZ/GS**	**Freeman DFPZ/GS**			
	Alt. 3*	**Alt. 4***	**Alt. 1**	**Alt. 3**	**Alt. 4**	**Potential Cumulative Change**
Suitable Habitat	375 acres	371 acres	1,261 acres	1,201 acres	1,549 acres	**5,001—5,349 acres**

*Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.

Based on Tables 3.56, the Freeman Project potentially contributes to a cumulative reduction in suitable fisher and marten habitat. It is uncertain as to what influence these various reductions in habitat would do to potential future fisher and marten activity and occupancy within the Wildlife Analysis Area. These cumulative reductions are not expected to increase any large scale, high contrast fragmentation above existing levels. Thus habitat connectivity is maintained across the Forest north to south from Middle Fork Feather River to Grizzly Ridge and on to Mt. Jura.

The greatest concern for pacific fishers in the Sierra Nevada range is the risk of further fragmentation due to large stand replacing fire (SNFPA FSEIS 2004, page 244). The design features of DFPZs retain habitat elements within the range of those used by fisher for foraging and dispersal such that they are not likely to create large barriers to further expansion and connectivity for fisher (Ibid, page 243). DFPZs are created to reduce the potential for large stand replacing fires.

The fisher does not appear to inhabit the HFQLG area and even if fisher were reintroduced into northern California, it would probably be several years after reintroduction before available habitats would become fully occupied (SNFPA FSEIS 2004, page 243). Based on the home range and stand size reported in the April 8, 2004 Federal Register, it appears as if the Freeman Wildlife Analysis Area supports large blocks of contiguous suitable habitat. Based on studies of home range sizes referenced in the above-mentioned Federal Register, estimates of potentially suitable and contiguous habitat that must be present before an area can sustain a population of fishers range from 31,600 acres in California, 39,780 acres in the northeastern United States and 64,000 acres in British Columbia. Based on the vegetation layer and GIS, it appears as if the Freeman Project falls short of this acreage figure under existing conditions, 26,882 acres of 4M, 4D, 5M, 5D habitats in the Wildlife Analysis Area. Thus the Freeman Project area may not support habitat attributes needed to contribute to the potential for recovery of the species in this area of the PNF.

Since no California wolverines or Sierra Nevada red fox are believed to exist in, or near, the Wildlife Analysis Area, no direct, indirect or cumulative impact are expected for the California wolverine and Sierra Nevada red fox.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on forest carnivore habitat, as no activities would occur that would cause disturbance to denning, resting, dispersing or foraging animals, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable forest carnivore habitat and other important prey habitat attributes such as large trees, large snags and down woody material.

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by marten, especially during the denning season, could cause disturbance that could disrupt and preclude successful denning.

Cumulative Effects

The No-action Alternative for the Freeman Project would not provide for the long-term protection of forest carnivore habitat from catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (2001). Large scale habitat fragmentation created as a result of wildfire could preclude the Freeman Wildlife Analysis Areas potential to contribute to fisher recovery.

Determination—Mesocarnivores

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for any of the Pacific fisher or American marten. This determination is based on the following:

1. retention of 82.9% to 86.8% of existing suitable denning habitat on National Forest within the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4);
2. retention of 87.8% to 90.6% of existing suitable habitat within the draft forest carnivore network in the 41,388 acre Wildlife Analysis Area (Alternatives 1, 3 & 4);
3. creation of a network of fuel reduction areas designed to reduce the loss of habitat due to wildfire.

It is also my determination that the Freeman Project will not affect the Sierra Nevada red fox or the California wolverine.

3.5.7.14 Pallid Bat (Antrozous pallidus)

Affected Environment—Pallid Bat

Pallid bats occur in a wide variety of habitats, including grasslands, shrublands and woodlands to mixed conifer forests (USDA Forest Service 2001). They are most abundant below 6000 feet elevation, but have been recorded up to 10,000 feet in the Sierra Nevada (Ibid). They are most common in open, dry habitats with rocky areas for roosting. They day roost in caves, crevices, mines and occasionally in hollow trees/snags, crevices in oaks and snags (Ibid). They prefer rocky outcrops, cliffs and crevices with access to open habitats for foraging. Philpott (1997) emphasizes the importance of oak woodlands for foraging. The SNFPA FEIS (2001) emphasizes the protection and enhancement of both westside foothill oaks and montane oaks to provide for pallid bats. The reduction of hardwoods, both from manual removal and competition from conifers, reduces foraging habitat for pallid bats, yet hardwood and hardwood-conifer stands that contain thick understory vegetation between ground level and eight feet prevents flight and hence use of the area for foraging (Ibid).

There is no indication that there has been a change in the range or distribution of the pallid bat (USDA Forest Service 2001). There are currently scattered records of Pallid Bat on the Plumas N.F. Bat surveys using mist nets at selected locations on the Plumas NF were conducted in June and September 1991 and again in July and August 1992. Habitats surveyed ranged from high and low elevation mixed conifer/red fir to eastside pine and sagebrush associations. The results of these survey efforts indicated the presence of at least 12 different bat species on the Forest. Two Pallid bats were detected along the Middle Fork Feather River near Portola (approx. 3.5 miles south of project area) and another bat was captured at Lowe Flat north of Antelope Lake (approx. 22 miles north of project area), both in 1992 (Lengas & Bumpus 1992, 1993). Pallid bats were found in surveys conducted in 1998 and 1999 at Frazier Creek with its confluence with Middle Fork Feather River which is approximately 7.5 miles south of the project area (PNF database). A dead pallid bat was collected from a home in Cromberg (approx. 5 miles southwest of the project area) where individuals had been roosting within the attic of a house. Bat surveys were conducted July-September 2001 for the Crystal-Adams DFPZ Project, located approximately 15 miles east of the project area. This survey established the presence of 16 species of bat; pallid bats were detected throughout the survey area through acoustic sampling, with one capture occurring in a landscape dominated by black oak, Jeffrey pine, sage and rock formations (Ecosystems West, Feb 2002). Bat surveys were conducted July-September 2001 for the Poison and Red Clover DFPZ Projects, located approximately 2.5 miles north of the project area. This survey established the presence of 14 species of bat; pallid bats were detected throughout the survey area through acoustic sampling (Ecosystems West, Feb 2002). Bat surveys were conducted July-September 2001 for the Last Chance DFPZ Project, located approximately 12.5 miles north of the project area. This survey established the presence of 16 species of bat; pallid bats were detected throughout the survey area through acoustic sampling with one pallid bat being captured via a mist-net (Ecosystems West, Feb 2002). The Mabie project, located south and west of Portola, CA, was surveyed July - September 2002 by Steve Holmes Forestry and acoustically detected one pallid bat. Then in the summer of 2002 a survey on the Feather River Ranger District in the Watdog project located lactating females.

The bat surveys conducted July-September 2001 for the Humbug project were located north of Portola, CA. The Humbug survey covered the southeastern portion of the Wildlife Analysis Area with two survey points falling within Freeman treatment areas. There were two acoustic detections and one mist net capture of pallid bats in the Humbug project area (Steve Holmes Forestry 2002). Thus it is assumed that pallid bats are present in the project area. No other areas within the Wildlife Analysis Area were surveyed for bats.

3.5.7.15 Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Affected Environment—Townsend’s Big-eared Bat

Townsend’s big-eared bats occupy a wide variety of habitats (older forest, desert, grasslands/plains, riparian, coastal). Roosting habitat requires caves, mines, abandoned human structures and rock crevices and water for drinking. They forage in a variety of habitats, including riparian areas, old forests and mixed hardwood-conifer forest. They feed primarily on flying insects, specializing in moths and it usually captures prey in flight, or by gleaning from foliage of brush or trees. The also feed along habitat edges. They prefer mesic (wet) habitats. They are usually found below 6000 feet but have been found up to 10,000 feet elevation.

Townsend's big-eared bats form maternity colonies of up to several hundred females. These colonies show a high degree of roost fidelity and, if undisturbed, colonies may occupy the same roost indefinitely (USDA Forest Service 2001). Its colonial nature places this bat at high risk with a single disturbance causing detrimental harm to potentially large populations (Philpott, 1997).

This species has suffered a substantial decline in population over the last 40 to 60 years, with approximately 52% of historical maternity roosts no longer occupied; 40% of these known sites had been destroyed or rendered unsuitable (USDA Forest Service 2001). They forage in a variety of open habitats as well as riparian habitat. The single most important non-structural requirement for roost sites for this species is absence of human disturbance (USDA Forest Service 2001).

Bat surveys using mist nets at selected locations on the Plumas NF were conducted in June and September 1991 and again in July and August 1992. The Townsend's big-eared bat was not recorded (Lengas & Bumpus 1992, 1993). Bat surveys were conducted in July-September 2001 for the Crystal-Adams DFPZ Project. Townsend's bat guano was encountered in 3 suitable structures, including a pocket cave and large cave in Little Last Chance Canyon as well as a log cabin; all appeared to be night roosts (Ecosystems West, Feb 2002). Bat surveys were conducted July-September 2001 for the Poison and Red Clover DFPZ Projects, located approximately 2.5 miles north of the project area. This survey established the presence of 14 species of bat; Townsend's big-eared bats were not detected throughout the survey area (Ecosystems West, Feb 2002). Bat surveys were conducted July-September 2001 for the Last Chance DFPZ Project, located approximately 12.5 miles north of the project area. This survey established the presence of 16 species of bat; Townsend's bat guano was encountered in 1 suitable structure (Ecosystems West, Feb 2002). The Mabie project, located south and west of Portola, CA, was surveyed July - September 2002 by Steve Holmes Forestry with no detections of Townsend's big-eared bats. Surveys conducted by Heady in 2001 on the westside of the Plumas frequently found Townsend's bats in suitable structures, including tunnels and buildings; all housed solitary day-roosting sites (Roberts, personal comm.). In 2002 a male Townsend's big-eared bat was captured in a wet meadow site. There were also three acoustical detections in both forest and rocky areas on the Feather River RD (Roberts, personal com.).

The bat surveys conducted July-September 2001 for the Humbug project were located north of Portola, CA. The Humbug survey effort covered the southeastern portion of the Wildlife Analysis Area with two survey points falling within Freeman treatment areas. There were no detections of Townsend's big-eared bats in the Humbug project area (Steve Holmes Forestry 2002). Within the Wildlife Analysis Area there is an abundance of meadow stringers which create edge habitat. Therefore Townsend's big-eared bats are potentially present in the project area. No other areas within the Wildlife Analysis Area were surveyed for bats.

3.5.7.16 Western Red Bat (*Lasiurus blossevillii*)

Affected Environment—Western Red Bat

Western red bats are usually found west of the Sierra Nevada/Cascade crest, most often below 3000-foot elevation, with migrants found outside their normal range. Roosting habitat includes forests and woodlands including mixed conifer forests. They roost primarily in trees, less often in shrubs. Roosts are often in edge habitats adjacent to streams, fields or urban areas. They are dependent on riparian and riparian edge and mosaic habitats. They appear to be highly associated with intact riparian habitat, particularly willows, cottonwoods and sycamores (USDA Forest Service 2001). They tend to roost out on the edge of the foliage and mostly in the largest cottonwoods (Pierson 1998 in SNFPA FEIS 2001).

There is no indication that there has been any change in the range or distribution of this species (USDA Forest Service 2001). There are several records of Western Red Bat on the Plumas N.F. Bat surveys using mist nets at selected locations on the Plumas NF were conducted in June and September 1991 and again in July and August 1992. A total of 11 species and 475 individuals were captured at 18 of 20 sites forest-wide (Lengas and Bumpus 1993). No Western red bats were captured near the project area. The western red bat was found along the Middle Fork Feather River near Blairsden (1 record) and at French Creek on the Feather River Ranger District (2 records) (Lengas & Bumpus 1992, 1993).

Bat surveys were conducted July-September 2001 for the Crystal-Adams DFPZ Project, located approximately 15 miles east of the project area in eastside pine habitat. Western red bats were detected throughout the survey area along the entire elevational gradient, through acoustic sampling; an acoustical detection at 7,049 ft is perhaps the highest elevational record for this species. Most of the detections were located along riparian corridors, high elevation ponds, in mature cottonwood riparian forest, but also in dry settings such as Jeffrey Pine and fir forests. One western red bat was captured in mist nets at Snow Lake (approximately 19 miles east of the project area (Ecosystems West 2002). Bat surveys were conducted July-September 2001 for the Poison and Red Clover DFPZ Projects, located approximately 2.5 miles north of the project area. This survey established the presence of 14 species of bat; western red bats were detected throughout the survey area through acoustic sampling (Ecosystems West, Feb 2002). Bat surveys were conducted July-September 2001 for the Last Chance DFPZ Project, located approximately 12.5 miles north of the project area. This survey established the presence of 16 species of bat; western red bats were detected throughout the survey area through acoustic sampling (Ecosystems West, Feb 2002). The Mabie project, located south and west of Portola, CA, was surveyed July - September 2002 by Steve Holmes Forestry and acoustically detected three western red bats. In 2002, six detections of red bat occurred between 4000 to 6000 feet along creeks, at seeps and in forest settings with mixed hardwood and conifer trees on the Feather River RD (Roberts, per. com).

The bat surveys conducted July-September 2001 for the Humbug project were located north of Portola, CA. The Humbug survey effort covered the southeastern portion of the Wildlife Analysis Area with two survey points falling within Freeman treatment areas. There were no detections of western red bats in the Humbug project area (Steve Holmes Forestry 2002). Cottonwood riparian stringers are not abundant, but aspen stands are abundant within the project area. Therefore western red bats are potentially present in the project area. No other areas within the Wildlife Analysis Area were surveyed for bats.

Environmental Consequences—Bats

Effects of the Action Alternatives

The implementation of Management Area direction and habitat prescriptions and allocations for bald eagle, California spotted owl, northern goshawk, forest carnivores, willow flycatcher and great gray owl, including the retention of large trees, retention of hardwoods, snags and LWD and maintaining aquatic/riparian ecosystem processes, would provide many of the habitat attributes necessary to support the sensitive bat species. Potentially suitable habitat may exist within the project area for all three of these bat species (Pallid, Townsend's big-eared and Western red bats).

Direct Effects

Direct effects from the Proposed Actions are possible if any of these species occurs in the project area. Destruction of active roosts through felling or removal of small trees with hollows could displace or harm individual bats. Chainsaw activity or the use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment resulting in lowered reproductive success. These effects would be most severe during the breeding season (May 20 to August 15) when the potential exists for disturbance to active breeding females and maternity colonies. If any of these sensitive bat species breed in the area, project activities during the breeding season could affect individual bats, including direct mortality. These bats have been known to utilize large conifer snags and tree hollows as day roosting sites, so some roosting habitat may be lost. Habitat attributes such as large live trees and large snags could be removed or modified by the proposed action alternatives. Hazard trees, including snags, along the road and those removed for safety reasons, could result in direct mortality of bat species that may be roosting within the tree or snag. However, with all action alternatives no trees over 30" dbh would be removed, three to six of the largest snags per acre would be maintained (except group selections), all hardwoods would be retained and adjacent to meadows, scattered conifers would be retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the meadow; mistletoe brooms higher than 20' from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc.; all habitat attributes that provide for bat nesting, roosting and/or foraging habitat.

Due to the small size of bats and the difficulty of surveying for them, it is hard to determine where they are roosting. Because they are insectivores, removal of logs may reduce the amount of microhabitat available for wood boring beetles that may be utilized as prey.

No riparian tree species, including cottonwood, are planned for removal. There would be no habitat disruption or modification to rock outcrops, caves and mining adits. No man-made structures that could provide habitat for bats are planned for removal or modification, other than roads and culverts, both of which do not provide habitat.

Indirect Effects

No permanent roads will be constructed so no long-term increases in human activity are expected as a result of this action. As part of a strategic system of defensible fuel profile zones, this project would reduce the potential for high-severity wildfires, which could eliminate vast tracts of habitat for these species. Prey base for bats (insects) may have some site-specific short-term reductions post underburning due to direct mortality of eggs, larvae, pupae and adults from fire. However, post fire conditions have been shown, in many instances, to increase plant vigor (Lyon and Stickney 1976, Debyle 1984, Stein et al. 1992). It has also been shown that many herbivore insects preferentially feed on and have increased reproductive success and fitness on more vigorous plants and plant parts, “the plant vigor hypothesis” (Price 1991, Spiegel and Price 1996). Therefore, post fire conditions may increase the forage base available to bats.

Cumulative Effects

No populations of sensitive bat species are known to occur in the project area, but based on surveys conducted across the Forest in various habitats, their presence is suspected. Cumulative effects on bats could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires and the firefighting practices (dozer lines, etc.) used by land managers to control them, have contributed and would continue to contribute to loss of habitat for this species. Construction and strategic placement of DFPZ’s can reduce the threat of large scale habitat altering, stand replacing fires, thus providing some protection to residual habitat attributes like large trees, large snags and buildings across the landscape for bat species use. This action would be a benefit to all bat species through some protection of the residual habitat attributes.

Effects of Alternative 2 (No-action)

Direct Effects

There would be no direct effects on bats or bat habitat, as no activities would occur that would cause disturbance to denning bats, nor any impacts to the existing habitat conditions.

Indirect Effects

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential modification of suitable bat habitat including the loss of large trees, large snags and down woody material.

With the current PNF woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by bats, especially during the breeding season (maternity roosts), could cause disturbance that could disrupt and preclude successful recruitment of young.

Cumulative Effects

The No-action Alternative for the Freeman Project would not provide long-term protection of bat habitat from being greatly altered by a catastrophic fire. There would be no actions designed to reduce the risk of high intensity wildfire. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30”) trees that may provide future habitat availability.

Determination—Bats

It is my determination that the Freeman Project may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the bats (Pallid bat, Townsend’s big-eared bat and Western red bat).

Summary of Determinations

Action Alternatives

The action alternatives would protect and maintain key sensitive species habitat areas through project design, specifically spotted owl PACs and SOHAs, would not be treated, disturbance would be limited through implementation of the necessary Limited Operating Periods (LOPs) and riparian areas and meadows would be managed by designating RHCAs and meeting BMPs during implementation. Nevertheless, impacts to National Forest lands resulting from the Freeman Project are expected to contribute to cumulative impacts on certain sensitive wildlife species. See Table 3.57 for a summary of the determinations.

These project level effects determinations are consistent with the determinations reached in the SNFPA 2004 ROD by meeting the following three conditions:

1. The project is designed in accordance with all Forest Plan design criteria as analyzed in the SNFPA FSEIS 2004 ROD, Table 2;
2. The spatial location and timing of this project, when considered cumulatively with all other projects affecting TES species and TES habitat in the HFQLG area, have been displayed and analyzed and results in a determination consistent with that reached in the SNFPA FSEIS 2004 ROD;

3. Available new information that was not available in the SNFPA FSEIS 2004 ROD has been included in this project level analysis and this new information leads to the same conclusion as that within the SNFPA FSEIS 2004 ROD.

Table 3.57 Summary of Effects of Proposed Action on Threatened, Endangered, Proposed and Sensitive Animal Species that Potentially Occur on the Plumas National Forest.

Species	Alternative 1, 3 & 4	Alternative 2 No-action
AMPHIBIANS		
Foothill yellow-legged frog (*Rana boylii*)	MAI	WNA
Mountain yellow-legged frog (*Rana muscosa*)	MAI	WNA
REPTILES		
Northwestern pond turtle (*Clemmys marmorata marmorata*)	MAI	WNA
BIRDS		
Bald eagle (*Haliaeetus leucocephalus*)	MAINLA	WNA
American peregrine falcon (*Falco peregrinus anatum*)	WNA	WNA
California spotted owl (*Strix occidentalis occidentalis*)	MAI	WNA
Northern goshawk (*Accipiter gentilis*)	MAI	WNA
Great gray owl (*Strix nebulosa*)	MAI	WNA
Willow flycatcher (*Empidonax trailii brewsteri*)	MAI	WNA
Greater sandhill crane (*Grus canadensis tabida*)	MAI	WNA
MAMMALS		
American marten (*Martes americana*)	MAI	WNA
Pacific fisher (*Martes pennant pacifica*)	MAI	WNA
California wolverine (*Gulo gulo luteus*)	WNA	WNA
Sierra Nevada red fox (*Vulpes vulpes necator*)	WNA	WNA
Pallid bat (*Antrozous pallidus*)	MAI	WNA
Townsend's big-eared bat (*Corynorhinus townsendii*)	MAI	WNA
Western red bat (*Lasiurus blossevillii*)	MAI	WNA

Determinations: WNA = Will Not Affect, MAINLA= May Affect but Is Not Likely to Adversely Affect Individuals or their designated critical habitat, MAI = May Affect Individuals, but in not likely to result in a trend toward Federal listing or loss of viability, LRTTFL = May affect individuals and is Likely to Result in a Trend Toward Federal Listing or loss of viability

3.5.8 Compliance with HFQLGFRA ROD and FEIS

Areas of suitable habitat have been surveyed to protocols based on the best available science, to determine information relevant to implementation of site-specific resource management activities. The BA/BE has documented the species surveys that were conducted for this project, as well as the protocols that were implemented.

Where appropriate, limited operating periods (LOPs) would be applied to unsurveyed habitat considered to be suitable for threatened, endangered or sensitive species: and to habitat considered suitable for any species for which viability may be a concern. See Table 2.3, page 2-8 (HFQLGFRA FEIS) and pages A-54, A-60 – A-62 (SNFPA FSEIS 2004 ROD). The BA/BE documents the need for LOPs as appropriate and needed. If target species are found, LOPs will be implemented on a site-specific basis. As surveys are conducted and no target species are found, LOPs can be lifted.

Habitat connectivity, including hydrologic connectivity, would be maintained to allow movement of old forest or aquatic/riparian-dependent species between areas of suitable habitat.

The analysis considered habitat connectivity as required by the ROD for the HFQLGFRA FEIS, for forest carnivores as cited in this document. The project will maintain habitat connectivity for (old forest-dependent, aquatic/riparian-dependent) species as discussed above.

Over the course of the pilot project, suitable habitat for old forest-dependent species and aquatic/riparian-dependent species (including amphibians) will not be reduced by more than 10 percent (18,640 acres) below 1999 levels for the HFQLG project (Tables 3.58 and 3.59). See Appendix F for the 10% monitoring form. CWHR types selected by the monitoring team to represent suitable habitat for late successional species includes the following CWHR labels 5M, 5D and 6. Data from the HFQLGFRA FEIS indicates that the baseline total for 5M, 5D, 6 is 186,401 acres within the HFQLG Planning Area. Thus 10% reduction would be approximately 18,640 acres. The Freeman Project analysis concludes that there would be a reduction in these strata types of approximately 15 acres with Alternative 1, 14 acres with Alternative 3, 14 acres with Alternative 4. Therefore, there would be a no cumulative contribution to the loss of suitable habitat for old forest-dependent species within the HFQLG Planning Area as a result of implementing three of the three action alternatives. Table 3.60 shows species specific habitat acre reductions for HFQLG projects on the Beckwourth RD.

Table 3.58 Cumulative Acres Counted Towards 10% Limit on Habitat Reductions for Old Forest Dependent (5M, 5D and 6) Species below 1999 Levels on the Beckwourth RD

Project	Planning Year	Old Forest Reduced (Acres)
Red Clover DFPZ/GS	2000	0
Dotta DFPZ/GS	2000	0
Last Chance DFPZ/GS	2001	0
Poison DFPZ/GS	2001	1
Crystal-Adams DFPZ/GS*	2002	672
Humbug DFPZ	2002	0
Mabie DFPZ	2003	0
HappyJack DFPZ/GS	2004	19
Freeman DFPZ/GS	2004	14 - 15
Total		**692-707**

* Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.

Table 3.59 Old Forest Habitat Acre Reductions for HFQLG Projects within the HFQLG Pilot project area (includes projected changes from Basin, Empire, HappyJack and Freeman Projects)

National Forest	Acres of Old Forest Reduction
Plumas	3,402 + Freeman = 3,402 + 15
Lassen	33 (as of 2/2005)
Sierraville RD	0 (none reported as of 2/2005)
Total	**3,450 acres or 1. 85% of 186,401 acres**

*10% reduction in 5M, 5D and 6 is reached at 18,640 acres

Table 3.60 Species Specific Habitat Acre Reductions for HFQLG Projects on the Beckwourth RD

PROJECT	Action Alternatives	Spotted Owl Nesting	Goshawk Nesting	Marten and Fisher Denning and Resting
Red Clover DFPZ/GS	3*	0	1,574 acres	1,562 acres
Dotta DFPZ/GS	2*	0	0	0
Last Chance DFPZ/GS	4*	0	25 acres	549 acres
Poison DFPZ/GS	4*	1 acre	35 acres	2 acres
Crystal-Adams DFPZ/GS**	1*	672 acres	1,051 acres	814 acres
Humbug DFPZ	3*	0	0	127 acres
Mabie DFPZ	3*	0	0	375 acres
HappyJack DFPZ/GS	4*	19 acres	2,355 acres	371 acres
Freeman DFPZ/GS	1	246 acres	3,006 acres	1,261 acres
	3	243 acres	2,853 acres	1,201 acres
	4	379 acres	3,416 acres	1,549 acres
Total		**935 – 1,071 acres**	**7,893 – 8,456 acres**	**5,001 – 5,349 acres**

*Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.

3.6 Management Indicator Species—Wildlife

3.6.1 Introduction

This report documents the effects of the Proposed Action (Alternative 1), No-action (Alternative 2) and two other action alternatives (Alternatives 3, 4) on selected Management Indicator Species (MIS) as a result of implementation of the Freeman Project. Description of the Freeman Project and all alternatives is found in Chapter 2 of the Freeman Project Environmental Impact Statement.

3.6.2 Current Management Direction

Chapter 5 of the 1988 Plumas National Forest Land & Resource Management Plan (PNF LRMP) contains a general monitoring plan providing guidance for MIS population and habitat monitoring over the life of the PNF LRMP. Some aspects of the monitoring plan on some MIS species has occurred during the life of the PNF LRMP, including annual or semi-annual nest monitoring, coordination with California Department of Fish & Game (CDFG) on Deer Herd plans and habitat exams and documenting changes in wildlife habitats through National Environmental Policy Act (NEPA) analysis.

Table 3.61 Management Indicator Species on the Plumas National Forest

SPECIES	STATUS, HABITAT INDICATOR	Category* for Project Analysis
Bald eagle (*Haliaeetus leucocephalus*)	Threatened, mature forest adjacent to open water bodies	Category 3 Analyzed in BA/BE
American peregrine falcon (*Falco peregrinus anatum*)	Sensitive, cliff nesting habitat	Category 1 Analyzed in BA/BE
California spotted owl (*Strix occidentalis occidentalis*)	Sensitive, mature, mixed conifer conditions	Category 3 Analyzed in BA/BE
Northern goshawk (*Accipiter gentilis*)	Sensitive, mature, mixed conifer and red fir conditions	Category 3 Analyzed in BA/BE
American marten (*Martes americana*)	Sensitive, mature, red fir conditions	Category 3 Analyzed in BA/BE
Deer (*Odocoileus spp*.)	Harvest, early seral, shrub	Category 3
Canada goose (*Branta canadensis*)	Harvest, wetlands	Category 3
Golden eagle (*Aquila chrysaetos*)	Special Interst, open forest	Category 3
Prairie falcon (*Falco mexicanus*)	Special Interest, early seral/cliff	Category 3
Trout group (Family *Salmonidae*)	Harvest, coldwater aquatic	Category 3
Largemouth bass (*Micropterus salmoides*)	Harvest, warmwater aquatic	Category 3

*Category 1: MIS habitat not within or adjacent to project area and would not be affected,
Category 2: MIS habitat within or adjacent to project area, but would not be affected,
Category 3: MIS whose habitat would be affected by the project (Source: Draft—MIS Analysis and Documentation in Project Level NEPA, R5 Environmental Coordination, May 23, 2006).

Project level MIS Selection and Project-level effects analysis for the Freeman Project is based on the one page Pacific Southwest Region (R5) “Draft—MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination, May 23, 2006. A Forest scale examination of habitat, population attributes and trend for each selected project-level MIS, documented in the June, 2006 Plumas National Forest Management Indicator Species Report, has been incorporated into the Freeman Project analysis. Management Indicator Species on the PNF are listed above in Table 3.61. Management Indicator Species are identified in the PNF LRMP, Appendix G (1988).

All Threatened, Endangered and Sensitive (TES) species are discussed in the project Biological Assessment/Biological Evaluation (BA/BE). Those MIS species that are classified as TES (bald eagle, peregrine falcon, California spotted owl, Northern goshawk and American marten) have been discussed in the BA/BE and not discussed in this particular document. Only the non-TES MIS species are discussed below.

All of the Plumas non TES MIS listed in Table 3.61 will be used for project-level analysis for the Freeman Project. The MIS have habitat that would be affected (directly or indirectly) by the Freeman Project. A description of all alternatives can be found within the Freeman BA/BE or EIS.

3.6.3 Scope of Analysis

Geographic Analysis Areas: The proposed treatment area is located in predominately Sierra mixed conifer forest habitat. The Treatment Area is defined as the units to be treated. This includes approximately 3,066 acres of DFPZ, 2,727 acres of Area Thinning, up to 175 acres of group selections and access roads to the groups. The **project area** is defined as the treatment area plus an additional larger land base which encompasses all of the treatment area. This project area is located at elevations ranging from 5,600 feet at Humbug Creek to 7,693 feet at Smith Peak. For the purpose of this MIS report, the **Wildlife Analysis Area** is defined as the project area and treatment area plus an additional larger land base. The additional larger land base was determined by potential indirect and cumulative effects on California spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. So the Wildlife Analysis Area goes out to and encompasses the closest PACs/HRCAs to the project area. The Wildlife Analysis Area totals approximately 46,039 acres (Figure 3.1) of which 41,388 acres are National Forest Lands. This Wildlife Analysis Area is also being used for all other wildlife species analyzed in this MIS report since the effects of the project to those species will not extend beyond the analysis area boundary for the California spotted owl. All direct, indirect and cumulative effects discussed, occur within this 46,039 acre Wildlife Analysis Area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to MIS and MIS habitat.

The Wildlife Analysis Area developed for the Freeman Project overlaps the Happy Jack Wildlife Analysis Area developed for the Happy Jack project (FY07 project) by about 2,006 acres near Happy Valley. No Happy Jack treatments (DFPZ, area thinning or group selection units) occur within the Freeman Wildlife Analysis Area; no Freeman treatments occur within the Happy Jack Wildlife Analysis Area.

Timeframe for Analysis: The timeframe used for determining cumulative effects depends on the length of time that lingering effects of the past actions would continue to impact the species in question. For the Freeman Project, general information based on the history of the area and sight specific information based on available data, going back approximately 25 years and forward approximately 5 years, was incorporated.

3.6.4 Analysis Methods

The Freeman Project was reviewed using aerial photographs, digital orthophoto quadrangles (DOQs), vegetation layer spatial datasets, species specific spatial datasets and known information to help determine the potential presence of MIS species (i.e. Deer, Golden eagle, etc.). In the field, while conducting protocol surveys for TES species, any observations of MIS species are documented on 1:24,000 scale quad maps. Species nest sites and locations are then incorporated into spatial datasets based on the mapped locations or Global Positioning System (GPS) points. For the analysis of effects, changes to suitable habitat were determined by using a spatial dataset of the vegetation layer combined with type of treatments (i.e. mechanical thinning, grapple piling, hand thinning, etc).

3.6.5 General

3.6.5.1 Affected Environment—General

The California Wildlife Habitat Relationships (CWHR) system was designed to be a planning tool to predict wildlife species habitat suitability for geographic locations and habitats in California. The CWHR system provides species' habitat suitability ratings for breeding, feeding and cover, in varying habitat types and seral stages. These suitability ratings are converted to numeric values and the three values are averaged to calculate overall habitat values for each habitat type and seral stage for each particular species. The CWHR system can be used to predict differences in habitat values between two habitat conditions and can indicate which species may be using habitat within a project area, as well as which may be negatively or positively affected by management actions, based on differences in habitat values between two habitat conditions. These values are not absolutes; they only provide an indicator of potential use of habitat by the species. CWHR Numerical values used in the system are: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence. Ratings were developed assuming that all special habitat elements were present in adequate amounts. Habitat suitability ratings for the selected Sierran Mixed Conifer (SMC) CWHR seral stages within the Wildlife Analysis Area are provided for terrestrial MIS species.

For the Wildlife Analysis Area the representative CWHR vegetation types are listed below in Table 3.62. Existing condition CWHR types were derived from a spatial dataset and 2000 aerial photo interpretation. Field analysis provided the basis for adjustments to the vegetative landbase.

Table 3.62 Summary of CWHR habitat types and acres within Wildlife Analysis Area from the vegetation layer (all acres are approximate and National Forest System Lands only)

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
AGS	1,045		PGS	2,258
ASP1M	11		PPN1	0
ASP1P	8		PPN3M	29
ASP1S	0		PPN3P	34
ASP2D	1		PPN3S	23
ASP2M	8		PPN4M	64
ASP2P	52		PPN4P	31
ASP2S	2		PPN4S	139
ASP3D	10		PPN5S	2
ASP3M	137		RFR1	0
ASP3P	151		RFR2S	398
ASP3S	11		RFR3D	50
ASP4P	14		RFR3M	23
BAR	201		RFR3P	27
EPN1	0		RFR3S	6
EPN2M	0		RFR4D	190
EPN2S	14		RFR4M	292
EPN3M	57		RFR4P	83
EPN3P	105		RFR4S	90
EPN3S	0		RFR5D	521
EPN4D	940		RFR5M	44
EPN4M	3,011		SGB	398
EPN4P	733		SGB1X	15
EPN4S	31		SGB3P	0
EPN5D	129		SMC1	27
EPN5M	783		SMC2D	4
EPN5P	73		SMC2M	17
JPN1	0		SMC2P	49
JPN2S	34		SMC2S	662
JPN3M	2		SMC3D	184
JPN3P	17		SMC3M	222
JPN3S	6		SMC3P	466
JPN4M	18		SMC3S	40
JPN4P	6		SMC4D	2,844
JPN4S	57		SMC4M	7,497

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
LAC	13		SMC4P	2,002
LPN1	0		SMC4S	129
LPN2S	56		SMC5D	2,418
LPN3D	29		SMC5M	1,382
LPN3M	48		SMC5P	170
LPN3P	53		SMC5S	35
LPN3S	6		SMC6D	94
LPN4D	284		Water	3,692
LPN4M	702		WFR1	0
LPN4P	223		WFR2S	153
LPN5D	144		WFR3D	286
LPN5M	0		WFR3M	132
MCP	460		WFR3P	45
MCP1X	103		WFR3S	83
MCP2X	4		WFR4D	1,319
MCP3M	8		WFR4M	1,423
MCP3P	0		WFR4P	338
MHC1	0		WFR4S	34
MHC3S	6		WFR5D	194
MHC4M	100		WFR5M	597
MHC4P	0		WFR5P	118
MHC5M	0		WTM	69
MRI	44		**Grand Total**	**41,388**

*1=Seedlings <1" diameter at breast height (dbh.), 2=saplings 1-6" dbh, 3=poles 6-11" dbh, 4=small 11-24" dbh, 5=medium/large >24" dbh. D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, P= Open Canopy Cover 25-39%, S=Sparse Canopy 10-24%. AGS = Annual Grassland, ASP = Aspen, BAR = Barren, EPN = Eastside Pine, JPN = Jeffrey Pine, LAC = Lacustrine, LPN = Lodgepole Pine, MCP = Montane Chaparral, MHC = Montane Hardwood-Conifer, MRI = Montane Riparian, PGS = Perennial Grassland, PPN = Ponderosa Pine, RFR = Red Fir, SGB = Sagebrush, SMC = Sierran Mixed Conifer, WFR = White Fir, WTM = Wet Meadow.

The CWHR habitat types present within the Wildlife Analysis Area are reflective of those found within the westside mixed conifer and consist of Sierra Mixed Conifer, White fir, Red fir, Lodgepole Pine, Ponderosa Pine and Montane Riparian/ Meadow. All habitat types are described in *A Guide to Wildlife Habitat of California*, California Department of Forestry and Fire Protection, October 1988 (Mayer et al 1988).

Section 3.2.3 within the SNFPA FSEIS (2004) provides an overview of the population trends of 32 of the total 72 MIS species identified in individual Forest Plans within the Sierra Nevada National Forests. This population trend data was derived from data collected primarily from state wildlife agencies and from breeding bird survey routes and other constant effort surveys within and adjacent to National Forest Lands.

3.6.5.2 Mule Deer (*Odocoileus hemionus*)

The PNF LRMP requires that the Forest monitor deer population trends in relation to management activities and ensure project compliance with recommended mitigation measures.

This is to be accomplished every five years to get 5-year trend analysis (PNF LRMP Chapter 5, page 5-10) to determine if population goals in the deer herd plans and predicted deer populations identified in the PNF LRMP are being achieved.

Affected Environment—Mule Deer

Deer populations have decreased from record highs of the 1950s and 1960s in several areas of the eastern half of the state, with the greatest declines evident in northeastern California and the north and central Sierra Nevada (CDFG 1998). Population fluctuations are natural and occur as a result of hard winters and other environmental catastrophes (such as drought or floods), changes in predation rates (especially by mountain lions), loss of habitat and disease.

Statewide, it is thought that declines in deer populations are due to low fawn survival (CDFG 1998), but causal relationships have not been determined. Conversions of brushfields to conifer plantations, lack of prescribed fire, overstocked conifer stands, increased road densities, competition and displacement by livestock, predation, urban sprawl and loss of productive riparian systems probably have all contributed to herd declines (Ibid). In the 1980s and 1990s, California had large increases in mountain lion populations. Pressure on the deer populations as a result of mountain lion predation may act to suppress deer numbers (USDA Forest Service 2001). Current population trends for mule deer is considered “variable” (Section 3.2.3 in the SNFPA SFEIS). The estimated deer population in California in 2002 was 554,000, with an average buck to doe ratio of 27 bucks per 100 does. In 2004 the estimated deer kill through hunter harvest was 37,746 and the reported deer kill was 20,925 (CDFG 2004). In 2005 the estimated deer kill was 29,566 and the reported deer kill was 16,430 (CDFG 2005).

The Sierra All Species Inventory (Appendix R, SNFPA FEIS 2001) assigns mule deer a moderate vulnerability rating for the Sierra Nevada. This rating is based upon three factors: (1) the species is ranked as “common,” with a population that exceeds 10,000 individuals, (refer to population estimates mentioned above); 2) the population trend is unknown but suspected to be decreasing; and 3) the range of mule deer in the Sierra Nevada is stable or increasing.

California is divided into 11 Deer Assessment Units (DAUs) for purposes of analysis. The Freeman Project is located within one DAU. The project is within what is identified as the Northeast Sierra Zone, which was designated DAU 3 (CDFG 1998) but is now identified as DAU 10 (CDFG 2003). Inexplicably, CDFG changed the DAU reference numbers between 1998 and 2003. The boundaries and the deer hunting zones within each DAU did not change.

Table 4.2.2.1a. in the SNFPA 2001 FEIS shows estimated deer populations for the 6 DAUs in the Sierra Nevada Forest Plan Amendment project area (CDFG 1998). Table 3.63 provides this information for DAU 10.

Current trends and population numbers are taken from the Environmental Document for Deer Hunting, produced by the California Department of Fish and Game, February 2003. Deer populations are considered stable in DAU 10, the Northeast Sierra Zone (hunting zones X6a through X8). Most notably eastside deer populations (DAU 9, 10) occupying great basin habitats experienced significant declines during 1990-1996. However these populations appear to have stabilized based on recent trend estimates (CDFG 2003).

Table 3.63 Estimated Deer Population and Trends for the one Deer Assessment Units (DAUs) within the Wildlife Analysis Area.

Totals Deer #	**DAU 10 (Changed from DAU 3)**
1952 Highs	40,000
1952 Density	11.1/sq mi
1992 Average	10,000
1992 Average Density	3.1/ sq mi

Deer populations within each DAU are derived from deer populations reported from each hunting zone. Within DAU 10, the hunting zones present within the Freeman Wildlife Analysis Area are X6a and X6b which is east and north of highway 70. The 2002 population status in X6a was approximately 2,490 mule deer and 1,825 mule deer in X6b.

The Plumas LRMP (USDA Forest Service, 1988), as amended, provides as an objective a deer population goal of approximately 24,000 deer across the Forest. Deer numbers are down in all Sierra Deer Herds (CDFG 1998).

The Freeman Wildlife Analysis Area falls within an area that provides summer range for the Sloat and Doyle Deer Herds. The Sloat and Doyle Deer Herds are managed under the guidance of deer herd management plans developed cooperatively between the California Department of Fish & Game and major land management agencies, including the Forest Service. These management plans provide deer population goals and habitat goals as well as identifies possible limiting factors to population growth. The management plans contain an action plan for all cooperating agencies to follow to achieve management goals.

The Sloat Deer Herd is composed primarily of Columbian black-tailed deer (*Odocoileus hemionus columbianus*) although there is some intermingling and hybridization with Rocky Mountain mule deer (*O.h. hemionus*) from the neighboring Doyle Deer Herd to the east. The Wildlife Analysis Area is located within hunting zones X6a and X6b, which allocated 380 (X6a) and 425 (X6b) deer tags in 2005.

The 1984 Sloat Deer Herd Management Plan called for a desired population goal of 5,500 animals at a buck to doe ratio of 20-25 bucks per 100 does and a spring fawn to doe ratio of 40-45 fawns per 100 does (Kahre 1984). The current population estimate for the deer hunting zone which is occupied by the Sloat deer herd is approximately 2,490 deer with a buck to doe ratio of 18 bucks per 100 does (CDFG 2003). It is suspected, based on observations and hunter kill that the population is well below the desired number, but suspected to be stable, (Lidberg, CDFG Unit Biologist, 2006 pers. comm.).

The 1982 Doyle Deer Herd Management Plan called for a desired population goal of 13,000 animals at a buck to doe ratio of 25-30 bucks per 100 does and a spring fawn to doe ratio of 40-45 fawns per 100 does (Fowler et al. 1982) . Annual population monitoring has been conducted by CDFG on the Doyle deer herd from 1997 to 2005. Population numbers for this deer herd are shown in the trend graph below (Figure 3.7). The population trend for the Doyle deer herd appears to be stable. The Doyle deer herd is also within DAU 10 which the Department of Fish & Game indicates has a stable trend for the assessment unit. This trend is consistent with California Department of Fish & Game's opinion that indicates a stable mule deer population trend for the Plumas NF (J. Lidberg, personal communication). It is suspected that the population within the Sloat Deer herd is also stable.

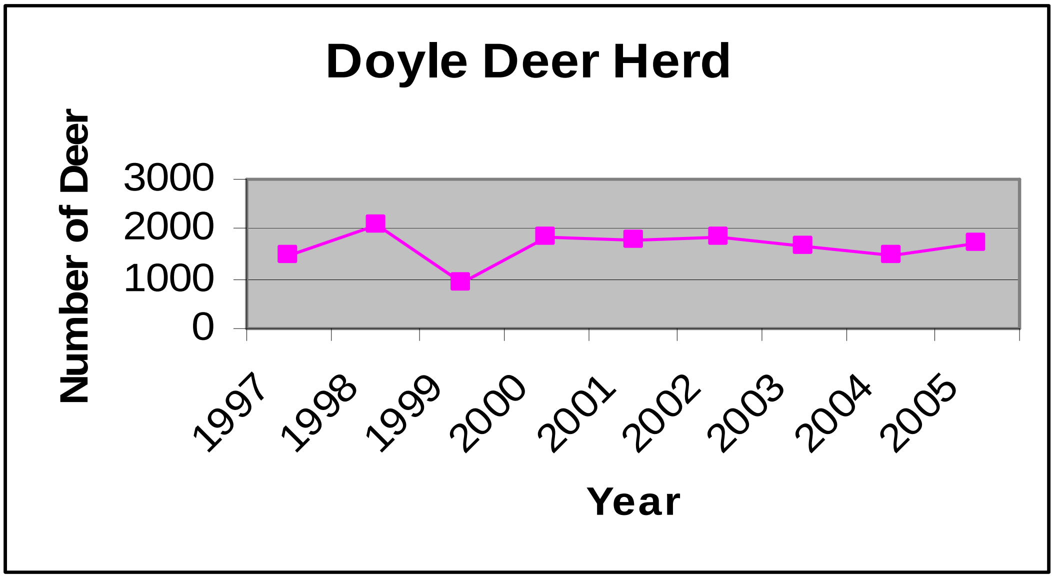

Figure 3.7 Trend in deer numbers in the Doyle deer herd.

Mule Deer seasonal ranges, as identified in individual deer herd plans, have been mapped across the PNF (USDA Forest Service 2006). Forest-wide, summer range habitat amounts to 1,454,381 acres, fawning areas make up 26,498 acres, winter range makes up 211,169 acres, critical winter range habitat is made of 21,435 acres, a known holding area makes up 3,704 acres and critical summer range is 7,095 acres.

Within the Wildlife Analysis Area there is approximately 19,101 acres of summer range for the Sloat deer herd (approximately 1.3% of the PNF total and 5% of total Sloat herd summer range) and 27,209 acres of summer range for the Doyle deer herd (approximately 1.9% of the PNF total and 6% of total Doyle herd summer range).

Within the Wildlife Analysis Area, the Sloat herd summer range (under the three proposed action alternatives) could be treated with approximately 999 to 1,026 acres of DFPZ, approximately 622 to 709 acres of Area Thinning with biomass removal and 49 to 183 acres of GS and/or aspen ETZs (Alternative1). Approximately 1,444 to 1,609 acres of DFPZ, approximately 2,116 to 2,275 acres of Area Thin treatments with biomass removal and 124 to 376 acres of GS and/or aspen ETZs (Alternative 1) could occur within Doyle herd summer range.

Open road density per square mile is an index used to predict at what level upland habitat would be effective in providing potential ungulate use of that habitat, referred to as a habitat effectiveness index. Higher road densities infer increased use by human users, which can result in changes in behavior and habitat use patterns by ungulate species (Lyon 1979, Thomas 1979, Wisdom 1996). The higher the open road density per square mile, potentially the less the surrounding habitat will be fully used (Lyon, 1983). The Western Association of Fish & Wildlife Agencies Mule Deer Working Group identified removing the negative effects of roads by reseeding and limiting access as a means of improving habitat for mule deer in forests (WAFWA, 2002). Both the Sloat Deer Herd Management Plan and the Doyle Deer Herd Management Plan call for reducing road access to increase the values of habitats to deer by reducing disturbance and illegal killing. The open road density within the Wildlife Analysis Area is approximately 2.9 miles/square mile, for a habitat effectiveness rating of 68 (or the effectiveness of deer habitat in obtaining optimum use of the maximum area is reduced about 18% by the presence of roads that are open to vehicular traffic) (Table 3.64).

Table 3.64 Existing open road density/habitat effectiveness (Hef) for deer within the Freeman Project Wildlife Analysis Area.

Road Class	Analysis Area Road Density	Analysis Area Habitat Effectiveness*	
		Hef	% Decline
Main	0.2 mi/sq. mile	99%	-1
Secondary	2.7 mi/sq. mile	73%	-27
Total	2.9 mi/sq. mile	70%	-30

* Thomas, J.W. 1979—Wildlife Habitat in Managed Forests the Blue Mountains of Oregon and Washington. Pg. 122

Disturbances within Sierran Mixed conifer usually results in a diverse, fire adapted shrub component consisting of species preferred as browse. Within the project area, preferred browse includes snowbrush ceanothus (*Ceanothus velutinous*), whitethorn ceanothus (*C. cordulatus*), deerbrush (*C. integerrimus*), bittercherry (*Prunus emarginata*) and greenleaf manzanita (*Arctostaphylos patula*), while winter forage is provided by wedgeleaf ceanothus (*C. cuneatus*) and silktassel (*Garrya fremontii*). Brushfields that develop on summer range after perturbations such as wildfire, logging and broadcast burning have been found to be very important fawning areas, as well as providing highly nutritious forage, especially up to the first 10-12 years following the disturbance.

Within Plumas County, deer respond to manipulated habitats that set back the successional pattern of vegetation in a predictable manner. The first 10 years there are local increases in deer use and numbers within the disturbed area, whether it is created by logging or fire. Deer respond to the vegetative response of the disturbance, manifested by an increase in succulent shrub and forb growth. As habitat matures and brush gets high and thick, fawning use starts to decline after about 15-25 years. Deer use can continue at lesser numbers than what was realized in the first 10 years, especially if natural openings and forested stands allow for movement. Planting the shrub areas with conifers accelerates the decline in deer use; thinning and release of conifers can result in a flush of new vegetative growth for deer browse up to the time that the conifers start shading out this growth. Somewhere between 25-50 years, the conifers within plantations or cutover areas dominate the site and browse is less available, but hiding and thermal cover is provided.

Shrub species may dominate and persist for up to 50 years or longer before conifer growth significantly reduce shrub growth through shading. This shrub stage has two characteristic successional sequences:

1. On poor, typically shallow soils, often overlaying bedrock, the shrubs tend to predominate to form a climax community.
2. On deeper forest soils, this shrub community represents secondary succession following disturbance.

The shrub species may exclude conifers for many years. However, these same species may facilitate the germination of shade tolerant conifer species by providing a protective cover, moderating microclimate and improving soil conditions. If no conifer seed source exists, such as within the interior of a stand replacing fire, the shrub community can occupy the site for several decades beyond normal successional timeframes. In mature timber stands, shrub species mature and die due to insufficient light and are only present as a sparse understory. The shrub component provides important habitat, including winter range, for deer, as well as early seral habitat for shrub nesting species, such as green-tailed towhees, fox sparrows and mountain quail.

CWHR suitability ratings for deer reflective of selected Sierra Mixed Conifer types that would increase and or decrease with the action alternatives are displayed in Table 3.65.

Table 3.65 CWHR Suitability Ratings for Deer within the Freeman Project Wildlife Analysis Area in Selected Sierra Mixed Conifer Types

Species	Key Habitat Features	CWHR Suitability Rating**
Mule Deer (includes blacktail) (*Odocoileus hemionus*)	Mosaic of early to intermediate seral stages of most forest, woodland and brush vegetation providing an interspersion of herbaceous openings, dense brush or tree thickets (critical for summer and winter thermal regulation), riparian areas and abundant edge. Moderate to dense shrublands near water needed for fawning.	SMC1 = 0.44 SMC2 = 0.89 SMC3P = 0.89 SMC4P = 0.66 SMC4M =0.77 SMC4D = 0.55 SMC5P = 0.66 SMC5M = 0.55

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence. SMC (Sierra Mixed Conifer)

Based on CWHR, the Freeman Wildlife Analysis Area (NF) supports 5,856 acres of grass/forb, shrub and early successional habitat (CWHR 1, 2, AGS, PGS, MCP, SGB, WTM) (Table 3.62). The majority of this habitat is due to the extensive meadow systems and past timber harvest. This habitat is important to a number of wildlife associates, including ground nesting birds, small mammals, several species of reptiles and bats.

Forage for deer is defined as all CWHR vegetation types identified above as grass/forb, shrub and early successional habitat, as well as all CWHR vegetation types with <40% canopy cover (S and P). These more open stands support some element of understory vegetation in varying degrees of species composition and availability that probably are used by deer for forage more so than for cover. Cover is supplied by CWHR types with canopy cover >40% (M and D). Based on Table 3.62 (excluding Water and Riparian), the analysis area supports approximately 11,287 acres of forage and 26,195 acres of cover for a forage:cover ratio of approximately 30:70. Desired forage:cover ratio within summer range is 50:50. Preferred forage is browse consisting of silktassel, wedgeleaf ceanothus, deer brush, mountain whitethorn; staple browse species consist of greenleaf manzanita, bittercherry and black oak (*Quercus kelloggii*), including mast.

Environmental Consequences—Mule Deer

Effects of the Action Alternatives

Direct and Indirect effects

There may be direct effects to deer with the proposed action alternatives. The potential exists for increased mortality as a result of increased traffic along all roads during project implementation. Treatment activities could disrupt fawning activity that would be occurring between June and August. This disruption could include direct mortality to hiding fawns, as well as displacement of fawns and does which could increase fawn mortality through predation. There may be disturbances to individuals that may be foraging in habitat within or adjacent to units proposed for treatment, which results in animals moving out of the area while activity is going on.

The Sierra Mixed Conifer (SMC) in all seral stages (SMC1-SMC6) provides for breeding, cover and feeding habitat suitability, with the highest habitat suitability for all life requisites achieved in the SMC2S, 2P and 3P (young tree, <40% canopy cover). The proposed action alternatives create more open forested habitat with creation of DFPZ and area thin treatments with biomass removal (creating 3P habitats and 4M/5M type habitats with open understories); group selection (GS) harvest units and aspen ETZ units increase the amount of early seral openings (SMC1 and SMC2) and increase within stand edge.

Changes in habitat suitability, as reflected by HSI in Table 3.64, indicate that changes to the CWHR in the mixed conifer as a result of the action alternatives would result in slight increases in habitat suitability when opening up denser stands (D & M). The largest increase in suitability comes from creating open, younger age stands (1 & 2), as both forage and brush cover is provided at higher levels than older and denser conifer stands.

The existing forage:cover ratio within the project area is 30:70. With the implementation of fuel treatments under Alternative 1 (including biomass), an additional 2,616 acres of foraging habitat (4M and 5M) could be created by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 559 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to roughly 39:61. Alternative 3 will potentially create approximately 2,717 acres of foraging habitat (4M and 5M) by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 175 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to 38:62 (slightly less than other action alternatives). Alternative 4 will potentially creating approximately 3,269 acres of foraging habitat (4M and 5M) by opening up denser forested stands currently providing cover habitat and clearing out the understories. In addition, 174 acres of openings supporting CWHR 1 and 2 would be added to the forage base, resulting in an improvement in the forage:cover ratio to 39:61.

Within the Sloat and Doyle Summer Ranges for Alternative 1, approximately 175 acres of group openings and 384 acres of aspen ETZs would be created for a total of 559 acres. The amount of open forested stands created by DFPZ and area thin treatments with biomass removal implementation (mechanical, grapple pile/masticate and hand thin) in Alternative 1 could increase by approximately 5,264 acres. Alternative 3 would create approximately 175 acres of groups and approximately 5,425 acres of open forested stands through DFPZ and area thin treatments with biomass implementation. Lastly, Alternative 4 would create approximately 174 acres of groups and approximately 5,525 acres of open forested stands through DFPZ and area thin treatments with biomass treatments.

The post project forage:cover ratio would persist for several years and slowly change as brush quality for forage declines due to increased shade from developing conifers in DFPZ and Area Thin treatments and increased conifer growth within group selection/ETZ units. In 12-50 years it is predicted that the amount of forage would again decline. With reforestation, conifers would dominate the brush within group openings anywhere from 15-50 years, depending on site and aspect.

Aspen is a major component within the Wildlife Analysis Area. Aspen thinning prescriptions would enhance aspen health and improve aspen productivity by reducing competition for limited resources. This enhanced health and improved productivity in the aspens stands would increase forage and cover for deer. Approximately 243 acres of aspen and 402 of aspen ETZ treatment would be implemented with Alternative 1. Alternatives 3 & 4 would implement approximately 232 acres of aspen treatment

Decommissioning 10 miles of road, as well as closing 1 mile of roads with proposed action alternatives would decrease open road density within the analysis area to about 2.7 miles/square mile providing for a slight increase in habitat effectiveness above pre-treatment levels (Table 3.66). These decommissioned/closed roads would recover habitat features, such as forbs, grass and browse, in 2-10 years. Closing roads would reduce potential roadkill, as well as reduce human accessibility into suitable habitat and making mule deer less susceptible to both illegal kill and hunter mortality. The action alternatives would construct approximately 2 miles of temporary road and 3 miles of system roads that would be closed post project. Approximately 16 miles of road would be reconstructed with the proposed action alternatives; reconstruction should not impact deer or deer habitat above existing levels.

Table 3.66 Post Project Implementation Open Road Density/Habitat Effectiveness (Hef) for Deer within Wildlife Analysis Area (all action alternatives)

Road Class	Analysis Area Road Density	Analysis Area Habitat Effectiveness	
		Hef	% Decline
Main	0.2 mi/sq. mile	99%	-1
Secondary	2.5 mi/sq. mile	77%	-23
Total	2.7 mi/sq. mile	73%	-27

* Thomas, J.W. 1979—Wildlife Habitat in Managed Forests the Blue Mountains of Oregon and Washington. Pg. 122

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ and Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species. Borax diffuses quickly into the stump and is not available for leaching into the ground surrounding the stump.Kliejunas (1991) presents data that suggests that the proper use of borax to prevent annosus root disease poses a very low risk of adverse environmental effects. Maximum doses of borax are estimated to be 17.9 mg/kg for deer and 42 mg/kg for rabbits. This estimate is based on a broadcast application of 10 lbs/acre. Actual doses resulting from stump treatments are expected to be lower in magnitude.

Cumulative Effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

In the Wildlife Analysis Area, foraging habitat for mule deer could be improved as a result of implementing all action alternatives and could provide higher quality habitat (from existing conditions) until brush is shaded out or becomes decadent in 12-50 years. With reforestation, brush would be set back through release and plantation thin treatments, allowed to recover and provide a small amount of new browse and eventually are shaded out by the growing conifers at about 50-60 years.

The action alternatives are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. The long term cumulative effects of this action would fall in line with the analysis conducted for the SNFPA (described below) and contribute to the decline of mule deer within the Wildlife Analysis Area, the Plumas NF and the Sierra Nevada range.

The action alternatives implement positive habitat manipulations that tend to reduce possible identified limiting habitat factors for California deer herds (creation of brushfields, using prescribed fire, opening up overstocked conifer stands, reducing road densities). Within these treated areas there could be a short-term increase in deer utilizing the brush/forb regeneration that would flourish with group openings and any treated area that would be underburned, prescribed burned, masticated or grapple piled. This increase in deer use may be more reflective of changes in use patterns by deer than any major increase in animals. On the other hand, other identified limiting factors (predation) could also be increased by the action alternatives. Urban sprawl would not be affected by the Proposed Actions, although human access into deer habitat would be reduced.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to compete with deer for the limited forage base.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the habitat for deer through increased quality of forage sources.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report. However; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to thin, masticate, grapple pile and underburn deer habitat thus potentially improving habitat conditions for deer.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.The effect of this action would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover which would have a nominal affect on the deer.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters and guides, fishing outfitters and guides, snowmobile poker runs, sled dog races and film productions. The on going recreational activities would continue to affect deer behavior and movement patterns in the Wildlife Analysis Area.

The California Department of Fish and Game is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to limit the availability of water to deer that forage around Lake Davis.

Deer habitat utility scores were calculated based upon CWHR models (Appendix B, SNFPA FEIS 2001) for the 2.3 million acres of mule deer habitat on National Forest in the Sierra Nevada. These scores predict the changes in relative utility of habitats for deer fawning, foraging, cover and winter range under implementation of management actions. This model is limited in that a number of structural and landscape features important to deer are not well evaluated. These features include the number and species of shrubs, shrub foliage volume and forest openings. The model is also not able to evaluate spatial distribution of habitat elements, such as level of continuity and presence and design of migration corridors. The SNFPA FEIS displayed that mule deer habitat utility declines under all alternatives, including implementation of the Standards and Guidelines outlined in the ROD (FEIS volume 3, part 4.2 page 26). This decline was based on the assumption that practices that open up canopies through mechanical treatments, like thinning, biomass and salvage logging within green stands, do not generate dense understories of shrubs, forbs and grasses that provide deer foraging habitat. Current direction under the SNFPA emphasizes mechanical treatments in order to insure minimizing potential changes to canopy cover.

With the analysis of S2 in the SNFPA FSEIS in 2004, there was no projected difference in deer habitat from what the 2001 SNFPA analysis disclosed. Overall, deer habitat utility would be expected to decline under the Sierra Nevada Forest Plan Amendment by –6.6% over a five-decade period (USDA Forest Service 2001). Since mule deer are a common species still occupying their historic range in the Sierra Nevada, it does not seem likely that the small decline in habitat utility values under the Plan Amendment result in the loss of viable, well-distributed populations (USDA Forest Service 2001).

In conclusion, based on the direct, indirect and cumulative effects of the action alternatives, it is suspected that the carrying capacity in the analysis area would be improved and that deer numbers would respond to the habitat changes such that there would be some upward trend in the Doyle deer herd and Sloat deer herd populations for at least the next 5 years. Summer range would be improved by opening up stands through thinning, prescribed burning in thinned stands, as well as prescribed burning old brushfields. All three actions providing additional high quality forage and improving trend in habitat suitability. Improving carrying capacity on National Forest land would contribute to moving the populations toward their herd population goals, as well as contributing to the PNF LRMP goal of 24,000 deer on PNF lands.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative Effects

There should be no direct effects to this species, but there would be indirect effects from the No-action Alternative. There would be no impact to Sierran mixed conifer habitat or aspen habitat. There would be no change in the forage:cover ratio and the existing forage conditions would continue to mature (decline in quantity and decrease in quality without any disturbance event).

Not treating existing fuels through thinning, DFPZs and area thin treatments with biomass implementation would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. The existing fuel loads within the area could produce a very hot fire, which could kill re-sprouting species of shrubs, potentially create monocultures, provide a medium for noxious, invasive weeds and burn minerals from the soil, leading to soil erosion and lower productivity.

There would be no reduction in the open road density within the analysis area.

The No-action Alternative would do nothing to reduce the identified possible limiting habitat factors for California deer herds (loss of brush fields, lack of prescribed fire, overstocked conifer stands, increased road densities). The cumulative effects of no action could fall in line with the analysis conducted for the SNFPA (described above) and contribute to the decline of mule deer within the Wildlife Analysis Area, the Plumas NF and the Sierra Nevada range. In the short term, forested stands would not be opened-up through thinning and underburning, thus very little regeneration of foraging habitat would occur. In addition, no action could result in potential larger and more intense wildfires, which, depending on weather conditions and fuel loadings, could either increase or decrease the productivity of foraging habitat.

In conclusion, based on the direct, indirect and cumulative effects of the No-action Alternative, it is suspected that deer numbers would respond slightly to the habitat changes created on private land, such that there would be some upward trend in the Doyle deer herd and

Sloat deer herd populations for at least the next 5 years. The carrying capacity on National Forest land would not be improved, thus there would be a stable to downward trend in deer numbers on National Forest, thus not contributing to the PNF LRMP goal of 24,000 deer on PNF lands. With the increased potential for a stand destroying wildfire, 1) a high intensity wildfire could reduce productivity of deer range for a long period of time, resulting in a long term reduction in carrying capacity, or 2) depending on fire intensity, decadent brush and closed forest could be converted to potentially improved deer habitat and carrying capacity could be improved above current levels.

3.6.5.3 Canada Goose (*Branta canadensis*)

The PNF LRMP requires that the Forest determine trends in Canada goose nesting populations through direct counts of adults and young on selected sites. No minimum monitoring frequencies are identified in the PNF LRMP (PNF LRMP Chapter 5, page 5-9).

Affected Environment—Canada Goose

The Canada goose is known to breed at lakes as high as 6,000 feet in Northeast California, which includes the Modoc, Lassen, Plumas and Tahoe National Forests. The subspecies of Canada goose nesting in Northeast California is *Branta canadensis moffitti* (Mowbray et al. 2002). This species breeds near open water (lakes, reservoirs, ponds, rivers and marshes); prefers ponds, marshes and lakes with natural islands and readily nests on human-made islands, rock piles, straw bales and nesting platforms (Ibid). There is one large open body of water within the Wildlife Analysis Area where Canadian geese have been observed (Nickerson, pers. obs.) and that is Lake Davis. Foraging habitat consists of grasslands/meadows adjacent to large bodies of water.

Population goals for geese have been established in management plans prepared for most populations in the Pacific Flyway by the Pacific Flyway Study Committee made up of state and federal biologists in 11 western states. These plans specify threshold population levels at which hunting regulations should be changed. For pacific populations, a breeding population threshold falls within between 1,000 and 1,250 pairs. If the breeding population index falls below 1,000 pairs, over a three year average, hunting would be restricted; conversely the harvest strategy could be more liberal when pairs exceed 1,250 (State of California, California Department of Fish & Game. 2005. Environmental Document, Migratory Game Bird Hunting (Waterfowl, Coots, Moorhens). Pgs 43- 45)

On the Plumas, Canadian geese were monitored annually from 1989 to 1991 and showed an increasing population trend for the PNF. Approximately 50 breeding pairs were identified on five reservoirs and four lakes, producing approximately 400 young. An unknown amount of geese are also raised on rivers and streams. The initial PNF LRMP estimate indicated a population of 200 geese. Post plan monitoring from 1989 to 1991 indicates that the goose population exceeded the population capacity goal set by the PNF LRMP of 800 geese (Figure 3.8). The trend indicated from 1989 to 1991 data shows a similar trend as the BBS trend for the Sierra Nevada Bio Regional Scale.

Based on Canada goose monitoring, it appears the PNF is contributing population numbers to the Pacific Flyway population in order to maintain the threshold index defined by the Study Committee of 1,000 Canada goose pairs. In addition, monitoring also indicates that the PNF has met and exceeded its population capacity of 800 geese on the forest. Therefore, it appears that the Canada goose population on the PNF is stable.

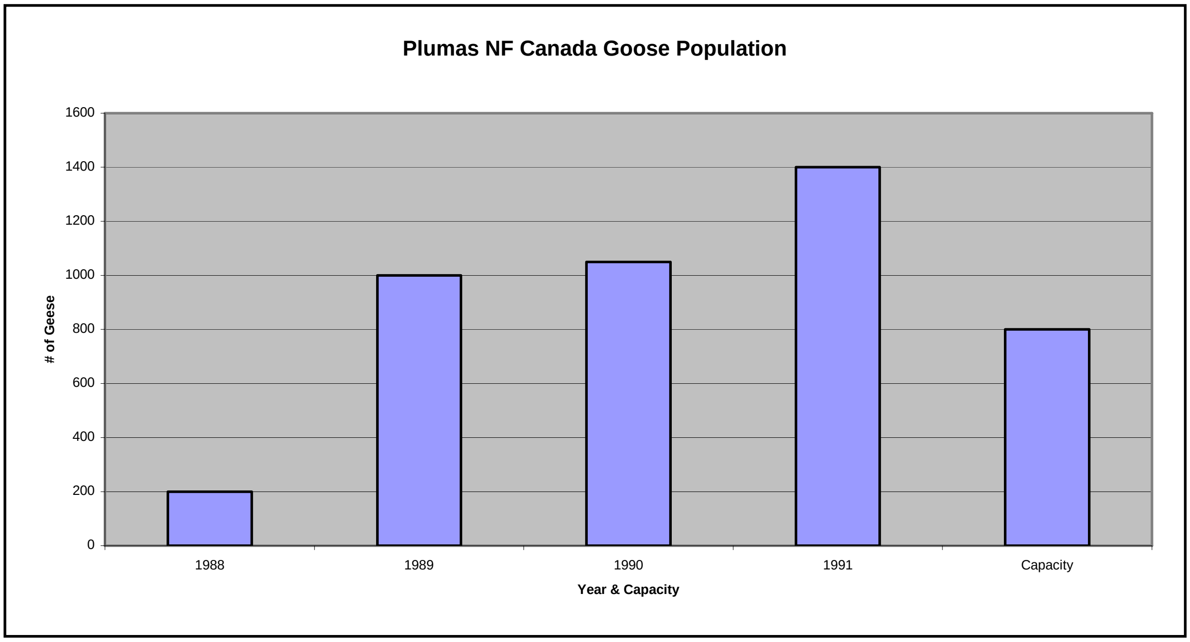

Figure 3.8 Population monitoring on the Plumas National Forest showing Canada goose population numbers and goose capacity estimated from Land & Resource Management Plan.

Environmental Consequences—Canada Goose

Effects of the Action Alternatives

Direct and Indirect Effects

There is suitable foraging habitat and potentially suitable nesting habitat within the Wildlife Analysis Area. However, direct habitat modification is not expected because Canadian geese use wetland habitats that would not be treated. Disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging and foraging activities.

There have been several documented Canada goose sightings within the Wildlife Analysis Area and flying over the Wildlife Analysis Area as they migrate south during the fall. The only proposed treatment planned in or adjacent to Canada goose habitat in the Freeman Project is aspen restoration, which is expected to improve meadow hydrology thus improve potential nesting and foraging habitat.

Cumulative Effects

Cumulative effects on the Canada goose could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another one hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to impact meadow vegetation thus degrading potential foraging and nesting habitat.

The Westside Lake Davis Watershed Restoration would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action should improve the meadow hydrology thus potentially improving Canada goose foraging and nesting habitat.

In conclusion, based on the direct, indirect and cumulative effects the Proposed Action and action alternatives would not result in any change in population trends to meet the identified PNF LRMP goal of 800 geese.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct or indirect effects on Canadian geese or Canada goose habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Cumulative effects

Since there are no direct or indirect effects to Canadian geese or there habitat, this project would not contribute to cumulative effects.

3.6.5.4 Golden Eagle (*Aquila chrysaetos*)

The PNF LRMP requires that the Forest monitor golden eagle population by documenting occupancy of nest sites and habitat trends in designated areas, involving direct counts of adults and young, at selected nest sites. Selected sites are monitored annually (PNF LRMP Chapter 5, page 5-9).

Affected Environment—Golden Eagle

Golden eagles nest within the Plumas in coniferous timber stands adjacent to large, open valleys or in rock cliffs along river drainages. Larger trees (≥ 30" dbh) that provide nesting potential for Golden Eagles adjacent to meadows and large open valleys are retained to comply with Forest Plan Standard and Guidelines for the Golden Eagle (LRMP, pg 4-33). Therefore, the habitat trend for the Golden Eagle is considered stable on the Plumas NF.

The PNF LRMP estimated a potential for the PNF to supply habitat for approximately 20 nesting pairs. The PNF has had as many as 9 known golden eagle nesting territories. The Beckwourth RD has had at least 3 known nest sites in the past; these 3 have become inactive, as the nest and nesting birds, have disappeared over time. The other 6 known sites are on the Mt. Hough Ranger District. There are no known golden eagle nest territories within the Wildlife Analysis Area. Based on annual monitoring reports from 1988 to 1992 the PNF hit a high of 30 golden eagles in 1992. In 2006, six of the nine historic nests sites on the PNF are suspected to be active based on sightings resulting in a current golden eagle population estimated at 12. Monitoring would continue in 2007. Based on past golden eagle numbers and ongoing monitoring of sites, it appears there is a downward population trend for golden eagles on the Plumas NF.

Within the context of the SNFPA bioregion, golden eagle has been lumped into a broad elevational distribution/open habitat use group of raptors; golden eagle primarily foraging in open vegetation types such as grasslands, alpine types, blue oak woodlands and eastside shrub types. Golden eagles rarely forage within the conifer forest zone. Forest management activities likely have minimal or indirect effects to these species because of the use of open, non-forested habitats, although a threat to the golden eagle is the loss of large trees used for nesting (US Forest Service 2001). The majority of nest sites on the Plumas are within trees (7 of 9 known sites). Sightings of golden eagles have been documented throughout the Wildlife Analysis Area. Sightings within the Wildlife Analysis Area are often of individuals soaring high above Grizzly Ridge, Lake Davis and Turner Ridge.

No current population trends for golden eagle were identified in Section 3.2.3 in the SNFPA FSEIS.

Neither nesting nor foraging habitat seems to be a limiting factor for the golden eagle population that inhabits the forested stands on the Plumas, as both are abundant and well distributed across the landscape. Habitat suitability values for selected CWHR types affected by the Proposed Action are listed in Table 3.67.

Table 3.67 Habitat Suitability Ratings for Golden Eagle for Selected CWHR Types within the Freeman Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Golden Eagle (*Aquila chrysaetos*)	Open terrain for hunting rodents and rabbits; includes early successional stage of forest and shrub. Nests in cliffs and large trees in open forest.	SMC1 = 1.0 SMC2 = 1.0 SMC3P = 1.0 SMC4P = 1.0 SMC4M =0.89 SMC4D = 0.78 SMC5P = 1.0 SMC5M = 0.89

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

Environmental Consequences—Golden Eagle

Effects of the Action Alternatives

Direct and Indirect Effect

There are no known golden eagle nesting territories within the Wildlife Analysis Area or project area, thus there would be no direct effect to the population of golden eagles on the Forest. No 30”+ dbh trees would be cut and the largest snags would be retained at a level of three to six snags per acres ≥15” dbh. Thus large perches and potential large nest trees would be present across the landscape at pre-treatment densities.

The Sierra Mixed Conifer (SMC) in all seral stages (SMC1-SMC6) provides for breeding, cover and feeding habitat suitability. The highest habitat suitability for all life requisites achieved are met in the earlier successional, open stages (SMC1, SMC2, 3P and 4P (young/mature tree, <40% canopy cover) This would increase in amount and distribution within the Wildlife Analysis Area with implementation of DFPZs, area thinning with biomass and group selections.

More acres of open forested habitat would be created with the action alternatives, including up to 175 acres of openings as the result of group selection units (depending on alternative) and up to an addition 384 acres of openings as a result of aspen ETZ (Alternative1), thus habitat suitability would theoretically increase. Prey species fed on by golden eagles (rodents and rabbits) could increase with these vegetative treatments, but such responses would be short term. Small openings, averaging about 1.5 acres in size distributed amongst dense forested stands, are probably too small to offer any long-term sustainability of foraging habitat to support a golden eagle nesting territory.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact

Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect golden eagles directly, or any avian and mammalian prey species.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

The Proposed Action would have no effect on known golden eagle nest sites, nor would cause any change in population distribution across the PNF or the Sierra Nevada range.

As the conifer habitat gets older and thicker, habitat suitability of all stages of SMC for foraging declines with canopy cover >60%; as the trees gets thicker with time, suitable foraging habitat declines.

The action alternatives are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. Thus future large openings created by wildfire may be reduced potentially limiting the availability of foraging habitat for golden eagles how hunt rodents and rabbits in early successional environments.

In conclusion, based on the direct, indirect and cumulative effects the Proposed Action and action alternatives would not result in any change in population trends to meet the identified PNF LRMP goal of attaining 20 nesting pairs and would not result in any change in nesting habitat with minor short term improvements in foraging habitat.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct effects to golden eagles with his alternative.

Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat development. It is common on the Plumas to observe golden eagles perched within, as well as soaring over, recent burns (burns up to 15 years in age) that still support a mosaic of open brush habitat that is not closed in, such as >70% canopy (Rotta, personal observation). It is expected that wildland burning would stimulate more grass/forb growth and browse sprout, which should improve forage conditions for prey species, primarily large rodents and rabbits. This increased foraging quantity and quality typically associated with more open forest stands and prescribed fire (Lotan and Brown 1985) that golden eagles prefer. Thus wildfires, which burn in a mosaic leaving residual trees and snags for perches, could be better habitat areas for golden eagles than protected forests.

The existing fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. It is likely that National Forest system lands would burn again, resulting in wildfire setting back successional pattern of vegetation development, creating much more open expanses of foraging habitat for golden eagle than currently exist or that would be created by the action alternatives.

Cumulative effects

This action would have no affect on known golden eagle nest sites, nor would cause any change in population distribution across the PNF or the Sierra Nevada range.

In conclusion, based on the direct, indirect and cumulative effects the No-action alternative would not result in any change in habitat or population trends to meet the identified PNF LRMP goal of attaining 20 nesting pairs.

3.6.5.5 Prairie Falcon (*Falco mexicanus*)

The PNF LRMP requires that the Forest monitor prairie falcon population by documenting occupancy of nest sites and habitat trends in designated areas, involving direct counts of adults and young, at selected nest sites. Selected sites are monitored annually (PNF LRMP Chapter 5, page 5-9).

Affected Environment—Prairie Falcon

Prairie falcons nest on the Plumas NF on rock cliffs within forested habitats throughout the transition and eastside zones. These rock cliffs are often associated with large, open areas. The Plumas NF currently has six known nesting eyries. The Beckwourth RD has five of the six known eyries. Forest Plan monitoring from 1989 to 1992 showed 11 falcons in 1989 and 1990, 15 in 1991. The current estimated population is 12 based on the 6 nesting territories on the Forest which consist of; Red Rock, Dixie, Mapes, Last Chance, Smith and Adams. This population trend indicates a slightly upward to stable population trend for the Plumas.

In 2006, the Plumas conducted monitoring of 30% of the current population at Red Rock and Smith territories. One known site (Smith) is within the Wildlife Analysis Area but approximately a half mile outside of the project area. No nesting activity has been observed at this sight in the last three years however, multiple sighting have been documented throughout the Wildlife Analysis Area. The Red Rock eyrie is active and the Smith eyrie is inactive in 2006.

Within the context of the SNFPA bioregion, the prairie falcon has been lumped into a broad elevational distribution/open habitat use group of raptors. The prairie falcon primarily forages in open vegetation types such as grasslands, alpine types, blue oak woodlands and eastside shrub types. Prairie falcons rarely forage within the conifer forest zone (USDA Forest Service 2001). Forest management activities likely have minimal or indirect effects to these species because of the use of open, non-forested habitats. Habitat suitability values for selected CWHR types affected by the Proposed Action were listed in Table 3.68.

No current population trends for prairie falcon were identified in Section 3.2.3 in the SNFPA FSEIS.

Table 3.68 Habitat Suitability Ratings for Prairie Falcon for Selected CWHR Types within the Freeman Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Prairie Falcon (*Falco mexicanus*)	Requires cliffs for nesting that overlook large open areas; requires open terrain for foraging.	SMC1 = 1.0 SMC2 = 0.78 SMC3P = 0.89 SMC4P = 0.78 SMC4M = 0.78 SMC4D = 0.78 SMC5P = 0.89 SMC5M = 0.78

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

Environmental Consequences

Effects of the Action Alternatives

Direct effects

There is a known prairie falcon territory within the Wildlife Analysis Area and many records of prairie falcon sightings within, or adjacent to, the Wildlife Analysis Area. However, the project area lacks suitable cliff nesting habitat, but there is cliff habitat suitable for nesting adjacent to the project area. Since there is known nesting activity in the Wildlife Analysis Area but no suitable nesting habitat within the project area, project activities would not affect prairie falcons directly. There would be no impact on the population of prairie falcons on the Plumas NF.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect prairie falcon directly, or avian and mammalian prey species.

Indirect effects

Open habitat created by the three proposed action alternatives may cause a shift of avian species diversity within the Wildlife Analysis Area, as birds that favor open habitats would replace those dependent on forested habitats. The majority of these species that would increase would be those that prefer early seral habitats. There would be a shift in use by birds as those species preferring shrub habitats would replace those that preferred mature conifer forest habitats. Small group openings, averaging about 1.5 acres in size, are probably too small to offer any long term sustainability to support a prairie falcon nesting territory or to provide much in the way of open, expansive foraging habitat required by the species.

Even though there is a known prairie falcon eyrie in the Wildlife Analysis Area and multiple sightings of prairie falcons throughout the Wildlife Analysis Area, this potential change in prey availability is expected to have little effect on this species.

Cumulative effect

The action alternatives would have no affect on the known nest sites, nor would cause any change in population distribution across the PNF or the Sierra Nevada range. Since there would be no direct or indirect effect to this species, the action alternatives would not contribute to adverse cumulative effects to habitat or populations of this species.

Effect of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There are no direct, indirect or cumulative effects to this species with this alternative.

3.6.5.6 Trout Group (Family *Salmonidae*)

The PNF LRMP requires that the Forest monitor trout to determine 5-year population and habitat trends in relation to management activities and ensure project compliance with recommended mitigation measures (PNF LRMP Chapter 5, page 5-9). Twenty percent of identified sites are to be monitored annually for trends.

Affected Environment—Trout Group

As MIS, trout represent the habitat requirements of coldwater fish species. Three species of trout are present within the Freeman Wildlife Analysis Area. Rainbow, brown and brook trout are present in Lake Davis and several creeks, including Big Grizzly, Freeman and Cow Creeks (Table 3.69).

All three species of trout are considered game species by the CDFG and are allowed to be taken by the public under the California Sport Fishing Regulations. CDFG still maintains a system of "put-and-take" where catchable sized rainbow trout are stocked in state waters. Trout within the lake and creeks are recruited with natural reproduction and stocking. The State conducts very little stocking in the tributaries anymore around Lake Davis.

Trout habitat on the PNF consists of 1,000 miles of streams and 64 lakes, reservoirs and ponds with an aggregate surface area of about 14,200 acres. The Wildlife Analysis Area supports about 28.5 miles of trout habitat (2.85 % of the PNF total) and one lake at 4,081 acres.

Table 3.69 Perennial Fish Bearing Streams and Lakes

Stream	Miles of Fishery within Wildlife Analysis Area	Type of Fishery
Lake Davis	4,081 acres or 6 area miles	Stocked and resident, rainbow, brook and brown trout fishery- supplemented with stocking by CDF&G
Big Grizzly Creek	9 miles	Resident, self sustaining rainbow/brown trout fishery
Little Grizzly Creek	1 mile	Resident rainbow trout fishery
Freeman Creek	5 miles	Resident rainbow & brook trout fishery
Cow Creek	4 miles	Resident rainbow & brook trout fishery
Dan Blough Creek	½ mile	Resident rainbow trout fishery
Little Long Valley Creek	4 mile	Resident rainbow trout fishery
Blakeless Creek	2 miles	Resident rainbow trout fishery
Oldhouse Creek	3 miles	Resident rainbow & brook trout fishery

Rainbow Trout (*Oncorhynchus mykiss*)

The rainbow trout is a native Californian game species with no official status. It is the most widely distributed and abundant salmonid in California. Suitable habitat for the rainbow trout includes perennial lakes, ponds and steams with cool water temperatures (0-26°C), high oxygen concentrations (can survive oxygen concentrations as low as 1.5-2.0 mg/l, but normally concentrations close to saturation are required for growth) and clean, well oxygenated gravel substrate for breeding (Behnke 1992). Rainbow trout deposit eggs in gravel nests (redds) in the late winter to early summer (February through June). Most eggs hatch within 80 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of redd and depend on yolk for food. Most of the yolk is depleted within 7-15 days and the young trout (fry) emerge from the gravel and begin exogenous feeding. Rainbow trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities. Optimal fry habitat includes cool, clear, fast-flowing permanent streams and rivers where riffles predominate over pools, where there is ample cover from riparian vegetation or undercut banks and where invertebrate life is diverse and abundant (Moyle 2002). Headwaters are extremely important to the overall stream condition and structure, particularly with respect to sediment loading and stream temperature.

Rainbow trout are highly aggressive in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002)

Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

Brook Trout (*Salvelinus fontinalis*)

The brook trout is a non-native game species. The brook trout is the most widely distributed and abundant non-native trout in California. Suitable habitat for the brook trout includes lakes, ponds and steams with cool water temperatures, high oxygen concentrations and clean, well oxygenated gravel substrate for breeding (Elliott and Jenkins 1972). Brook trout deposit eggs in gravel nests (redds) in the late fall to early winter (September through December). Most eggs hatch within 120-150 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of redd and depend on yolk for food. Most of the yolk is depleted within 7-15 days and the young trout (fry) emerge from the gravel and begin exogenous feeding. Brook trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities.

Brook trout are highly aggressive in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002)

Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

Brown Trout (*Salmo trutta*)

The brown trout is a non-native trout in the western hemisphere. It has acquired adaptations to a wide range of habitat conditions. These adaptations include the ability to tolerate higher water temperatures and more turbidity than other trout species. Suitable habitat for the brown trout includes lakes, ponds and steams with cool water temperatures, high oxygen concentrations and clean, well oxygenated gravel substrate for breeding. Brown trout deposit eggs in gravel nests (redds) in the late fall to early winter (September through December). Most eggs hatch within 120-150 days after fertilization, with hatch date dependent on water temperature and spawning date. The newly hatched alevins remain within the interstices of the redd and depend on the yolk for food. Most of the yolk is depleted within 7-15 days and the young trout (fry) emerge from the gravel and begin exogenous feeding. Brown trout mortality rates are often high during the fry life stage. Therefore, fry survival is considered critical to maintaining sustainable population densities (Kalish 2001).

Brown trout are the most aggressive salmonid in California in establishing and defending feeding territories. They are sit-and-wait predators that feed mostly on drifting aquatic organisms and terrestrial insects, but they will also take active benthic invertebrates (Moyle 2002).

Optimal feeding habitat is slow, deep, cool water (pools) downstream from riffle habitat.

Trout population data was taken from seven streams on the PNF from standing stock surveys conducted by the Department of Water Resources from 1988 to 2004. This timeframe runs from adoption of the Forest Plan, 1988 and serves to indicate a trend in trout populations over this 16-year period.

The seven Plumas streams where standing stock surveys were conducted for the trout group include; Hungry Creek, Lights Creek, Red Clover Creek, Ward Creek, Little Last Chance Creek, Big Grizzly Creek and Crystal Creek. Standing stock surveys were conducted at sampling stations within each creek. Each station length varied, but fell within a range of 41 meters to 88 meters. Standing stock surveys were done using the two-count method of Seber and LeCren (1967) or the multiple pass method of Leslie and Davis (1939) with limits of confidence computed using a formula proposed by DeLury (1951). This method was used for the seven streams during all years of the surveys. The results of the population estimates are shown below in Figure 3.9 below. Population estimates (i.e. number of trout per station) for all seven streams were averaged by year and plotted on Figure 3.9. The black trend line indicates an increasing population trend for the trout group on the PNF (USDA Forest Service 2006). Big Grizzly Creek is within the Wildlife Analysis Area and the others are not.

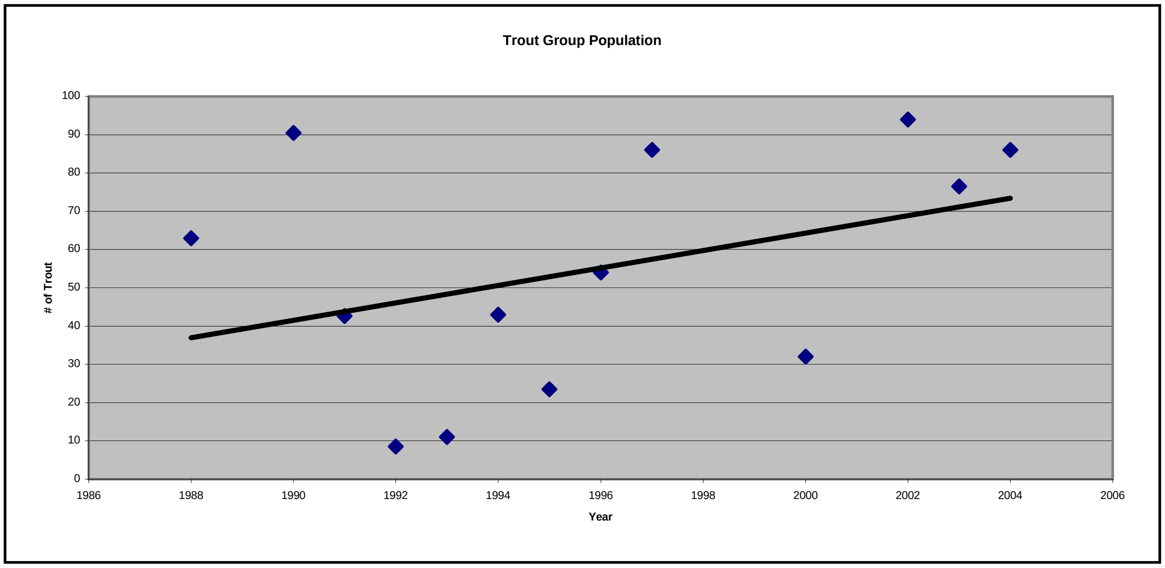

Figure 3.9 Trout group population trend for the Plumas National Forest.

Environmental Consequences—Trout Group

Effects of the Action Alternatives

Direct effects

There is the potential for a loss of individual fish due to harvesting practices within the drainages, but this would be very rare. In general, there would be no direct effect to MIS trout species with implementation of the action alternatives. No group selection would occur within RHCAs. The only mechanical treatment within RHCAs would occur in aspen treatment units and mechanical thin treatment units with an equipment exclusion zone of 25’ to 100’on each side of the stream.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact

Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish. Thus Sporax applied to stumps should not affect fish, or any species that feeds on fish.

Indirect effects

Proposed Actions under Alternatives 1, 3 and 4 should not significantly increase sediment delivery to aquatic habitats and may help reduce sediment transport. Through the design of the action alternatives and by implementation of Standard Operating Procedures (SOPs) for soils and streamside management ground disturbance activities will be minimized. However, fuels reduction harvesting in fish bearing RHCAs could decrease wood available for ground cover and sediment traps in the RHCAs.

The SAT guidelines and BMPs would be followed. Implementation of BMPs designed to minimize upslope erosion, should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats. Equipment exclusion zones will act as buffers designed to trap sediment that may become mobile. Stream restoration work is planned within the project area in 2006. This work will mitigate on going accelerated erosion. All this combined will mean there would be no measurable downstream effects on beneficial uses due to sediment from the proposed action alternatives, thus no indirect effects on MIS fish species will occur downstream.

Fuels reduction harvesting in non-fish bearing RHCAs and on upland slopes would lower risk of future wildfire and reduce the probability that retained snags, woody debris and live vegetation in RHCAs would be consumed by future fire. Fuels reduction harvesting some trees within RHCAs will reduce fuel loading and the potential for a stand replacing fire.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Fuel loads would be significantly reduced by all action alternatives, reducing the potential for high severity wildfires. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic and riparian habitats aquatic MIS fish species require.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. The grazing would continue to have a negative impact on water quality and channel condition (Drake 2006).

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This project would potentially improve the trout fisheries habitat through the restoration of the stream banks and channel.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects thus little to no changes in shading of the RHCAs.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007.

The Personal Use Firewood program on the PNF is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. A 10-year average (1991-2000) indicates that 3,273 permits were issued annually resulting in the annual sale of 10,417 cords of wood on the Plumas. Since 1993 there has been a declining trend in both number of permits and cords sold (for the year 2000, 2,227 permits issued selling 6,392 cords, while in 2003, 819 permits were sold for a total of 2,154 cords). Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed. The effect of this action would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover which would have a nominal affect on the trout group.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. These recreation activities would continue to utilize the trout fisheries in this area.

Treatment to eradicate the Pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate and water quality in all the streams within the Freeman Project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through and use of National Forest lands to lake Davis and it's tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers.

In conclusion, based on the direct, indirect and cumulative effects the Proposed Action and action alternatives would not result in any change in habitat or population trends.

Effects of Alternative 2 (No-action)

Direct effects

There would be no direct effects to trout species or their habitat, as no activities would occur that would cause disturbance to individuals, populations, nor any impacts to the existing habitat conditions.

Indirect effects

All trees providing cover to aquatic and riparian habitats would be retained. In the long-term 25 to 40+ years, accumulations of downed and standing wood in RHCAs, in combination with new vegetation and similar upslope conditions would result in a very high wildfire risk. Dead wood of all sizes in combination with new vegetation would add to fuel loading including fuel ladders. Conditions would be set for fire ignition, spread, crowning and torching of dead and live vegetation in the RHCAs.

Ground cover provided by tree limbs, boles, cones and new vegetation will help reduce soil erosion and sediment delivery to stream channels. Alternative 2 would retain potential materials for ground cover in RHCAs.

Cumulative effects

Existing fuel loads left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burned. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect the aquatic and riparian habitats aquatic MIS species require.

3.6.5.7 Largemouth Bass (*Micropterus salmoides*)

The PNF LRMP requires that the Forest monitor largemouth bass to determine 5-year population and habitat trends in relation to management activities and ensure project compliance with recommended mitigation measures (PNF LRMP Chapter 5, page 5-9). Twenty percent of identified sites are to be monitored annually for trends.

Affected Environment—Largemouth Bass

Largemouth Bass (LMB) are a MIS for Lake Habitat on the PNF and represent the requirements of warm water species. LMB are considered a game species by the CDFG and are allowed to be taken by the public under the California Sport Fishing Regulations. Bass have been introduced by the CDFG into most reservoirs on the Plumas NF with the intent of providing sport fishing opportunities for the public and/or controlling populations of introduced baitfish.

Available LMB habitat on the PNF consists mainly of the 12,900 acres of Lakes, reservoir and pond habitat on the Forest. LMB occupy the following lakes and reservoirs; Antelope Lake, Little Grass Valley Reservoir, Bucks Lake, Butt Valley Reservoir, Round Valley Reservoir, Sly Creek Reservoir, Ponderosa Reservoir, Lake Davis, Frenchman Lake , Lost Creek Reservoir and occur in those portions of the following lakes and reservoirs that border or intrude on National Forest Lands which include Lake Almanor, Lake Oroville and New Bullards Bar Reservoir. LMB are found in low numbers within the North Fork Feather River. The amount of LMB habitat has remained relatively stable as the existing lakes and reservoirs have not undergone any substantial change in habitat conditions. The Wildlife Analysis Area supports about 4,081 acres of LMB habitat (31.6 % of the PNF total) in the form of Lake Davis.

Based on the amount of LMB habitat forest-wide and the fact that much of this habitat has not undergone any substantial changes since the development of the Forest Plan the habitat trend for LMB on the PNF is considered stable.

Largemouth bass, being voracious predators, are extremely vulnerable to angling, which is one of the main reasons they are such popular game fish. This means, however, that in many reservoirs at least half the population of legal-size fish is caught each year. If such fishing is sustained for a number of years, the catch rate declines and the fish caught are, on average, smaller. For this reason size and bag limits on bass are increasingly restrictive and catch-and-release fishing is encouraged. In many reservoirs a decline in bass populations occurs regardless of fishing pressure. Such declines are often associated with reservoir aging. For a variety of reasons, new reservoirs often develop outstanding populations of bass and other game fishes, which gradually decline as the reservoir matures. In some situations the manipulation of reservoir water levels to increase food availability or spawning success may maintain relatively large populations of bass. Such manipulation, however, is seldom possible because it is likely to conflict with uses for which the reservoir was originally intended, such as irrigation and power production (Moyle 2002). However, some hydropower operations, such as recreational white water activities within the North Fork Feather River have the potential to affect the “nests” of this species and lower the productivity of the species.

Data available on file for Largemouth Bass was taken from Lake Davis. Available LMB data was plotted on Figure 3.10 and was taken from 1992 data from a frequency chart of bass sampled at Lake Davis found in the PNF files. 1993 data comes from CDFG sample forms found in the PNF files of bass sampled at Lake Davis. 2002 to 2004 data comes from CDFG Northern Pike website.

Based on the data available from Lake Davis, there appears to be a downward population trend for Largemouth Bass (black trend line). This downward trend at Lake Davis may be attributed to the Northern Pike found in Lake Davis. Efforts to eradicate the Pike at Lake Davis are currently in the planning stage. Removal of Pike at Lake Davis will also result in the removal of LMB. However this population will likely be re-established after treatment of Lake Davis and over time through CDFG stocking efforts to provide a sport fishery for the public.

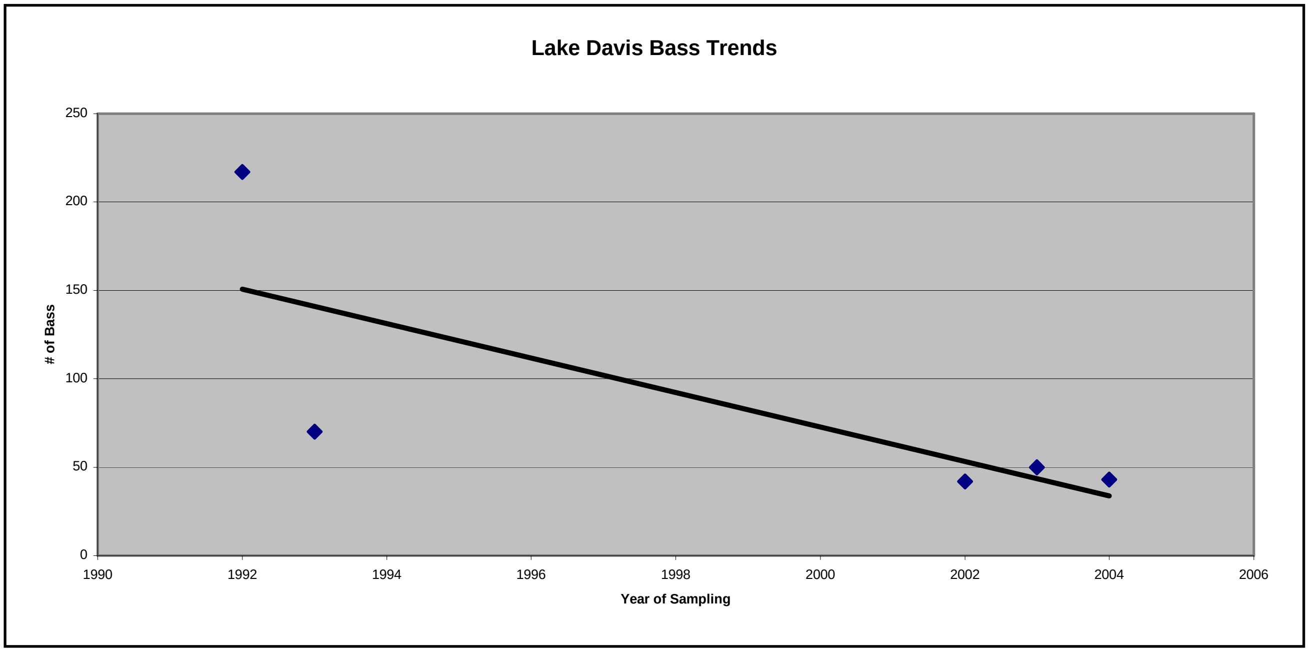

Figure 3.10 Largemouth Bass population trend at Lake Davis, Plumas National Forest.

Environmental Consequences—Largemouth Bass

Effects of the Action Alternatives

Direct effects

In general, there would be no direct effect to the LMB or LMB habitat with implementation of the action alternatives.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish. Thus Sporax applied to stumps should not affect fish, or any species that feeds on fish.

Indirect effects

Proposed Actions under Alternatives 1, 3 and 4 should not significantly increase sediment delivery to aquatic habitats and may help reduce sediment transport. Through the design of the action alternatives and by implementation of Standard Operating Procedures (SOPs) for soils and streamside management ground disturbance activities will be minimized. However, fuels reduction harvesting in fish bearing RHCAs could decrease wood available for ground cover and sediment traps in the RHCAs.

The SAT guidelines and BMPs would be followed. Implementation of BMPs designed to minimize upslope erosion, should serve to minimize sedimentation of the streambed and subsequent degradation of downstream aquatic habitats. Equipment exclusion zones will act as buffers designed to trap sediment that may become mobile. Stream restoration work is planned within the project area in 2006. This work will mitigate on going accelerated erosion. All this combined will mean there would be no measurable downstream effects on beneficial uses due to sediment from the proposed action alternatives, thus no indirect effects on the LMB will occur downstream.

Fuels reduction harvesting in non-fish bearing RHCAs and on upland slopes would lower risk of future wildfire and reduce the probability that retained snags, woody debris and live vegetation in RHCAs would be consumed by future fire. Fuels reduction harvesting some trees within RHCAs will reduce fuel loading and the potential for a stand replacing fire.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Fuel loads would be significantly reduced by all action alternatives, reducing the potential for high severity wildfires. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic and riparian habitats aquatic MIS fish species require.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. The grazing would continue to have a negative impact on water quality and channel condition (Drake 2006).

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This project would potentially improve the LMB fisheries habitat through the reduction of sediment in the stream and lake.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects thus little to no changes in shading of the RHCAs.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007.

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Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. These recreation activities would continue to utilize the LMB fisheries in this area.

Treatment to eradicate the Pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate and water quality in all the streams within the Freeman Project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through and use of National Forest lands to lake Davis and it's tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers. These activities could further reduce or eliminate the LMB population at Lake Davis.

In conclusion, based on the direct, indirect and cumulative effects the Proposed Action and action alternatives would not result in any change in habitat or population trends.

Effects of Alternative 2 (No-action)

Direct effects

There would be no direct effects to LMB or their habitat, as no activities would occur that would cause disturbance to individuals, populations, nor any impacts to the existing habitat conditions.

Indirect effects

All trees providing cover to aquatic and riparian habitats would be retained. In the long-term 25 to 40+ years, accumulations of downed and standing wood in RHCAs, in combination with new vegetation and similar upslope conditions would result in a very high wildfire risk. Dead wood of all sizes in combination with new vegetation would add to fuel loading including fuel ladders. Conditions would be set for fire ignition, spread, crowning and torching of dead and live vegetation in the RHCAs.

Ground cover provided by tree limbs, boles, cones and new vegetation will help reduce soil erosion and sediment delivery to stream channels. Alternative 2 would retain potential materials for ground cover in RHCAs.

Cumulative effects

Existing fuel loads left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burned. Any additional acres burned at high intensity could contribute to increased sedimentation, which would adversely affect the aquatic and riparian habitats aquatic MIS species require.

3.6.5.8 Changes in Habitat Ratings and Values for MIS

Table 3.70 indicates which species would benefit from DFPZs and Group Selection harvest, which species would experience a reduction in habitat values and which species would not see a change in the value of habitat from these activities. In this table, CWHR values for current conditions (no action alternative) are compared with expected changes in habitat that are numerically calculated by the CWHR program. Values were derived from the programmatic HFQLG FEIS analysis and are not specific to this project but changes in HSI are reflective of opening up stands from dense forested stands.

Table 3.70 Changes in Habitat Suitability Index for MIS

Species	% Change in habitat value* with Action Alternatives from Existing condition (Alt 2): DFPZ	% Change in habitat value* with Action Alternatives from Existing condition (Alt 2): Group Selection
Deer	+23%	+10%
Golden Eagle	+6%	+9%
Prairie Falcon	+5%	+28%

*Values taken from HFQLGFRA FEIS analysis. Values above are an indicator of potential trends in habitat suitability, within treated areas, for the listed MIS with implementation of Alternatives 1, 3 and 4.

3.7 Supplemental Wildlife Report

3.7.1 Introduction

This report documents the effects of the Proposed Action (Alternative 1), No-action (Alternative 2) and two other action alternatives (Alternatives 3, 4) on selected Neotropical Migratory Birds (NTMB), the woodpecker group, the gray squirrel and the willow/alder community as a result of implementation of the Freeman Project. Description of the Freeman Project and all alternatives is found in Chapter 2 of the Freeman Project Environmental Impact Statement. General effects of the Proposed Action and the action alternatives (in terms of impacts to various CWHR types as a result of implementing fuel reduction, group selection, individual trees selection and biomass removal) has been described in detail in the Freeman Fuel Treatment, Group Selection and ITS Project BA/BE (Nickerson, 2006). This report tiers to that document.

3.7.2 Current Management Direction

Under the Code of Federal Regulations (36CFR219), Subpart A—National Forest System Land and Resource Management Planning:

> Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning area.

The Migratory Bird Treaty Act (16 U.S.C. §§ 703-712, July 3, 1918, as last amended in 1989) implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the act, taking, killing, or possessing migratory birds, including nests and eggs, is unlawful. The species protected by this law extend beyond those normally considered migratory, to include species that occur in the U.S. and the other neighboring countries at some point during their life cycle.

In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act (66 FR 3853-3856). The executive order directs federal agencies to work with the FWS to promote conservation of migratory bird populations.

To help implement the executive order, the Forest Service and FWS entered into an interim memorandum of understanding (MOU) having the purpose of strengthening migratory bird conservation through enhanced collaboration between the two agencies in coordination with state, tribal and local governments. Although this interim MOU expired on January 15, 2003, the conservation measures that it contained are still applicable for use in environmental planning today. The MOU continues to provide guidance for the two federal agencies until more detailed direction is developed pursuant to the executive order.

Project level Neotropical Migratory Bird (NTMB) Selection and Project-level effects analysis for the Freeman Project is based the PSW (Region 5) Land Bird Monitoring Implementation Plan (USDA Forest Service 1996), the SNFPA FEIS, APP. R and the SNFPA FSEIS (chapter 3, page

173). All Threatened, Endangered and Sensitive (TES) species are discussed in the project Biological Evaluation/Biological Assessment (BE/BA). All Management Indicator Species (MIS) are discussed in the project Management Indicator Species report. All Migratory Birds (MB), woodpeckers, gray squirrels and the willow/alder community analyzed in this report have habitat that would be affected (directly or indirectly) by the Freeman Project. A description of all alternatives can be found within the Freeman BE/BA or EIS.

3.7.3 Scope of Analysis

Geographic Analysis Areas: The proposed treatment area is located in predominately Sierra mixed conifer forest habitat. The Treatment Area is defined as the units to be treated. This includes approximately 3,066 acres of DFPZ, 2,727 acres of Area Thinning, up to 175 acres of group selections and access roads to the groups. The **project area** is defined as the treatment area plus an additional larger land base which encompasses all of the treatment area. This project area is located at elevations ranging from 5,600 feet at Humbug Creek to 7,693 feet at Smith Peak. For the purpose of this Supplemental Wildlife report, the **Wildlife Analysis Area** is defined as the project area and treatment area plus an additional larger land base. The additional larger land base was determined by potential indirect and cumulative effects on California spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. So the Wildlife Analysis Area goes out to and encompasses the closest PACs/HRCAs to the project area. The Wildlife Analysis Area totals approximately 46,039 acres (Figure 3.11) of which 41,388 acres are National Forest Lands. This Wildlife Analysis Area is also being used for all other wildlife species analyzed in this Supplemental Wildlife report since the effects of the project to those species will not extend beyond the analysis area boundary for the California spotted owl. All direct, indirect and cumulative effects discussed, occur within this 46,039 acre Wildlife Analysis Area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to Neotropical Migratory Birds (NTMB), woodpeckers, gray squirrels and the willow/alder community and there habitat.

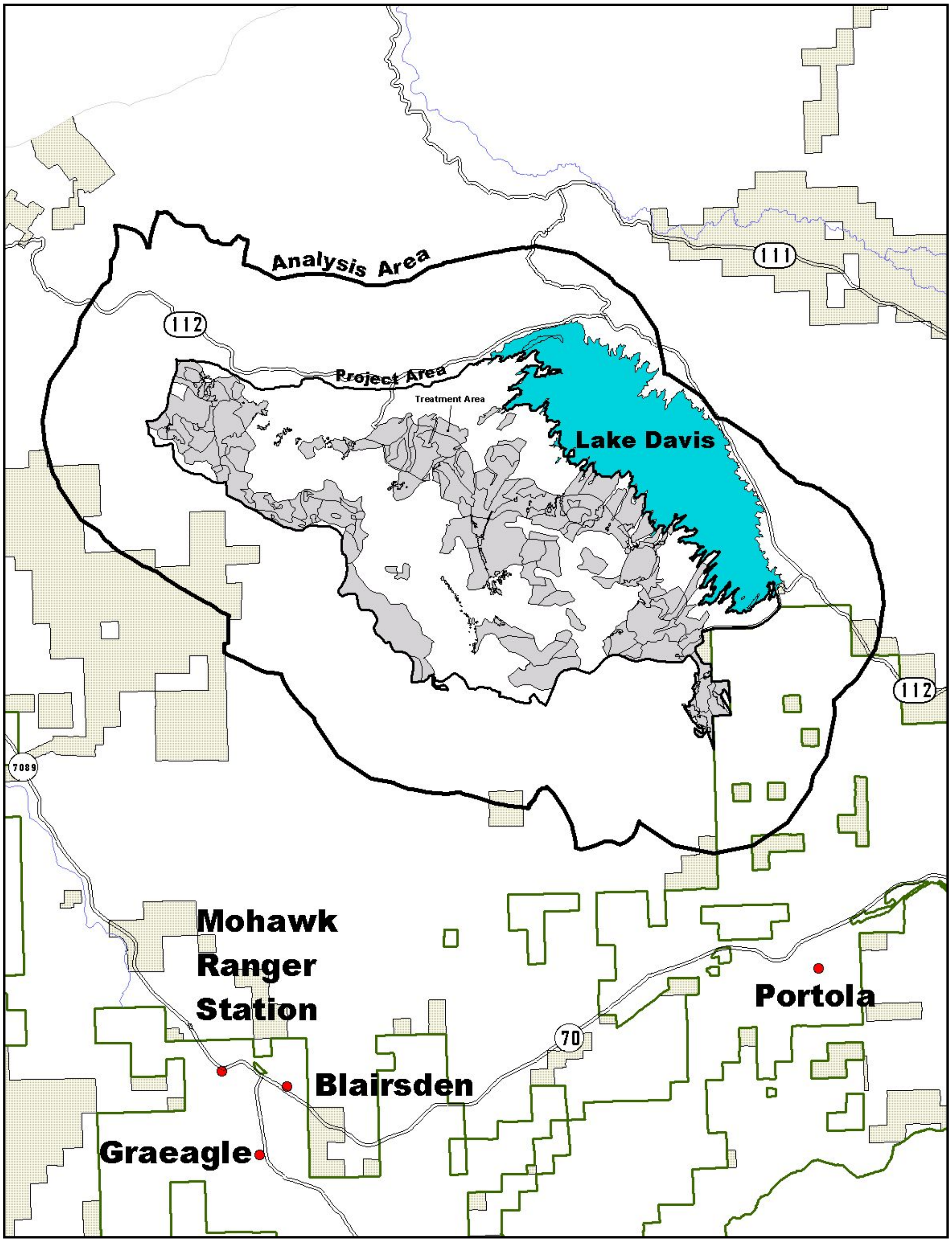

Figure 3.11 Freeman Wildlife Analysis Area, project area and Treatment Area (solid color).

The Wildlife Analysis Area developed for the Freeman Project overlaps the Happy Jack Wildlife Analysis Area developed for the Happy Jack project (FY07 project) by about 2,006 acres near Happy Valley. No Happy Jack treatments (DFPZ, area thinning or group selection units) occur within the Freeman Wildlife Analysis Area; no Freeman treatments occur within the Happy Jack Wildlife Analysis Area.

Timeframe for Analysis: The timeframe used for determining cumulative effects depends on the length of time that lingering effects of the past actions would continue to impact the species in question. For the Freeman Project, general information based on the history of the area and sight specific information based on available data, going back approximately 25 years and forward approximately 5 years, was incorporated.

3.7.4 Analysis Methods

The Freeman Project was reviewed using aerial photographs, digital orthophoto quadrangles (DOQs), vegetation layer spatial datasets, species specific spatial datasets and known information to help determine the potential presence of NTMB species (i.e. Swainson's thrush, Lazuli bunting etc.), woodpeckers, gray squirrels and the willow/alder community. In the field, while conducting protocol surveys for TES species, any observations of NTMB species, woodpeckers, gray squirrels, or the willow/alder community are documented on 1:24000 scale quad maps. Species nest sites and locations are then incorporated into spatial datasets based on the mapped locations or Global Positioning System (GPS) points. For the analysis of effects, changes to suitable habitat were determined by using a spatial dataset of the vegetation layer combined with type of treatments (i.e. mechanical thinning, grapple piling, hand thinning, etc).

3.7.5 Affected Environment—General

The California Wildlife Habitat Relationships (CWHR) system was designed to be a planning tool to predict wildlife species habitat suitability for geographic locations and habitats in California. The CWHR system provides species' habitat suitability ratings for breeding, feeding and cover, in varying habitat types and seral stages. These suitability ratings are converted to numeric values and the three values are averaged to calculate overall habitat values for each habitat type and seral stage for each particular species. The CWHR system can be used to predict differences in habitat values between two habitat conditions and can indicate which species may be using habitat within a project area, as well as which may be negatively or positively affected by management actions, based on differences in habitat values between two habitat conditions. These values are not absolutes; they only provide an indicator of potential use of habitat by the species. CWHR Numerical values used in the system are: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence. Ratings were developed assuming that all special habitat elements were present in adequate amounts. Habitat suitability ratings for the selected Sierran Mixed Conifer (SMC) CWHR seral stages within the Freeman Wildlife Analysis Area are provided for terrestrial NTMB species, woodpecker group, gray squirrels and the willow/alder community.

For the Freeman Wildlife Analysis Area the representative CWHR vegetation types are listed below in Table 3.71. Existing condition CWHR types were derived from vegetation layer (GIS) and 2000 aerial photo interpretation. Field analysis provided the basis for adjustments to the vegetative landbase.

Table 3.71 Summary of CWHR habitat types and acres within Wildlife Analysis Area from the vegetation layer (all acres are approximate and National Forest System Lands only)

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
AGS	1,045		PGS	2,258
ASP1M	11		PPN1	0
ASP1P	8		PPN3M	29
ASP1S	0		PPN3P	34
ASP2D	1		PPN3S	23
ASP2M	8		PPN4M	64
ASP2P	52		PPN4P	31
ASP2S	2		PPN4S	139
ASP3D	10		PPN5S	2
ASP3M	137		RFR1	0
ASP3P	151		RFR2S	398
ASP3S	11		RFR3D	50
ASP4P	14		RFR3M	23
BAR	201		RFR3P	27
EPN1	0		RFR3S	6
EPN2M	0		RFR4D	190
EPN2S	14		RFR4M	292
EPN3M	57		RFR4P	83
EPN3P	105		RFR4S	90
EPN3S	0		RFR5D	521
EPN4D	940		RFR5M	44
EPN4M	3,011		SGB	398
EPN4P	733		SGB1X	15
EPN4S	31		SGB3P	0
EPN5D	129		SMC1	27
EPN5M	783		SMC2D	4
EPN5P	73		SMC2M	17
JPN1	0		SMC2P	49
JPN2S	34		SMC2S	662
JPN3M	2		SMC3D	184
JPN3P	17		SMC3M	222
JPN3S	6		SMC3P	466
JPN4M	18		SMC3S	40
JPN4P	6		SMC4D	2,844
JPN4S	57		SMC4M	7,497
LAC	13		SMC4P	2,002

CWHR Type*	Wildlife Analysis Area		CWHR Type*	Wildlife Analysis Area
LPN1	0		SMC4S	129
LPN2S	56		SMC5D	2,418
LPN3D	29		SMC5M	1,382
LPN3M	48		SMC5P	170
LPN3P	53		SMC5S	35
LPN3S	6		SMC6D	94
LPN4D	284		Water	3,692
LPN4M	702		WFR1	0
LPN4P	223		WFR2S	153
LPN5D	144		WFR3D	286
LPN5M	0		WFR3M	132
MCP	460		WFR3P	45
MCP1X	103		WFR3S	83
MCP2X	4		WFR4D	1,319
MCP3M	8		WFR4M	1,423
MCP3P	0		WFR4P	338
MHC1	0		WFR4S	34
MHC3S	6		WFR5D	194
MHC4M	100		WFR5M	597
MHC4P	0		WFR5P	118
MHC5M	0		WTM	69
MRI	44		**Grand Total**	**41,388**

*1=Seedlings <1" diameter at breast height (dbh.), 2=saplings 1-6" dbh, 3=poles 6-11" dbh, 4=small 11-24" dbh, 5=medium/large >24" dbh.
D= Dense Canopy Cover > 60%, M= Moderate Canopy 40-59%, P= Open Canopy Cover 25-39%, S=Sparse Canopy 10-24%.
AGS = Annual Grassland, ASP = Aspen, BAR = Barren, EPN = Eastside Pine, JPN = Jeffrey Pine, LAC = Lacustrine, LPN = Lodgepole Pine, MCP = Montane Chaparral, MHC = Montane Hardwood-Conifer, MRI = Montane Riparian, PGS = Perennial Grassland, PPN = Ponderosa Pine, RFR = Red Fir, SGB = Sagebrush, SMC = Sierran Mixed Conifer, WFR = White Fir, WTM = Wet Meadow.

The CWHR habitat types present within the Wildlife Analysis Area are reflective of those found within the westside mixed conifer and consist of Sierra Mixed Conifer, White fir, Red fir, Lodgepole Pine, Ponderosa Pine and Montane Riparian/ Meadow. All habitat types are described in *A Guide to Wildlife Habitat of California*, California Department of Forestry and Fire Protection, October 1988 (Mayer et al 1988).

3.7.5.1 Neotropical Migratory Birds

Affected Environment—Neotropical Migratory Birds

Neotropical Migratory Birds (NTMB) are defined as species whose breeding area includes the North American temperate zones and that migrate in many cases south of the continental United States during non-breeding seasons (Hunter et al 1993). The Breeding Bird Survey (BBS) coordinated by the US Fish and Wildlife Service indicates that certain populations of NTMB species in California have been declining over the past 33 years (2003 data). Although there appear to be multiple causes for declines, habitat fragmentation and decreases in habitat quantity and quality, caused by changes in land use, seem to be largely responsible (Sherry and Holmes 1993, Terborgh 1992).

Saab and Rich (1997) found that Neotropical migrant species with decreasing population trends tend to be those which nest in shrub layers and species with increasing population trends tend to nest in tree canopies. Within the 1996 RDEIS Managing California Spotted Owl Habitat in the Sierra Nevada National Forests of California: An Ecosystem Approach, a summary table of Sierran Neotropical Migratory Bird species with measurable population declines based on Breeding Bird Surveys conducted in coordination with the U.S. Fish and Wildlife Service indicates that 32 species showing population declines have some habitat association with grassland/shrubland/open forest and/or riparian.

The PSW (Region 5) Land Bird Monitoring Implementation Plan (USDA Forest Service 1996) identified certain migratory birds as having a high priority for monitoring and mitigation efforts. Within the SNFPA FEIS, terrestrial birds were classified as having high, moderate and low vulnerability (high vulnerability species are at greatest risk to loss of viability within the Sierra Nevada bioregion (SNFPA FEIS, APP. R). Forty land bird species (not all neo-tropical migrants) that are of particular concern and are a high priority for monitoring efforts in the Sierra Nevada bioregion were identified within the SNFPA FSEIS (chapter 3, page 173). Twelve neo-tropical migrants identified on this list are analyzed below.

Table 3.72 provides a list of selected species that occur within the analysis area that are included in the above-mentioned categories. They have been grouped according to habitat type. Some species fall into more than one group. The assumption is that, if the effects on several species within one group are analyzed, the effects on all species that belong to that group are analyzed.

Table 3.72 CWHR Suitability Ratings for Selected High Priority Migratory Birds within the Wildlife Analysis Area

Habitat Group	Species	Key Habitat Features	CWHR Suitability Rating*
Open Water Obligate			
	Osprey (*Pandion haliaetus*)	Uses large snags and trees near fish-bearing river or lake[1]	SMC1 = 0.11 SMC2 = 0.22 SMC3P = 0.55 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.89 SMC5P = 0.89 SMC5M = 0.89
Riparian Bird Assemblages			
	Belted kingfisher (*Ceryle alcyon*)	Usually excavates a burrow in a steep bank of sandy or other friable soil for nest, usually near water, but can be up to 1 mile away[1]	No values for SMC
	Swainson's thrush (*Catharus ustulatus*)	Rare in Sierras; prefers large tree (>24" dbh), moderate to dense (>40% canopy closure) stands; nest is an open cup in willow or alder, 2-20 feet above ground; eats mostly insects and spiders in litter under shrubs or on forest floor; gleans from shrubs; rarely flycatches[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0 SMC4P = 0 SMC4M = 0.55 SMC4D = 0.55 SMC5P = 0 SMC5M = 0.55
	Warbling vireo (*Vireo gilvus*)	Prefers small to large tree (>6" dbh), sparse to moderately dense (<70% canopy closure) stands; frequents wooded areas with tall trees, open to intermediate canopy and a substantial shrub understory; nest usually 4-12 feet above ground; gleans insects and spiders from foliage; sometimes eats aerial insects[1]	SMC1 = 0 SMC2 = 0.33 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.89
	Yellow warbler (*Dendroica petechia*)	Prefers small to medium tree (6-24" dbh), open to moderate (20-69% canopy closure) stands; substantial shrub understory usually present; nest is an open cup 2-16 feet above ground in a deciduous sapling or shrub; gleans and hovers for insects and spiders; occasionally eats aerial insects [1]	SMC1 = 0 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.89 SMC4D = 0.66 SMC5P = 0.55 SMC5M = 0.55
	Yellow-breasted chat (*Icteria virens*)	Prefers sapling tree (<6" dbh), moderate to dense (>40% canopy closure) stands; nest usually 2-8 feet above ground in dense brush along stream or river; gleans insects and berries from foliage[1]	No values for SMC

Habitat Group	Species	Key Habitat Features	CWHR Suitability Rating*
	White-crowned sparrow (*Zonotrichia leucophrys*)	Breeds in montane meadows and along stream courses with shrubs or conifers; seed-eater; nest on ground or at base of shrub or on limb, usually within 1.3 feet of ground; winters in open areas near shrubs or other cover; eats primarily seeds; also eats insects; feeds on ground[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Brush Species			
	Common poorwill (*Phalaenoptilus nuttallii*)	Inhabits all stages of shrub areas, preferring clearings and open stages for foraging; insects for prey; nest is a scrape on the ground; feeds on insects caught in the air, also some on insects on the ground[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0.33 SMC4M = 0.11 SMC4D = 0.11 SMC5P = 0.33 SMC5M = 0.11
	Lazuli bunting (*Passerina amoena*)	Occupies open brush lands and thickets of willows, other shrubs or trees, tall weeds, or vines; eats insects and seeds taken from foliage or ground; sometimes takes aerial insects; nest usually 1.5-4 feet above ground[1]	SMC1 = 0.11 SMC2 = 0.33 SMC3P = 0.33 SMC4P = 0 SMC4M = 0 SMC4D = 0 SMC5P = 0 SMC5M = 0
Forest Species			
	Olive-sided flycatcher (*Contopus cooperi*)	Prefers large tree (>24" dbh) stands; most numerous in montane conifer forest where tall trees overlook canyons, meadows, lakes, or other open terrain; nests 5-70 feet above ground; feeds on aerial insects, especially honey bees[1]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.77 SMC4P = 0.77 SMC4M = 0.77 SMC4D = 0.77 SMC5P = 1.0 SMC5M = 1.0
	Western wood-peewee (*Contopus sordidulus*)	Prefers medium to large tree (>12" dbh) stands; most numerous in woodlands or forests, with sparse to moderate canopy cover, which border on meadows, streams, lakes and other moist, open areas; nest usually 13-80 feet above ground; feeds mostly on flying insects; occasionally gleans insects from foliag[1]	SMC1 = 0.33 SMC2 = 0.44 SMC3P = 0.77 SMC4P = 1.0 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
	Red crossbill (*Loxia curvirostra*)	Prefers large tree (>24" dbh), open to moderate (20-69% canopy closure) stands; availability of mature conifer seeds more important than kind of conifer; in Sierra Nevada, most numerous where conifer canopy with open to moderate canopy border meadows, lakes, or streams; nests 5-80 feet above ground, usually high up[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0.22 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.77 SMC5M = 0.77

Habitat Group	Species	Key Habitat Features	CWHR Suitability Rating*
	Evening grosbeak (*Coccothraustes vespertinus*)	Prefers medium to large tree (>12” dbh), moderate to dense (>40% canopy closure) stands; usually nests in forests dominated by firs; most important foods are seeds of fir, pine and other conifers and buds of hardwoods such as oak, willow and maple; usually nests more than 35 feet above ground, but can nest 7-100 feet above ground[1]	SMC1 = 0 SMC2 = 0.11 SMC3P = 0.22 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 0.77 SMC5M = 1.0
	Vaux’s swift (*Chaetura vauxi*)	Prefers large tree (>24” dbh), moderate to dense (>40% canopy closure) stands; feeds exclusively on flying insects [1]; minimum tree size for nesting is 20” dbh; minimum nesting height is 31 feet [2]	SMC1 = 0.44 SMC2 = 0.44 SMC3P = 0.44 SMC4P = 0.44 SMC4M = 0.44 SMC4D = 0.44 SMC5P = 0.44 SMC5M = 0.44
	Western bluebird (*Sialia mexicana*)	Prefers medium to large tree (>12” dbh), open (<40% canopy closure) stands; usually nests in old woodpecker cavity in snag, tree, or stump; availability of snags frequently limits population density; captures insects on ground or foliage; occasionally eats aerial insects[1]	SMC1 = 0.22 SMC2 = 0.22 SMC3P = 0.33 SMC4P = 0.66 SMC4M = 0.44 SMC4D = 0 SMC5P = 0.66 SMC5M = 0.44
	Band-tailed pigeon (*Columba fasciata*)	Prefers medium to large tree (>12” dbh) stands; prefers multi-layered forests with a light understory; dense thickets often used for breeding; feeds on acorns and fruits of several species[1]	SMC1 = 0 SMC2 = 0 SMC3P = 0.55 SMC4P = 0.77 SMC4M = 1.0 SMC4D = 1.0 SMC5P = 1.0 SMC5M = 1.0
Forest and Grassland Species			
	Common nighthawk (*Chordeiles minor*)	Prefers open (<40% canopy closure) stands; breeders most common where suitable nesting sites (e.g., barrens, burns, lava flows) occur near favorable foraging areas (e.g., meadows, lakes, other mesic, insect-rich habitats); eats aerial insects; lays eggs on bare ground; trees usually in vicinity of nest[1]	SMC1 = 1.0 SMC2 = 0.89 SMC3P = 0.89 SMC4P = 0.89 SMC4M = 0.33 SMC4D = 0.33 SMC5P = 0.89 SMC5M = 0.33
	Chipping sparrow (*Spizella passerina*)	Prefers open (<40% canopy closure) stands; frequents woodlands with sparse herbaceous cover and few shrubs, if any, for breeding; often forages in open shrub or grassland habitat nearby; gleans insects and seeds from ground and foliage; usually nests 1-6 feet above ground[1]	SMC1 = 0.55 SMC2 = 0.75 SMC3P = 0.89 SMC4P = 1.0 SMC4M = 0.66 SMC4D = 0.33 SMC5P = 0.66 SMC5M = 0.66

*CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

[1]California Department of Fish and Game 2005 and CWHR Version 8.1

[2]Thomas et al. 1979.

In 2001, Executive Order 13186 was issued to outline responsibilities of federal agencies to protect migratory birds under the Migratory Bird Treaty Act (66 FR 3853-3856). This order directs federal agencies to work with the USFWS to promote conservation of migratory bird populations. The Forest Service and the USFWS entered into an interim memorandum of understanding (MOU) to strengthen migratory bird conservation. This interim MOU expired on January 15, 2003, yet the conservation measures that are contained within the MOU are still applicable for use in environmental planning (SNFPA FSEIS 2004, Ch. 3, p.172). The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities as authorized by Congress may result in the take of migratory birds and that short-term negative impacts are balanced by long-term benefits.

Environmental Consequences–Neotropical Migratory Birds

Effects of the Action Alternatives

Direct, Indirect and Cumulative effects

Actions that open up forest stands thru thinning, such as with the proposed DFPZ - thinning prescriptions and Area Thinning with biomass removal, would result in projected increases in habitat trends for several species listed in Table 3.72 (warbling vireo, chipping sparrow, lazuli bunting, white-crowned sparrow, western bluebird, common nighthawk and common poorwill). These species respond favorably to opening up the forested canopy, allowing for increased understory plant diversity. Of the birds listed in Table 3.72, Swainson’s thrush appears to be adversely affected by thinning that convert closed forested stands to open forested stand. Olive-sided flycatcher and evening grosbeak also appear to have projected decrease in habitat suitability. Most of the rest of the species have changes in habitat suitability that are relatively neutral. Alternative 3 would create less open stands across the analysis area and subsequently maintains more habitats for the Swainson’s thrush, olive- sided flycatcher and evening grosbeak.

Actions that create openings within the forested landscape with group selection harvests and aspen extended treatment zones (ETZs) (Alternative 1) to the point that they have projected declines in species habitat trends include osprey, Swainson’s thrush, warbling vireo, yellow warbler, western wood-peewee, evening grosbeak, red crossbill and band-tailed pigeon. Approximately 3 species listed in Table 3.72 have projected increase in habitat suitability. That is they respond favorably to habitat conditions that create small gaps in the forest landscape (white-crowned sparrow, lazuli bunting and common nighthawk).

It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by Neotropical bird species. Alternative 1 creates 175 acres of groups across approximately 3,966 available acres of mechanical harvest treatment area equaling a group density of approximately 4.4%. Alternative 3 creates 175 acres of groups across 3,723 acres of mechanical harvest treatment area equaling a group density of approximately 4.7%, while

Alternatives 4 creates fewer acres of groups (174 acres) across 4,514 acres of mechanical harvest treatment area equaling a group density of approximately 3.9%. Thus groups are more dispersed across the landscape with Alternatives 4 than with Alternatives 1 & 3, with groups more clumped in the landscape with Alternative 3. Within stand fragmentation caused by high density placement of groups would increase edge effects created by groups, reducing effective interior forest habitat and potentially create unsuitable forest interior habitat within that planning area for certain neotropical migrants. Neotropical migrants favoring forest interior habitat (Swainson's thrush, western wood-peewee, evening grosbeak, red crossbill and band-tailed pigeon) would have reduced habitat capability with all action alternatives implementing groups and aspen ETZs (Alternative 1), with alternative 3 & 4 providing overall more interior forest between groups than alternative 1.

The cumulative effect of Group Selections, aspen ETZs (Alternative 1), area thin treatments w/biomass removal and DFPZs on forested conditions supporting Neotropical birds listed in Table 3.72 would be that habitat capability would overall be improved for birds that prefer openings and open canopied habitat across the landscape. Based on the CWHR model Swainson's thrush, evening grosbeak and red crossbill would have decreased habitat suitability. The remainder of the listed birds are relatively unaffected by the proposed action alternatives.

In addition to habitat modification and its affect on Neotropical migratory birds, direct effects on nesting birds can occur as a result of tree removal, mastication and prescribed burning, killing young birds in the nest that cannot fly. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. It is unknown as to what the overall effect on Neotropical migrant species populations might be.

As mentioned earlier, increasing the amount of open forest, as well as small openings and increased edge may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence within the National Forest portion of the Wildlife Analysis Area has been documented. Three active livestock grazing allotment are present within the Wildlife Analysis Area. Some facilities that are often associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are present. Because cowbirds are present in the Wildlife Analysis Area there is some risk that brood parasitism could increase above existing levels within the Wildlife Analysis Area as cowbirds respond to increased open habitat and edges.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect Neotropical migratory birds.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There would be no direct effect to Neotropical birds with this alternative.

Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat maintenance and development. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. Any additional acres burnt would likely result in the loss of the largest trees and snags, an increase in large scale fragmentation of forested landscapes, loss of large riparian structures and simplification of habitat diversity.

Some Neotropical migrants utilize early successional habitats that develop following wildfire. These early successional habitats would be at a much larger, homogenous pattern across landscapes as a result of wildfire; smaller, more heterogeneous patterns and patch sizes of this habitat would be created with the action alternatives, which should improve the distribution of this habitat type within the landscape (USDA Forest Service 2004).

3.7.5.2 Woodpecker Group (Family *Picidae*)

The PNF LRMP requires that the Forest monitor snags to ensure compliance with Forest Standards & Guidelines for snags by conducting sample counts on snags in project areas annually on selected projects (PNF LRMP Chapter 5, page 5-9).

Affected Environment—Woodpecker Group

The condition of snag-dependent species is indicated by the woodpecker group, which includes 10 species on the PNF. Current management for woodpeckers consists of applying a specific snag retention standard for the land allocation identified by the SNFPA. It is assumed that if this snag standard were met, viable populations of snag-dependent species would result.

Most all species of woodpeckers will utilize dead trees within both open and dense forested stands for foraging. Several woodpecker species can successfully utilize early seral, shrub-dominated habitats for nesting provided that snags of suitable size are present. These species include Northern flicker (*Colaptes auratus*), Lewis woodpecker (*Melanerpes lewis*) and hairy woodpecker (*Picoides villosus*). Other species require some form of live tree cover surrounding snag habitat for nesting (pileated woodpecker (*Dryocopus pileatus*), white-headed woodpecker (*Picoides albolarvatus*) and downy woodpecker (*Picoides pubescens*) as well as Williamson’s sapsucker (*Sphyrapicus thyroideus*)).

Current population trends for certain woodpeckers were identified in Section 3.2.3 in the SNFPA FSEIS: Stable (hairy woodpecker, Northern flicker), possibly decreasing to decreasing (pileated woodpecker, red-breasted sapsucker (*Sphyrapicus ruber*)) and possibly increasing (white-headed woodpecker).

Snags/Logs

Snags, particularly large ones (>24 inches dbh), are an important wildlife habitat component of forested stands. They provide habitat for primary cavity nesters such as woodpeckers and secondary cavity nesters such as flying squirrels and some Neotropical migratory birds, including the western bluebird (*Sialia mexicana*), violet-green swallow (*Tachycineta thalassina*), Vaux's swift (*Chaetura vauxi*) and American kestrel (*Falco sparverius*). Snags are also the main source of large downed woody debris. Past management practices, including logging, firewood cutting, road construction and other activities, have probably led to a decline in the number of large diameter snags in the Wildlife Analysis Area, with a detrimental effect on associated wildlife species. By contrast, it is likely that small diameter snags have increased somewhat due to the creation of densely stocked stands and resulting mortality, with a subsequent benefit to wildlife that use small-diameter snags.

The PNF LRMP, amended by the 2004 SNFPA FSEIS, Table 3.2, provides direction for snag densities. The proposed action alternatives would retain three to six of the largest snags per acre where they exist. Dead trees less than 15" dbh, for the most part, would be removed from all treatment areas. Snags that pose a hazard to operability would be removed.

Selected woodpecker species that could be present within the Freeman Wildlife Analysis Area, are presented in Table 3.73. CWHR suitability ratings are provided for selected Sierra Mixed Conifer types that would increase and or decrease with the action alternatives.

Table 3.73 CWHR Suitability Ratings for Selected Woodpeckers within the Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Pileated Woodpecker* (*Dryocopus pileatus*)	Prefers medium to large tree (>12" dbh), moderate to dense (>40% canopy closure) stands[1]; at least 0.14 snags/acre >20" dbh for maximum populations[2].	SMC1 = 0.0 SMC2 = 0.0 SMC3P = 0.33 SMC4P = 0.33 SMC4M =0.66 SMC4D = 0.66 SMC5P = 0.66 SMC5M = 1.0
Lewis's Woodpecker (*Melanerpes lewis*)	Open stands; forages primarily on insects in spring and summer—60% aerial feeding, 30% ground-feeding, 10% foliage gleaning; late summer and fall, berries and fruits; winter, acorns [1]; at least 1.01 snags/acre >12" dbh for maximum populations [2]	SMC1 = 0.33 SMC2 = 0.55 SMC3P = 0.67 SMC4P = 1.0 SMC4M = 0.66 SMC4D = 0.33 SMC5P = 1.0 SMC5M = 0.66

Species	Key Habitat Features	CWHR Suitability Rating**
Williamson's Sapsucker (*Sphyrapicus thyroideus*)	Prefers medium to large tree (>12" dbh) stands; would use project area for wintering (nests at higher elevations); drinks sap and eats cambium from holes drilled into conifers; gleans insects from trunks and, to a lesser extent, drills for wood-boring insects[1]; at least 1.5 snags/acre >12" dbh for maximum populations[2]	SMC1 = 0.0 SMC2 = 0.0 SMC3P = 0.0 SMC4P = 0.66 SMC4M = 0.66 SMC4D = 0.44 SMC5P = 0.89 SMC5M = 0.89
White-headed Woodpecker (*Picoides albolarvatus*)	Prefers medium to large tree (>12" dbh) stands; often nests near edges of roads, natural openings, or small clearings; eats seeds and insects; gleans insects from needles or picks them from under bark flakes[1]; uses snags at least 24" dbh for nesting; at least 2.25 snags/acre >10" dbh for maximum populations[2]	SMC1 = 0.22 SMC2 = 0.33 SMC3P = 0.44 SMC4P = 0.55 SMC4M = 1.0 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0
Red-breasted Sapsucker* (Sphyrapicus ruber)	Prefers large tree (>12" dbh), sparse to moderately dense (<70% canopy closure) stands; typically nests near stream or meadow; eats insects from holes drilled usually in hardwoods, aerial insects, sap and cambium[1]; once part of yellow-bellied sapsucker species; snag requirements for yellow-bellied sapsucker (determined before species were separated) were at least 1.5 snags/acre >10" dbh for maximum populations[2]	SMC1 = 0.44 SMC2 = 0.55 SMC3P = 0.66 SMC4P = 1.0 SMC4M = 0.89 SMC4D = 0.55 SMC5P = 1.0 SMC5M = 0.89
Downy Woodpecker* (*Picoides pubescens*)	Closely associated with riparian softwoods; frequents open hardwood and conifer habitats; eats beetles, ants, berries, fruits, nuts[1]; snag densities should be at least 3.0 snags/acre >6" dbh for maximum populations[2]	SMC1 = 0.11 SMC2 = 0.22 SMC3P = 0.55 SMC4P = 0.55 SMC4M = 0.44 SMC4D = 0.33 SMC5P = 0.55 SMC5M = 0.44
Hairy Woodpecker* (*Picoides villosus*)	Uses relatively open or patchy stands of large, mature (>12" dbh) trees and snags of sparse to moderate density[1]; snag densities should be at least 1.8/acre > 10 inches dbh for maximum populations[2]	SMC1 = 0.22 SMC2 = 0.55 SMC3P = 0.55 SMC4P = 1.0 SMC4M = 1.0 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0
Northern Flicker* (*Colaptes auratus*)	Open forests and shrub habitat with abundant edges for feeding and snags for nesting; annual diet about 55% animal matter (insects) and 45% plant matter[1]; snag densities should be at least 0.4/acre > 12 inches dbh for maximum populations[2]	SMC1 = 0.33 SMC2 = 0.33 SMC3P = 0.66 SMC4P = 0.77 SMC4M = 0.77 SMC4D = 0.66 SMC5P = 1.0 SMC5M = 1.0

*Observed in the Wildlife Analysis Area.
**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.
[1]California Department of Fish and Game 2005 and CWHR Version 8.1
[2]Thomas et al. 1979.

Environmental Consequences—Woodpecker Group

Effects of the Action Alternatives

Direct and Indirect effects

Woodpecker mortality could occur with the falling of snags when birds are within the cavity. This is especially true with immature birds in the nest. Falling snags that provide insects and larvae eaten by woodpeckers would reduce foraging habitat.

As per the action alternatives, three to six of the largest snags per acre would be retained where they exist. Dead trees less than 15" dbh, for the most part, would be removed from all treatment units, but snags would be removed that pose a hazard to operability.

Alternative 1 treats approximately 240 more acres than Alternative 3, while Alternative 4 treats about 46 acres less than Alternative 3. Assuming equal distribution and density of snags across the Wildlife Analysis Area, Alternative 4 maintains more snags than all the other alternatives.

In Wildlife Habitats in Managed Forests, the Blue Mountains of Oregon and Washington, (Thomas 1979), Thomas provided a summary of specific hard snag requirements (number per acre of certain size classes) for woodpeckers occurring in the Blue Mountains of Oregon. Woodpecker species and snag requirements were associated with specific plant communities. Thomas also provided research findings in regard to the numbers and sizes of snags needed to maintain primary cavity nesters at population levels ranging from 10-100% of potential.

Bull et al, in Trees and Logs Important to Wildlife in the Interior Columbia River Basin, (May 1997), discussed several research studies that presented new data suggesting that some of the assumptions and data used in the Thomas model are not valid and that the prescribed snag densities need to be revised upward. Thomas snag densities are based on the number of snags needed for roosting and nesting and did not include additional snags needed for foraging. The Thomas model provided only two roost trees per year per pair of woodpeckers, where studies are showing that many more roost trees are used by a pair within a year (in Bull et al 1997). Radio telemetry studies have shown home ranges to be larger than those used in the Thomas model for at least three woodpecker species. "The Thomas model did not take into account the habitat needs of some of the secondary cavity nesters, like bats and brown creepers, that use such snag features as loose bark" (in Bull et al 1997). Bull and others concluded that "the snag numbers presented by Thomas and others (1979) are not adequate to support the populations intended because of a lack of foraging strata and invalid assumptions used in the model".

Based on research by Bull and others, the Pacific Northwest Research Station, USDA Forest Service, concluded that "current direction for providing wildlife habitat on public forest lands does not reflect findings from research since 1979; more snags and dead wood structures are required for foraging, nesting and roosting than previously thought" (USDA Forest Service 1999).

Snag densities, based on snags 10 inches dbh or greater, recommended by Bull (from various studies in Idaho and Oregon) for mixed conifer range from 2.5/acre in open canopy (defined as

<30% canopy cover), with 1.8/acre of these snags greater than 20" dbh, to 9/acre in closed canopy (>30%), with 3.5/acre of these snags greater than 20" dbh. Bull also states in her review that "Published data suggest that populations of cavity nesters were viable in stands of ponderosa pine and mixed-conifer forests that contained about four snags per acre, a large component of old growth stands and abundant logs" (Bull et al 1997). Cavity nesters as a group selected clumps of snags rather than snags that were retained in uniform, evenly spaced distributions and they selected larger diameter and more heavily decayed snags (Saab and Dudley 1997).

Based on the above information, as well as the analysis of effects for the snag guidelines required in the SNFPA EIS and ROD (2001 and 2004), the proposed snag densities for each of the action alternatives would provide for habitat needs of woodpeckers that would use the analysis area post fuels reduction.

CWHR habitat suitability ratings for woodpeckers identified in Table 3.73 above indicate that there would be slight changes to woodpecker habitat suitability: habitat suitability for the pileated woodpecker and white-headed woodpecker would decline with opening up stands, while the rest of the woodpeckers would have slight increases or no change in habitat suitability. These changes in habitat suitability assume the key habitat element (snag) would be provided for each CWHR habitat type. Of the species listed on Table 3.73, all but the pileated woodpecker and Williamson's Sapsucker would use the group selection harvest areas, although both species have been observed nesting in clearcuts and/or natural openings (Rotta, personal observations on Plumas NF).

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14" dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect avian species, including woodpeckers.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on woodpecker group from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Proposed vegetation treatments are designed to reduce the risk of future stand replacement fires and promote the reestablishment and development of a mature closed canopy mixed conifer forest. Fuels reduction should create conditions that would lessen the risk for future stand replacement fires, thus providing the opportunity to retain structural elements likes snags for a longer period of time.

All action alternatives include road construction; decommissioning, closure and reconstruction (see alternative descriptions for mule deer above). Closing roads would reduce potential availability of snags for becoming hazard trees or being available for firewood.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. However, all snags that present hazards to road traffic, regardless of size, are being, or would be, removed. Removal of these snags would have a negative effect on individual animals that use snags, yet these hazard trees make up a very small amount of the total snag component in the Wildlife Analysis Area.

The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would maintain between three to six snags/acre.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. Continued public use within areas used by woodpeckers and cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young.

Thus the cumulative effects in the Freeman Wildlife Analysis Area would be a decrease in snag numbers, with snags in the Wildlife Analysis Area being retained at three to six snags per acre. This reduction in snags across the landscape could limit the availability of suitable nesting cavities thus affecting woodpecker breeding success. However, the retention of three to six snags per acre across the Wildlife Analysis Area is expected to maintain a supply of snags suitable for cavity nesting wildlife.

It is suspected that the direct, indirect and cumulative effects of the Proposed Action and action alternatives would have some short term decreases in woodpecker numbers as the disturbances associated with activities, as well as the modification of habitat reducing stand level habitat suitability, as well as snag removal, would increase risk to individual woodpeckers. Reductions in the Habitat Suitability Index (HSI) for pileated and white-headed woodpeckers are expected to have short term impacts to these species. It is anticipated that the longer term impacts would result in woodpecker numbers rebounding to pre-project levels as the risk to wildfire is reduced, the forest canopy cover closes in, roads are closed, mature oaks that are retained and released with management actions attain some decadence and snag recruitment continues across the landscape.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There would be no direct effects with this alternative. Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat maintenance and development. The existing fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt and the premature loss of the largest snags still present.

CWHR habitat suitability ratings for woodpeckers identified in Table 3.73 would not change as a result of Alternative 2 (No-action). With time, as snag fall down proceeds, the loss of snags would decrease habitat suitability until new snags >15” dbh are recruited from the forested stands through natural mortality or wildfire.

Cumulative effects

Hazard tree removal on NFS lands along roads has been an ongoing and continuing action. All snags that present hazards to road traffic, regardless of size, are being, or will be, removed. Removal of these snags would have a negative effect on individual animals that use snags.

With the current Plumas National Forest woodcutting program, the project area (excluding the lake side of 24N10 and surrounding Lake Davis) would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within areas used by woodpeckers and cavity dependent species, especially during the nesting season, could cause disturbance that could disrupt and preclude successful recruitment of young. No roads would be closed or decommissioned with this alternative, allowing for continued access for woodcutting and hazard tree removal, resulting in loss of snags.

It is suspected that the direct, indirect and cumulative effects of the no action alternative would maintain stable populations in the short term. With increased risk of wildfire, there could be a short term flush of snags as a result of stand destroying fires that would benefit both nesting and foraging for some species. These snags would fall and not be available in the long term and no replacement snags would be available for 50+ years. The longer term impacts would result in potentially lower woodpecker numbers than currently existing because of the potential for large stand destroying fires, removing large blocks of habitat and reduction the availability of snags and snag recruitment, which potentially reduces the carrying capacity of the area to support woodpecker populations.

3.7.5.3 Gray Squirrel (*Sciurus griseus*)

The PNF LRMP requires that the Forest monitor trends of selected habitat components, especially hardwoods, by annually summarizing hardwood information in stands being managed to meet hardwood standards as planned on a compartment basis. (PNF LRMP Chapter 5, page 5-11)

Affected Environment—Gray Squirrel

The western gray squirrel is considered fairly common in mature stands of most mixed conifer-hardwood habitats. It continues to be managed as a game animal, with harvest season running about 6 months (August to end of January) and allowable take (bag limits) in 2005 being 4 per day, with 4 in possession. The estimated 2000 harvest was 74,888 (CDFG 2002).

Simulation models have been developed for the western gray squirrel, using habitat suitability models from CWHR database, acreage of habitats from Forest and Rangeland Resource Assessment Program’s 2002 version 1 and population density information from research investigations, to analyze, understand and predict the outcome of human caused events (hunting) on squirrel populations (CDFG 2002). Western Gray Squirrel occupies 24 CWHR habitat types in California consisting of 29,921,555 acres. The number of gray squirrels in suitable habitat ranges between 0.2 and 1.0 squirrels/acre. Using the simulation model, there is an average breeding population of approximately 18 million squirrels, which produce approximately 20.5 million young, resulting in an average total population of about 38.5 million gray squirrels in California (CDFG 2002). No current population trends for western gray squirrel were identified in Section 3.2.3 in the SNFPA FSEIS.

The gray squirrel indicates the condition of hardwood-dependent species on the Plumas NF. Mature stands of trees are required for cover, mast and availability of snags for denning. It is an opportunistic feeder. The diet varies with the availability of foods. It eats hypogeous fungi, acorns, fruits, forbs and other tender shoots and leaves. In the summer, fall and winter acorns are very important.

Black Oak, in particular, produces the squirrel’s major food (acorns) and provides cavities for nesting. Based on CWHR types, the majority of the Freeman Project is typed as Sierra Mixed

Conifer. Black oak becomes a minor component of the mixed conifer as you move east across the Plumas National Forest. In addition there is approximately 106 acres typed as Montane Hardwood-Conifer forest, with black oak the dominant species. Black oak does best in open sites, but it can be maintained under adverse conditions such as shade, ridgetops and south slopes where conifers may regenerate in its shade. Secondary succession following fire and cutting begins with a dense shrubby stage as a result of a flush of black oak sprout that will compete with surrounding brush for 20+ years. On mesic sites the conifer component overtakes the oaks more rapidly than on xeric sites, where the oak component is dominant longer, taking 60-90 years to mature. Managing and maintaining existing oaks and hardwoods as well as managing to promote increased hardwood vigor and recruitment would likely be crucial for managing the gray squirrel.

Table 3.74 CWHR Suitability Ratings for Gray Squirrel within the Wildlife Analysis Area

Species	Key Habitat Features	CWHR Suitability Rating**
Gray Squirrel (*Sciurus griseus*)	Within the Sierras, needs mature stands of mixed conifer and hardwood habitats, including within stand oak/conifer association. Cavities within trees and snags are used for denning, but can also create nests on branches. Up to 2.5acre home range.	SMC1 = 0.11 SMC2 = 0.11 SMC3P = 0.33 SMC4P = 0.33 SMC4M =0.66 SMC4D = 0.66 SMC5P = 0.66 SMC5M = 0.66

**CWHR Suitability rating: 1.0 = high suitability, optimal for species occurrence, 0.66 = moderate suitability, suitable for species occurrence, can support moderate population densities; 0.33 = low suitability, marginal for species occurrence, can support low population densities; 0.00 = unsuitable for species occurrence.

The PNF LRMP, as amended by the HFQLG EIS, provides direction for black oak management:

> *"Where oak is present, retain an average 25 to 35 square feet basal area per acre of oaks over 15 inches diameter at breast height (DBH). Site specific planning will determine feasibility and specific needs. Retain smaller oaks, if determined to be necessary for future recruitment."*

Environmental Consequences—Gray Squirrel

Effects of the Action Alternatives

Direct effects

There may be direct effects to gray squirrels with the action alternatives. The potential exists for increased mortality as a result of increased traffic along all roads during project implementation. Treatment activities would occur in suitable habitat so direct mortality could be expected from logging activity. There may be disturbances to individuals that may be foraging in habitat within or adjacent to units proposed for treatment, which could result in animals moving out of the area while activity is going on, subjecting squirrels to increased risk of predation.

The action alternatives (1, 3 & 4) could potentially open up the canopy cover on up to 5,525 acres in fuels treatment areas of dense conifer habitat (>40% canopy cover, becoming 40% canopy cover), potentially creating stands that may release hardwoods within the treatment units. Hardwoods would be retained within throughout the Wildlife Analysis Area.

The action alternatives could create up to 175 acres of gaps & openings through the group selection harvest method and up to 384 acres in Alternative 1 of openings around aspen through aspen extended treatment zone prescription. Retention of hardwoods within Group Selection harvests and aspen ETZ harvests could contribute to small patches of hardwood dominated openings for 15-50+ years. After the conifers start to dominate these groups, hardwoods should be of the larger size class, contributing to higher production of forage, contributing to stand decadence and providing potential cavities.

Changes in Habitat suitability, as reflected by HSI in Table 3.74, indicate that changes to the CWHR in the mixed conifer as a result of the action alternatives would result in slight decreases in habitat suitability when opening up denser stands (M & D), as open stands provide little in the way of cover. Hardwood retention within DFPZ, area thin treatments and groups within the mixed conifer may provide adequate cover that would allow for squirrel use.

Indirect effects

With reforestation, oaks, retained at between 25-35 square feet basal area per acre where they exist, would then compete with planted conifers. Under ideal growing conditions, black oaks may not get to a size to produce mast until about age 50, when trees are approximately 9 inches dbh and producing 5 lbs of acorns/tree. By age 80, acorn production has improved to 20 lbs/tree and by year 100 the oak is 17 inches dbh and producing 60 lbs/tree (USDA Forest Service 1973). Cavities in oaks that gray squirrels can use for dens may start to develop by age 100.

With action alternatives, hardwoods are not targeted for removal. Any hardwoods that are cut would sprout back and depending on the treatment of the stand, compete with residual conifers and/or brush. Reforestation within groups would accelerate the development of conifer cover, in association with any hardwood development that might occur. Thus SMC3 (trees 6-11” dbh) type habitat could develop between 20-40 years, providing low habitat suitability (HSI of 0.33) for breeding, cover and feeding (Table 3.74). By year 60+, size class 4 trees are expected to develop in the plantations, providing for higher breeding, cover and feeding habitat suitability (HSI of 0.66 for M stands). CWHR habitat suitability ratings for gray squirrel would decline slightly with the action alternatives in the short term, but with the retention of hardwoods (specifically oaks) habitat suitability should increase in the long term, as the surrounding mixed conifer trees mature and canopy cover increases.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

The proposed action alternatives include the treatment of excess fuels and reforestation of conifers by planting. These treatments are designed to reduce the risk of future stand replacing fires and promote the reestablishment and development of a mature, closed canopy, mixed conifer forest.

This project could enhance gray squirrel habitat within the Wildlife Analysis Area as well as protect habitat outside the Wildlife Analysis Area by reducing the risk of high intensity wildfire and by enhancing the growth of dominant and co-dominant trees, including black oak where present.

All action alternatives include road construction; decommissioning, closure and reconstruction (see alternative descriptions for mule deer above). Closing roads would reduce potential roadkill, as well as reduce human accessibility into suitable habitat and making gray squirrels less susceptible to hunter mortality and loss of habitat through woodcutting.

In 2005, gray squirrel hunting season in Plumas County is approximately 6 months long, with a daily bag and possession limit of 4 squirrels. Opening up stands could make squirrels more visible, thus more vulnerable to hunting mortality.

It is suspected that the direct, indirect and cumulative effects of the Proposed Action and action alternatives would have some short term decreases in gray squirrel numbers as the disturbances associated with activities, as well as the modification of habitat reducing stand level habitat suitability would increase risk to individual squirrels. It is anticipated that the longer term impacts would result in squirrel numbers rebounding to pre-project levels as the risk to wildfire is reduced, the forest canopy cover closes in, roads are closed and the hardwoods that are retained and released with management actions begin to produce forage.

Effects of Alternative 2 (No-action)

Direct and Indirect effects

There should be no direct effects to this species. There would be no impact to Sierran Mixed Conifer habitat or Hardwood habitats. Ultimately, conifer encroachment would eventually reduce oak from the mixed conifer sites without any kind of disturbance.

Indirect effects of no action include the potential for future wildfire and its impact on habitat. The high fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt.

Hardwood loss through shading and conifer succession is expected to be higher with this alternative than with the action alternatives because the action alternatives are designed to release hardwoods from competition.

Cumulative effects

There would be no change from the existing condition in terms of human accessibility and gray squirrel susceptibility to roadkill, hunter mortality and snag removal by woodcutting in suitable habitat, as the open road density would remain at existing levels. Hardwood recruitment into the larger size classes would not be improved if no vegetative manipulation were conducted to release hardwoods from conifer competition.

It is suspected that the direct, indirect and cumulative effects of the no action alternative would maintain stable populations in the short term. It is anticipated that the longer term impacts would result in potentially lower squirrel numbers than currently existing because of the potential for large stand destroying fires, removing large blocks of habitat and reduction of hardwoods through conifer competition, all of which potentially reduces the carrying capacity of the area to support gray squirrel.

3.7.5.4 Willow/Alder Community

The PNF LRMP requires that the Forest monitor project compliance with BMPs and effects on structure and distribution of riparian vegetation, involving field review of project planning and implementation. Project implementation monitoring would be reported annually (PNF LRMP Chapter 5, page 5-11).

Affected Environment—Willow/Alder Community

Riparian areas include perennial stream channels and water bodies, areas of riparian vegetation (willows, alders, aspen, cottonwood, etc) floodplains and wetlands including wet meadows. Forest Service policy, as reinforced in the LRMP as amended by the HFQLG FEIS and the SNFPA FEIS/FSEIS, is to manage riparian areas to favor riparian-dependent resources over other resources. The HFQLGFRA FEIS requires the use of Riparian Habitat Conservation Areas (RHCAs) as prescribed by the Scientific Analysis Team guidelines (HFQLGFRA FEIS Table 2.6 and 2.7). These SAT guidelines apply to the Freeman Project. Implementation of RHCAs should allow for protection/management of riparian areas to favor riparian dependent species. Actions that will remove excessive fuel loadings within RHCAs will reduce future threats of stand replacing fires which could degrade channels, lower water table and site productivity and remove and alter species composition of the riparian vegetation.

Riparian habitats, along with the associated aquatic environments, provide habitat for willow flycatcher, greater sandhill crane, northwestern pond turtle, fish, amphibians and other aquatic organisms. Riparian communities add landscape diversity and often serve as movement corridors for numerous wildlife species. Usually this habitat exists as a narrow, often dense grove of broad-leaved, winter deciduous trees along streams and lakes. Species consist of white alder, willow, aspen, cottonwood, bigleaf maple and dogwood. Much of this habitat exists as alder and/or willow stringers along perennial streams & seeps. The transitional ecotone between riparian and adjacent non-riparian vegetation is often abrupt. The shape of many riparian zones, particularly the linear nature of streams, maximizes the development of edge, which is so highly productive for wildlife. Riparian areas serve as elevational and habitat corridor links for wildlife movement. The predominance of riparian communities present within the Wildlife Analysis Area are not all mapped as separate vegetation polygons but are inclusions within the dominant habitat type polygon, thus acreage figures of riparian in Table 3.71 is a conservative figure.

Wet meadows occur where water is at or near the surface most of the growing season, following spring runoff. Perennial grasses, juncus and sedge usually dominate wet meadows. Overgrazed meadows usually have more forbs and fewer grasses/grass-like plants present. Dry meadows usually occur on better-drained soils, are lower in herbaceous production and higher in brush production and usually result from some sort of disturbance that has lowered wet meadow production, such as a lowering of water table. Meadows are usually associated with forested ecotones in all vegetation types and usually exist indefinitely unless hydrologic regimes are altered. An ecotone is a transition or transitional zone between two adjacent ecological communities with some characteristics of each. Meadow ecotones within the Wildlife Analysis Area exist where other forest types encroach into more mesic sites supporting grass/sedge/forb-dominated vegetation. Meadows are an important component of many montane riparian communities. Wet meadows are found extensively throughout the Freeman Wildlife Analysis Area.

Riparian/aquatic and wet meadow habitats are disproportionately important to wildlife, typically having greater species diversity (floral and faunal) than surrounding uplands (Kondolf et al in Sierra Nevada Ecosystem Project (SNEP), 1996). Of the total 401 Sierran species of mammals, birds, reptiles and amphibians combined, 21% depend on riparian areas near water, while many more use it occasionally or regularly to find food, water and shelter (Graber 1996). Graber also identifies 83 terrestrial vertebrate species considered to be dependent upon riparian (including meadow and lakeshore) habitat to sustain viable Sierran populations; twenty-four percent of these species dependent on the riparian community area are at risk of extinction (Graber 1996). The vegetation structure in riparian habitat within the project area is similar to that described in SNEP (Volume II Chapter 36). Riparian habitat has been fragmented to some degree by a decrease in width and loss of connectivity and simplified by the loss of large trees and deciduous understories, replaced by younger, conifer-dominated forest. As a result, riparian habitat is likely less productive for associated species. The effectiveness of riparian areas as corridors for wildlife movement has also likely been decreased.

Approximately 48 miles of perennial streams supporting riparian habitat are within the Wildlife Analysis Area. Species composition of the riparian vegetation is primarily alder, willow, cottonwood and aspen. Aspen is a major plant community within the Wildlife Analysis Area. Additional riparian habitat exists along meadow edges, springs and seeps.

Environmental Consequences—Willow/Alder Community

Effects of the Action Alternatives

Direct and Indirect effects

The willow/alder community is not identified as a vegetation type slated for fuel treatments or group selection, yet standing conifers within RHCAs would be removed to reduce fuel loadings within the RHCA, thus reducing the risk of future wildfire from occurring within the stream/riparian environment. Several treatment areas are located within aspen stands that would have some conifer removal that would create more favorable growing conditions for the aspen. CWHR habitat suitability ratings for bird species identified as being within the riparian bird assemblage identified in Table 3.72 would not change as a result of the action alternatives, as the key habitat element (riparian vegetation) would not be modified with any alternative.

Fuels reduction within DFPZs and area thinning should create conditions that would lessen the risk of future stand replacing fires, thus providing the opportunity to retain vegetative diversity within riparian habitats for a longer period of time than without treatment.

Increasing the amount of open forest, as well as small openings and increased edge may increase the risk of brood parasitism by brown-headed cowbirds on various bird species that nest in riparian habitat. Very little brown-headed cowbird presence within the National Forest portion of the Wildlife Analysis Area has been documented. Three active livestock grazing allotment are present within the Wildlife Analysis Area. Some facilities that are often associated with brown-headed cowbirds, including pack stations, supplemental feeding stations, holding facilities, or corrals are present. Because cowbirds are present in the Wildlife Analysis Area there is some risk that brood parasitism could increase above existing levels within the Wildlife Analysis Area as cowbirds respond to increased open habitat and edges.

All action alternatives would have Sporax (Borax) applied to pine stumps ≥14” dbh within the DFPZ to Area Thinning treatment units to minimize the susceptibility to Annosus root rot. Use rates would be one pound to 50 square feet of stump surface. Based on the Pesticide Fact Sheet prepared by Information Ventures, Inc. (1995), this rate is considered non-toxic to vertebrate species, including birds. Borax does not build up (bioaccumulate) in fish, inferring no build up occurs in other vertebrate species. Thus Sporax applied to stumps should not affect various bird species that nest in the willow/alder community directly, or avian and mammalian prey species.

Cumulative effects

The analysis of cumulative effects of the proposed action alternatives evaluates its anticipated impact on MIS wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest and recreation use.

Grazing would be expected to continue on private and National Forest lands at current levels. There are seven livestock grazing allotments (Grizzly Valley Community, Grizzly Valley, Humbug, Chase, Lake Davis, Long Valley and Willow Creek 2) that overlap into the Wildlife Analysis Area of which four are active. Approximately 40 percent of the Humbug allotment is within the project area. Ninety five cow/calf pairs area authorized from June 1 thru August 1. One hundred percent of the Grizzly Valley allotment is within the project area. Five hundred cow/calf pairs are authorized from June 16 thru September15. Approximately 50 percent of the Grizzly Valley Community allotment is within the project area. One hundred fifty seven cow/calf pairs are authorized from June 16 thru September 30 and another One hundred and twenty cow/calf pairs are authorized from June 16 thru September15. The remaining four allotments only overlap the Wildlife Analysis Area with the Chase allotment being the only active allotment. This activity would continue to degrade riparian habitats through the browsing of aspen, willow, etc. thus potentially affecting the nesting suitability of the riparian habitat for riparian dependent species.

Opening up forested stands with the proposed action alternatives could result in a flush of grasses and forbs that would serve as transitory range within the allotments. With small conifer removal within RHCAs, there could be an increase in willow/alder growth that could be browsed on by both livestock & deer. No cottonwood, aspen, or other hardwood is proposed for removal within the Wildlife Analysis Area. Livestock and deer browsing within the Wildlife Analysis Area may have some short-term impacts (retard potential growth) to the vegetative response of thinning within RHCAs, but it is expected that growth will exceed animal consumption.

The Westside Lake Davis Watershed Restoration Project would restore 50 headcuts and gullies within the project area. Implementation of this project would improve channel stability and reduce sedimentation within 20 stream channels. This action potentially improves the habitat for various bird species that nest in riparian habitat by promoting an increase in willow/alder and aspen growth.

Future activities include on going work within the Humbug DFPZ, Long Valley KV and hazard tree removal projects. Little to no change in overstory vegetation is anticipated with these projects. The Proposed Action for the Grizzly DFPZ, partly within the Wildlife Analysis Area, is currently under development and could not be precisely evaluated at the time of this report however; the effects are expected to be similar to the Freeman Project. Additional potential projects (tentatively identified as Cutoff and Mt. Ingalls), involve fuel treatments and fall partly within the Wildlife Analysis Area near Bagley Pass and Crocker Cutoff. However, no site specific planning has occurred. Planning could potentially occur in 2007. These future projects would continue to thin, masticate, grapple pile and underburn around willow/alder habitat thus potentially improving habitat conditions and increasing willow/alder growth.

The Personal Use Firewood program on the Plumas National Forest is an ongoing program that has been in existence for years and is expected to continue. This program allows the public to purchase a woodcutting permit to remove firewood from National Forest lands. Much of this wood material either consists of down logs found in the forest, along forest roads and within cull decks created by past logging operations, or as standing snags. The Freeman Project area, as well as the Wildlife Analysis Area (excluding the Lake side of 24N10 and surrounding Lake Davis) is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss within the Wildlife Analysis Area; snag and log removal is most common along, or within a short distance from, open roads. More area would be accessible to woodcutting with the no action alternative, as no existing roads would be closed.

The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover. Future effects include persistence of the largest trees, retention of snags away from roads and reduction in habitat losses due to large, damaging wildfires.

Recreational use is expected to continue at the current rate. The current rate includes approximately 13 Special Use Permits that are within the Wildlife Analysis Area. These include hunting outfitters & guides, fishing outfitters & guides, snowmobile poker runs, sled dog races and film productions. The on going recreational activities would continue to affect riparian bird behavior and movement patterns in the Wildlife Analysis Area due to human disturbance.

The California Department of Fish and Game is proposing to draw down the water level of Lake Davis and use the piscicide rotenone in an attempt to contain and eradicate the northern pike from the reservoir and its upstream tributaries. The drawdown and treatment are proposed to start in the fall of 2007. This project has a potential to cause down cutting in the streams thus damaging the existing willow/alder habitat.

Effects of Alternative 2 (No-action)

Direct, Indirect and Cumulative effects

There would be no direct effect on willow/alder communities, along with species dependent on this community. Indirect effects of the No-action Alternative include the potential for future wildfire and its impact on habitat. The existing fuel loads that would be left by this alternative, especially within the RHCAs, would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in additional acres burnt. A more intense burn within the RHCA could lead to soil damage, reduction in site class productivity and a change in species composition that would not maximize the potential of the streamside environment. The willow/alder community could be eliminated with such an intense burn.

Changes in Habitat Ratings and Values

Table 3.75 indicates which species would benefit from DFPZs and Group Selection harvest, which species would experience a reduction in habitat values and which species would not see a change in the value of habitat from these activities. In this table, CWHR values for current conditions (no action alternative) are compared with expected changes in habitat that are numerically calculated by the CWHR program. Values were derived from the programmatic HFQLG FEIS analysis and are not specific to this project but changes in HSI are reflective of opening up stands from dense forested stands.

Table 3.75 Changes in Habitat Suitability Index for Selected Species

Species	Change in habitat value* with Action Alternatives from Existing condition (Alt 2): DFPZ (%)	Change in habitat value* with Action Alternatives from Existing condition (Alt 2): Group Selection (%)
Gray Squirrel	-9%	-45%
Pileated Woodpecker	-23%	-35%
Hairy Woodpecker	+19%	+7%

*Values taken from HFQLGFRA FEIS analysis. Values above are an indicator of potential trends in habitat suitability, within treated areas, for the listed MIS with implementation of Alternatives 1, 3 and 4.

3.8 Watershed and Soil Resources

3.8.1 Introduction

The following assessment is summarized from the cumulative watershed effects and soils assessment for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006f). This effects assessment addresses impacts to both the watershed resource and the soil resource. A cumulative impact, as defined in 40 CFR 1508.7 is:

> The impact on the environment which results from the incremental impact of the action when added to other past, present and foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ 1971).

Cumulative impacts may occur off-site and, in the case of the water resource, may affect downstream beneficial uses of water. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple management activities within a watershed (USDA Forest Service 1988a, MacDonald 2000). Table 3.76 lists the specific measures used to examine the cumulative watershed and soil effects.

Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation and domestic water supplies. Information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects as well as the downstream physical effects (Menning et al. 1996, McGurk and Fong 1995). This CWE analysis addresses effects to both near-stream and downstream uses by using the Region Five Cumulative Off-site Watershed Effects Analysis method (USDA Forest Service 1988a). This method is based on the concept of ERA, which is described under 4.1 of the methods section.

Procedures for assessing the effects of cumulative impacts on Forest and Rangeland soils are addressed in the Region Five Soil Management Handbook (FSH2509.18). It describes soil quality analysis standards that may be used as a measure to insure that soil productivity, soil hydrologic function and soil buffering capacity, important soil parameters, are maintained or improved.

Soils provide the nutrient and hydrologic foundation necessary to sustain terrestrial ecosystems. Soil productivity is generally considered to be the capacity of soils to produce plants. Indicators of soil productivity include soil cover, soil porosity and organic matter. Maintenance of soil cover is important to prevent accelerated soil erosion. Soil porosity is used to assess soil compaction. Organic matter in the soil and on the soil surface stores nutrients used by plants and organisms that inhabit the soil. Together, these factors address important physical, chemical and biological soil properties. Soil quality standards provide threshold values that indicate when changes in soil properties and soil conditions would result in long-term losses in inherent productivity or hydrologic function of the soil. Detrimental soil disturbance may result when threshold values are exceeded for certain soil properties. This assessment will evaluate cumulative impacts of past, present and future actions on the soil resource. In addition, standard soil mitigation measures are described which apply to all action alternatives and can be referenced in Appendix B.

3.8.2 Summary of Effects

3.8.2.1 Alternative 1 (Proposed Action)

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 Soil Standards, there would be a lower risk that soil productivity would be impaired. In general Alternative 1 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. Five watersheds would have a substantial amount of mechanical treatments. This would be an additional increase in ground disturbance over one third of the existing subwatershed, which is a considerable amount. Impacts on soil resources would be greater than Alternatives 2, 3 and 4. Approximately 31 percent of the subwatersheds analyzed or 3,772 acres would be treated mechanical. Within individual watersheds the percent mechanical treatment ranges from 9 to 82, with eight subwatersheds between 9 and 40 percent.

The cumulative ERA values would not exceed the threshold of concern (TOC) in any subwatershed. Two subwatersheds would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave three subwatersheds at moderately high risk of cumulative effects (6 percent or greater TOC in sensitive and greater than 9 percent in the upland). Low to moderate increases in six other subwatersheds means those subwatersheds would be at higher risk of cumulative effects. However, these subwatersheds would still be within a low to moderate risk of cumulate effects.

Eight hundred forty acres of RHCA would be treated mechanically. RHCA widths were delineated at 150 feet, the height of a site potential tree.

Five hundred nine acres of aspen would be treated, 350 of which would be in RHCAs. Aspen treatments include a 75-foot extended treatment zone. Aspen treatments in RHCAs would be limited to slopes of 15 percent or less.

There would be 1,848 to 6,160 hand piles generated in this alternative.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

There would be about 5 miles of system road re-construction, approximately 0.3 miles of road relocation, 8 miles of road decommissioning and 2 miles of temporary road construction. Decommissioning 10 miles of roads approximately 8 from this Decision and approximately 2 from a previous decision, would result in long-term benefits to watershed resources resulting from a reduction in road density. One watershed, Riz, would improve over the existing condition in the sensitive portion of the watershed. Road obliterations would result in a 2% reduction in road density in this watershed. Seven other watersheds would experience offsets from the impacts of the Proposed Action thru the decommissioning of these roads. Four to 31 Grapple burn piles would be generated.

3.8.2.2 Alternative 2 (No-action)

The lack of fuel treatment in Alternative 2 would leave soil productivity and watershed values vulnerable to the damaging effects of future severe wildfires.

No road decommissioning would occur, so associated long-term beneficial watershed effects would not be realized.

3.8.2.3 Alternative 3

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 Soil Standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than other action alternatives. Alternative 3 would reduce the amount of mechanical treatments by approximately 200 acres to 3,574, so there would be less ground disturbance from equipment, skid trails and landings. Approximately 29% of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the mechanical treatment ranges from 8.5% to 61% and eight subwatersheds are between 8.5% and 40%.

The cumulative ERA values would not exceed the TOC in any subwatershed. ERA increases would leave four subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9% in the upland). Moderate increases in four subwatersheds would raise the disturbance levels to a moderate risk of cumulative effects. Increase in three subwatersheds means while they are at a higher risk, they are at a low risk for cumulative effects.

Seven hundred fifty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using these criteria for RHCA width delineation there was a 47 acre increase in the RHCAs, all of which would be treated mechanically.

One hundred eighty-one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35 percent or less.

There would be 972 to 3,240 hand piles generated in this alternative. Four to 33 Grapple piles would be generated.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

The same road actions would occur for all action alternatives. Decommissioning 10-miles of roads would result in long-term benefits to watershed resources resulting from a reduction in road density. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads.

3.8.2.4 Alternative 4 (Preferred Alternative)

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than Alternative 1 but greater than 2 and 3. Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3,507, so there would be less ground disturbance from equipment, skid trails and landings. However, there is more mechanical thinning and less grapple piling and mastication in this alternative and mechanical thinning is more ground disturbing than the other two activities. Approximately 28.5% of the subwatersheds analyzed would be treated mechanically. Within individual watersheds the mechanical treatment ranges from 8% to 54% and eight subwatersheds are between 8% and 40%. Alternatives 1 and 3 have one more group select unit than this alternative.

The cumulative ERA values would not exceed the TOC in any subwatershed. The upland portion of four watersheds would be at threshold. As a result one subwatershed would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave the other three subwatersheds at moderately high risk of cumulative effects (greater than 6 percent TOC in sensitive and greater than 9 percent in the upland). Increases in four other subwatersheds means those subwatersheds would be at higher risk of cumulative effects and would be at a moderate risk for cumulative effects. Three subwatersheds would have increases in the ERA but would remain at a low risk of cumulate effects.

Seven hundred forty-seven acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using this criterion for RHCA width delineation there was a 47 acre increase in the RHCAs. All 47 acres would be treated mechanically.

One hundred eighty-one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35% or less.

There would be 1,644 to 5,480 hand piles generated in this alternative. One to seven grapple piles would be generated.

The enhanced ability of fire management to suppress, control and contain fires that impact or start in fuel treatments under 90th percentile weather conditions would produce long-term benefits for soil productivity and watershed values that would otherwise remain more vulnerable to the damaging effects of future severe wildfires.

The same road actions would occur for all action alternatives. Decommissioning 10-miles of roads would result in long-term benefits to watershed resources. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads.

3.8.3 Scope of the Analysis

This section describes the geographic and temporal boundaries utilized in this assessment. These areas differ for the watershed effects analysis and the soil assessment area. Table 3.76 lists the specific measures used to examine the cumulative watershed and soil effects.

Table 3.76 Summary of Environmental Indicators and Measures Examined in This Assessment

Key ecosystem element	Environmental indicators	Variable Assessed
Water Quality	Chronic sedimentation, accelerated hillslope erosion	Equivalent roaded acres
Soil Productivity	Organic matter losses	Surface fine organic matter
	Soil loss	Effective soil cover
	Detrimental compaction	Skid trails and landings

3.8.3.1 Cumulative Watershed Effects Analysis

Geographic Analysis Area: The geographic area examined for the cumulative watershed effects analysis consists of 11 subwatersheds, which encompass approximately 12,315 acres or about 3% of the Beckwourth Ranger District (Figure 3.12). With one exception only subwatersheds greater than 400 acres where proposed treatments would occur on at least 1% of the subwatershed area were considered for this effects analysis. One subwatershed less than 400 acres was evaluated because there was a large amount of activity proposed within the subwatershed. Ten subwatersheds lie within the Freeman Hydrologic Unit Code 6 (HUC 6) watershed; the remaining subwatershed is within the Big Grizzly Creek HUC 6 watershed (Figure 3.12). Both HUC6 watersheds are contained within the Lake Davis/Long Valley HUC 5 watershed.

Timeframe of Analysis: The temporal bounds of the watershed effects analysis are typically 25 years. However, this value varies depending on the type of disturbance activity contributing to cumulative effects. Timber harvests were considered recovered after 25 years, so harvests occurring prior to 1980 were excluded from the effects model. No temporal component was included for existing roads, regardless of when they were constructed.

3.8.3.2 Soil Assessment

Geographic Analysis Area: Current soils conditions were assessed at the treatment unit scale. Soils related information was collected within 70 of the treatment units described in the Proposed Action (Figure 3.13 and 3.14). Four of these units were subsequently dropped from the project so they are absent from the effects discussion of this report. Within each sampled unit, data was collected on line transects which traversed portions of the unit.

Timeframe of Analysis: The current soil condition reflects the cumulative effects of past activities, regardless of when they took place. For example, if multiple activities have occurred in a given treatment unit over the past 50 years, it is not necessarily possible to separate the effects of older treatments from more recent ones. As a result, it is not practical to set a time constraint on those effects. The future timeframe for the soils analysis must extend until the resource has recovered from the impact of the proposed activities. The persistence of soil effects into the future can vary widely. For example, ground cover may recover within one to two years following a treatment. Soil compaction, however, may last for decades. Thirty years was chosen as a future timeframe for soil effects. After this time, the degree and variability of soil conditions are expected to be similar to the No-action Alternative.

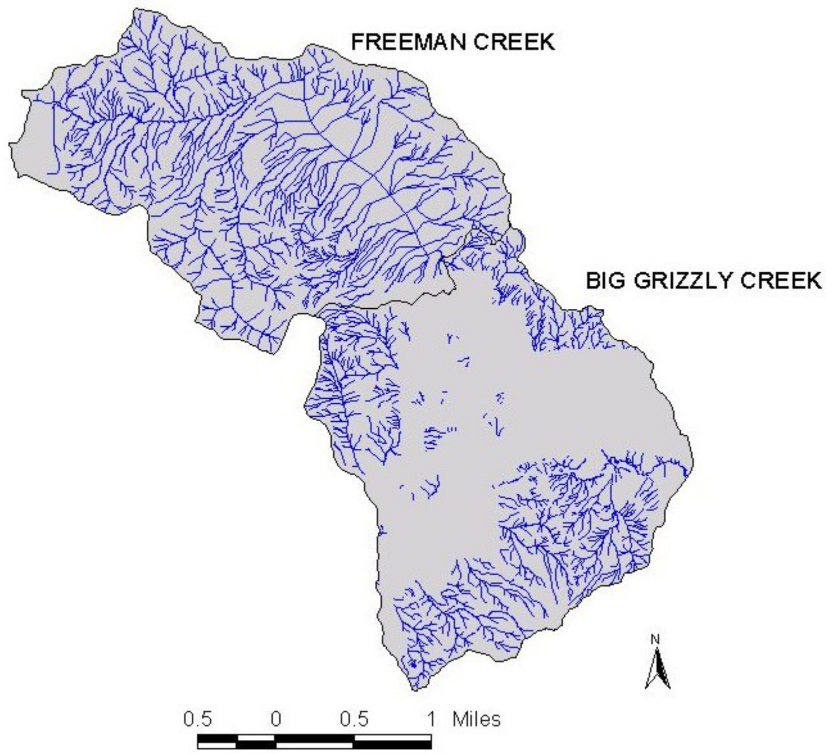

Figure 3.12 The two HUC 6 watersheds that encompass the Freeman assessment area. This figure does not include streams on private land.

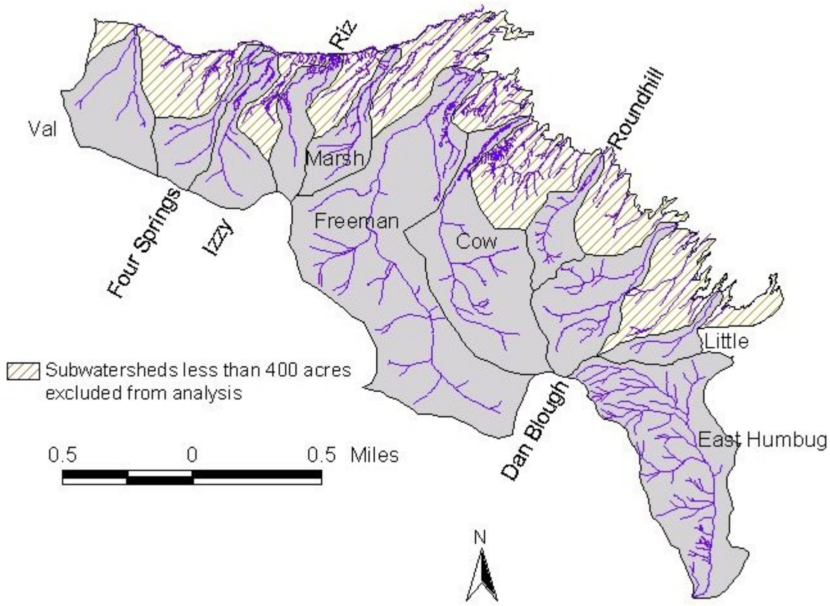

Figure 3.13 The analysis subwatersheds examined for cumulative watershed effects

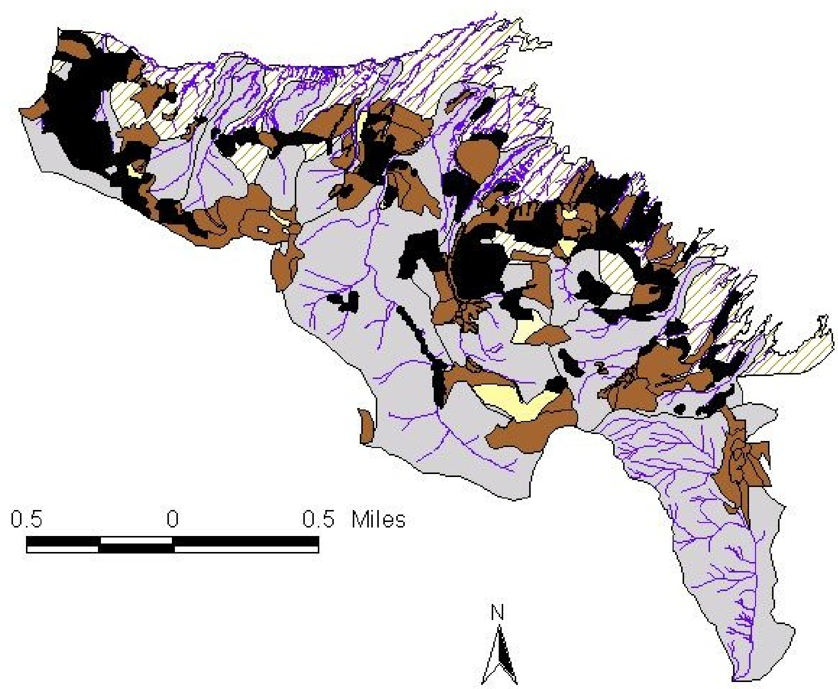

Figure 3.14 Proposed treatment units including, proposed treatment units that were sampled for soil information. Units in black were sampled. Other units were not sampled and were not proposed for mechanical treatment.

3.8.4 Analysis Methods

3.8.4.1 Cumulative Watershed Effects Methods

There are numerous methods for assessing the effects of land use activities on the landscape. A discussion and comparison of different methodologies can be found in documents such as, A Scientific Basis for the Prediction of Cumulative Watershed Effects, Cumulative Watershed effects: Applicability of Available Methodologies to the Sierra Nevada and Research and Cumulative Watershed Effects. (Dunn et al. 2001, Berg et al. 1996, Reid 1998, USDA Forest Service 1988a). For the purpose of this CWE, the effects of past, present and reasonably foreseeable future impacts were assessed using the Region Five Cumulative Off-site Watershed Effects Analysis (USDA Forest Service 1988a). Under this approach, the impacts of land management activities were evaluated on the basis of equivalent roaded acres.

"Equivalent roaded acres" (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one ERA. Numeric coefficients are used to convert acres of management activities such as timber harvest, underburning and grazing to ERAs. For example, 1 acre of underburning equals 0.05 ERA. In a given watershed, disturbances are added together to determine a cumulative ERA for that watershed. This value is often expressed as a percentage of the TOC. The TOC is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects are high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the TOC is 12% of the watershed area, 100% of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface, 600 acres of mechanical harvest or 343 acres of group selects.

The assessment area for the Freeman Project is contained within of two 6th field (Hydrologic Unit Code, or HUC 6) watersheds. Freeman is 28,110 acres and Big Grizzly is 30,310 acres in size. With one exception within each HUC 6 watershed, analysis subwatersheds ranging from about 440 to 3,750 acres were delineated. Past management activities were analyzed to determine the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land subjected to past management activity was converted to an equal area of road surface, resulting in a measure of ERA. Numeric disturbance coefficients were used to convert these management effects to equivalent road effects in terms of the pattern and timing of surface runoff. Plumas National Forest watershed staff developed disturbance coefficients based on visual observations, field surveys, published studies, transects and aerial photo interpretation. Coefficients vary by management activity, silvicultural prescription, site preparation methods, type of equipment utilized and fire line intensity. The disturbance coefficients used in this analysis are shown in Table 3.77.

Table 3.77 Disturbance coefficients used to calculate ERA values in the Freeman Project.

Treatment Activity	ERA coefficient	Treatment Activity	ERA coefficient
Clearcut		Slash treatment, site preparation	
tractor yard, tractor pile, burn piles	0.35	activity fuels burn	0.05
tractor yard, broadcast burn	0.3	burn of activity fuels piles	0.03
Skyline yard, no site prep	0.15	mechanical site prep for planting	0.25
Skyline yard, broadcast burn	0.2-0.25	burning site prep for planting	0.08
Seed-tree cut		**DFPZ treatments** mechanical treatment, prescribed fire	
tractor yard, tractor pile, burn piles	0.35	above with tractor yard	0.2
tractor yard, broadcast burn	0.3	above with skyline yard	0.1
Overstory removal		above with helicopter yard	0.05
tractor yard, tractor pile, burn piles	0.25	biomass, prescribe fire	0.08
tractor yard, underburn	0.18	prescribe fire	0.05
Skyline yard	0.1	**Aspen treatments** mechanical treatment, prescribed fire	
Single-tree selection		above with tractor yard	0.25
tractor yard, tractor pile, burn piles	0.15-0.2	above with skyline yard	0.15
tractor yard, hand pile, burn piles	0.1	above with helicopter yard	0.05
Group selection		Individual tree selection	
Tractor yard, tractor pile burn piles	0.35	tractor yard	0.1-0.2
Skyline yard, underburn	0.2	skyline yard	0.05
helicopter yard, underburn	0.1	helicopter yard	0.02
Shelterwood, seed step		Mastication	0.04
tractor yard, tractor pile, burn piles	0.35	Grapple piling	
Shelterwood, removal step		non- aspen	0.1-0.05
tractor yard	0.25	aspen	0.15
Commercial thin		Roads	
tractor yard	0.2	existing	1
Sanitation and Salvage		new construction	1
tractor yard	0.1-0.2	obliteration	-1
Precommercial thin		Grazing	0.1-0.25
tractor yard	0.1-0.2		

The assessment of past timber harvest activities was restricted to events within the last 25 years. These values reflect the period of time required for site recovery following these types of activities and events. Beyond this time frame, vegetation has generally had ample opportunity to reestablish and develop adequate crown cover to provide organic material to the soil. Together, crown and litter cover provide physical protection against soil erosion. In addition, roots have reoccupied the soil mantle and most effects from compaction have been negated except along established roadways. These factors tend to moderate peak flows and therefore diminish adverse effects on channel condition and water quality. A linear recovery coefficient was incorporated into the analysis to reduce the disturbance coefficients over a 25 year time period, an example of a 30 year recovery is shown in Figure 3.15.

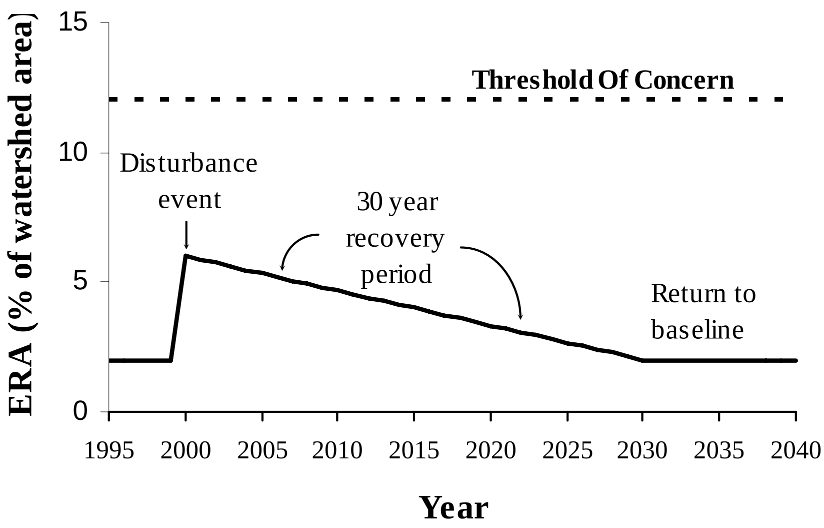

Figure 3.15 Conceptual disturbance and recovery model.

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. This value can serve as an index to describe impacts to downstream water quality. An increase in the road density of a watershed can result in greater impacts to water quality downstream.

Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially impact downstream channel stability and water quality. This upper estimate of watershed "tolerance" to land use is called the threshold of concern (TOC). For this analysis, the TOC was assessed for each subwatershed in terms of the percent of the area in a hypothetically roaded condition. As disturbances approach the TOC, there is an increased loss of soil porosity and soil cover, resulting in greater runoff potential and peak flows. Above the TOC, water quality may be degraded to the point where the water is no longer available for established uses, such as municipal water supplies or no longer provides adequate habitat for fisheries. In addition, stream channels can deteriorate to the extent that riparian and meadowland areas become severely degraded.

Another phrase used frequently in cumulative impact assessments is the expression **"natural watershed sensitivity",** which is an estimate of a watershed's natural ability to absorb land use impacts without increasing the effects of cumulative impacts to unacceptably high levels. Watersheds with a high natural sensitivity can tolerate less land disturbance and require greater care when planning land use activities than watersheds with low sensitivity. Measures used to evaluate watershed sensitivity include the potential for 1) soil erosion, 2) high intensity and/or long duration precipitation events, including rain-on-snow, 3) landslides and debris flows and 4) channel erosion within alluvial stream channels.

Higher equivalent roaded acre values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment transport off-site.

Stream channels in poor condition tend to be more sensitive to increases in peak flow since they are frequently lacking an effective root mass to bind streambanks and large organic debris to trap and retain the sediment moving through the system. These channels frequently become downcut (erode below the stable grade of the channel) so all flow is confined within the channel, unable to access the floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream.

As a guide to the CWE assessment, when planned activities within forest watersheds result in increases in equivalent roaded acres of 25% to 30% of the TOC, we generally realize relatively small increases in peak flows. Given that the ERA threshold for the subwatersheds in this analysis is 12% of the watershed area, this would likely result from an increase of 3% to 4% ERA. In watersheds where streams are stable and ERA values (watershed disturbances) are not approaching threshold, such increases generally do not stress the system. However, where increases in ERA approach 40% to 50% of threshold (5 to 6% ERA or higher), stream channels are in poor condition, or ERA values are approaching thresholds of concern, a closer look at the activities planned within the watershed is important.

3.8.4.2 CWE Model Assumptions

The CWE method used in this analysis is a mathematical model that expresses land disturbance in terms of a common variable, ERA. To calculate the ERA, acres of past ground disturbing activities were converted to ERA values based on disturbance coefficients multiplied by treatment area. Coefficients were applied to similar activities regardless of soil type, slope conditions, season of operation, or specific equipment characteristics. In calculating ERA contributions due to roads, all roads were assumed equal regardless of surface material (i.e., paved, graveled, native surfaced). Acres of roads were calculated by assuming that all roads were 25 feet wide. Urban or developed areas are included because their impervious surfaces such as roofs and paved driveways would affect infiltration and runoff around these areas. There are no major developments within this analysis area. Landslide prone areas occur within the analysis area. Portions of units 24, 25, 48, 88, 95, 100–102 and 107 are located within or adjacent to these landslide prone areas. Landslides were not included in this CWE model. According to the fire history no large fires have occurred in the project area within the last 25 years, therefore no fires were assessed for this analysis.

Disturbances were calculated with Geographic Information System programs, using Plumas National Forest modified corporate data files. While substantial efforts are made to keep revising these data files as new information becomes available, site-specific field verification is required to more accurately capture attributes within the analysis area. Roads and stream channels are the emphasis of this verification because professional estimates conclude that there may be up to 20% more roads on the landscape than are depicted in the corporate data. Conversely, the corporate data tends to over predict the presence of ephemeral streams and occasionally fails to predict the presence of some stream segments. Where treatment activities are proposed, field data was collected to verify the presence or absence of stream courses and additional roads within the treatment units. These field-verified files were used when calculating ERA contributions. Stream miles, road densities and road-stream crossing information presented in Table 3.80 are based on a combination of corporate data files and field verified data.

Past public harvest activities were summarized from the Stand Record System database, timber atlases and sale contracts. Activities were verified using the hardcopy Stand Record System cards. This provided our quality control. Where harvest methods were not provided, activities were assumed to be yarded by tractor. Harvest activities on private lands were provided from California Department of Forestry. These records only included information for harvest plans submitted since 1994 and locations were described by township, range and section. Unless specified, all private activities were assumed to be tractor yarded, which is considered more ground disturbing than other yarding methods (Table 3.77). Reasonably foreseeable future activities that are expected to be completed in 2005 were included in the ERA calculations for the current condition. All others were assessed separately and their effects are discussed in the Reasonably Foreseeable Future Activities portion of this report.

In general, while calculating the ERA contribution by the proposed harvest activities, all areas of treatment units were assumed to be treatable. For example, no compensations were made for rock outcrops or open areas. Treatment units containing a combination of mastication and prescribed fire treatments were analyzed as though mastication would occur over the entire area. The location of individual treatments within these combination units was not specified, so the mastication coefficient was used because it was considered more disturbing than prescribed underburns (Table 3.77). The precise location of group selects units were not determined at the time of this report, therefore the following assumptions were made. Group select treatments would not occur in RHCAs. When a unit that contained group select fell in more than one watershed the aerial photos were reviewed to estimate the most likely placement for the groups. For treatment units where prescriptions included treatment of the RHCA, designated 25, 50 and 100 foot equipment exclusion zones and slopes greater than 15 percent were assumed not treated. For Alternatives 3 and 4 it was assumed Aspen Units would be treated on slopes up to 35%. Therefore, the remaining area within the RHCAs were assumed to be treated by hand, piled then burned. Where prescribed fire was proposed within RHCAs, no contribution was assessed for the equipment exclusion zone because no active ignitions would occur in this area and it was assumed that the disturbance would be mosaic in nature and limited to occasional creep. Where watersheds approached threshold as a result of the proposed activity refinement of the analysis occurred. In these cases compensation was given to open areas and a no treatment area was assigned. In other cases where stand density was light or patchy the coefficient was reduced to reflect the difference in the amount of ground accessed mechanically.

3.8.4.3 Soil Assessment Methods

Soil quality Standards and Guidelines that apply to this project exist at both the regional level (USDA Forest Service 1995) and forest level (USDA Forest Service 1988b). These standards focus on protection and improvement of National Forest System Lands for continuous forest and rangeland productivity and favorable water flows. To address these standards, this soil assessment focused on soil productivity measures including surface fine organic matter, soil cover and compacted soils.

Surface fine organic matter consists of organic material on top of mineral soil and includes plant litter, duff and woody material less than 3 inches in diameter (USDA Forest Service 1995). According to Forest Service Region 5 Soil Quality Standards (1995), fine organic matter should cover at least 50% of the area. In addition, effective soil cover must be maintained to avoid detrimental accelerated erosion. Effective ground cover includes living vegetation, plant and tree litter, surface rock fragments and applied mulches. The forest-wide soil Standards and Guidelines (USDA Forest Service 1988b) provide a guide for prescribing effective ground cover based on the Region 5 Soil Erosion Hazard Rating system (USDA Forest Service 1990). Minimum effective ground cover for soils with erosion hazard ratings of low, moderate, high and very high, are 40%, 50%, 60% and 70%, respectively. To avoid land base productivity loss due to soil compaction, the forest level soil standards (USDA Forest Service 1988b) indicate that the area dedicated to landings and permanent skid trails should not exceed 15% of a timber stand unit. Detrimental compaction exists when soil porosity is reduced by more than 10%, relative to natural conditions (USDA Forest Service 1995).

In addition to soil productivity, soil hydrologic function and soil buffering capacity are also addressed in this assessment. The former is determined by the CWE analysis and the latter is addressed in the discussion of the action alternatives.

A field crew assessed soil productivity measures in the proposed treatment units during the summer of 2004. Site specific treatment locations within units, such as placement of group selection harvest sites, are currently unknown, which prevented soils assessment in the specific locations where treatment would occur. Treatment units were stratified first by maximum soil erosion hazard rating (USDA Forest Service 1988c). In a given treatment unit, the number of point transects sampled in each erosion hazard rating class was determined by the total acres in each class.

Within each unit to be sampled, transects were randomly selected. To prevent locating transects parallel to skid trails and thereby inadequately sampling them, transects were intentionally located so as to not run directly up and down a slope. In addition, transects were placed between system roads in order to concentrate sampling in the ground disturbing activity areas.

Transects had 25 to 100 sample points dependant on unit size. Transect length often varied and one to three transects were covered in each unit sampled. Transects were placed between the roads according to the slope conditions described above when a sampling area was bound by two system roads. Sample points were evenly distributed along the transect. At each point, the type of ground cover was determined. Cover categories included three depth classes of duff and litter, three size classes of woody debris, live vegetation, rock, or bare soil. If bare soil was encountered, an assessment was made to categorize the location as disturbed or undisturbed by management activities, showing evidence of erosion or deposition, or recently burned. To estimate the extent of compacted soils, an assessment was made to determine whether or not each sample point was located on a skid trail, landing, or road. This data was used to estimate the percent cover of fine organic matter, effective soil cover and ground occupied by skid trails, landings and non-system roads.

3.8.5 Affected Environment

The Freeman Defensible Fuel Profile Zone (DFPZ) and Group Select (GS) Project is located on the Beckwourth Ranger District within Lake Davis/Long Valley Watershed. The project area ranges in elevation from 5,800 feet to 7,200 feet. Within the analysis area there are 10 drainage basins over 400 acres in size. Main drainages within the project area include Big Grizzly, Cow and Freeman Creeks. Many of the small tributaries flowing into Lake Davis originate from springs situated in their headwaters. Small watersheds comprise seventy percent of the Lake Davis watershed, so land management activities within these smaller watersheds play a substantial role in maintaining water quality within the lake. Big Grizzly Creek flows from Lake Davis into the Middle Fork of the Feather, a Federally designated Wild and Scenic River. Approximately 300 acres of land situated in the western portion of the project area drain into Little Grizzly Creek and thence to Indian Creek and the East Branch North Fork of the Feather River.

Freeman, Cow and Big Grizzly Creeks are relatively sensitive stream systems with high fishery values. Spawning and rearing of trout within these streams supplement the lake's annual stocking program by the California Department of Fish and Game. The lower reaches of these streams are in poor to fair condition; however, within the last fifteen years numerous improvements have been made to improve stream channel condition and enhance trout habitat.

Watershed sensitivity analyses for the HFQLG planning watersheds were reported in the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA Forest Service 1999). Results applicable to this project are duplicated in Table 3.78. Numeric scores were expressed in a categorical fashion (i.e., low, moderate, high) as per the HFQLG FRA FEIS. The sensitivity rating was based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorms and on the ability to revegetate. The watersheds included in this analysis received moderate sensitivity ratings. For each subwatershed analyzed in this assessment, the ERA threshold of concern is 12% of the watershed area (Table 3.78).

Table 3.78 Cumulative Watershed Effects Analysis Subwatersheds and the HUC 6 and HFQLG Watersheds that Encompass Them.

HUC 6 Watershed	HFQLG Watershed		Analysis subwatershed	Subwatershed Acres	Established TOC for the subwatershed
	ID#	Sensitivity			
Freeman	110131	Moderate	Val	876	12
			Four Springs	489	12
			Izzy	649	12
			Riz	467	12
			Marsh	491	12
	110104	Moderate	Freeman	3744	12
			Cow	1749	12
			Round Hill	440	12
			Dan Blough	958	12
			Little	298	12
Big Grizzly	110197	Moderate	East Humbug	2153	12

3.8.5.1 Precipitation

Average annual precipitation varies from 40 to 50 inches in the lower elevations of the analysis area and between 50 and 70 inches along Grizzly Ridge (Pacific Regional Information System). Annual precipitation is relatively consistent throughout the project area yielding approximately 12,000 acre feet of runoff. Most surface waters within the project area drain to Lake Davis. Precipitation falls primarily as snow above 600 feet, with yearly snowfall total approaching 62 inches at 6,900 feet. Snow estimates are a 10 year average from the Grizzly Snow course. Precipitation distribution is characteristic of the Mediterranean climate, with most precipitation occurring between October and May. About half of the annual precipitation falls during December, January and February. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

3.8.5.2 Soils and Parent Materials

The project area is a composite of different geologic types. The main formations within the analysis area are Bonta, Penman and Ingalls, with intrusions of columnar hornblende andesite. These formations are volcanic conglomerates and mudflow breccias from the Miocene, Eocene and Oligocene periods. Generally, parent rock materials within the units are andesitic volcanics that have a pyroclast composition. Geology in some of the units consists of Quaternary lake deposits many of which are covered by more recent alluvium deposits. Other units within the project area are composed of Cretaceous and Mesozoic granitics, quartz diorite or granodiorite. There are minimal inclusions of greenstone or metarhyolite.

Soils derived from volcanic parent materials, including pyroclastic andesite generally are more developed and less erosive, but have a tendency for mass instability, compaction, rilling and road maintenance problems. In contrast, soils developed from granitics are shallow to moderately deep, poorly developed, loosely consolidated and highly erosive. Ground cover retention is an important factor on these soil types. Given their large component of coarse sands, there is a low tendency toward compaction. In comparison, lake deposits soils are a deep, well formed mix of interbedded fine silt and sand with occasional gravel lenses. In general, alluvium deposits within the analysis area are highly permeable, crudely stratified, poorly sorted sands, gravels and silts with occasional clay lenses. Barren, rocky areas occur throughout the analysis area.

Streamflow is responsive to rainfall and snowmelt events once the soils become saturated, but peak flows are not "flashy" in nature. The soil and geology of the area result in a watershed condition where summer flows are generally very low or nonexistent within streams draining the project area. Riparian vegetation is generally abundant along most perennial streams, providing shade and bank stability to stream channels, with exceptions within some meadow environments. The soil types by subwatershed are listed in Table 3.79. For a full listing of soil type by unit refer to Appendix F of the Cumulative Watershed Effects and Soils Assessment (USFS PNF BRD 2006f).

3.8.5.3 Stream Channels and Road Density

Stream Channels

Stream channels in the analysis area exhibit a range of types. Generally streams flow from moderately steep forested areas through low gradient meadows. There was typically no riparian vegetation component associated with upland ephemeral streams. According to the corporate database there are approximately 29 miles of perennial streams, 27 miles of intermittent streams, 79 miles of ephemeral streams and 6 miles of stream that are unclassified. A watershed crew field verified all the channels within the project area and identified 101 miles of RHCAs and 19 miles of non-RHCAs leaving 22 miles of stream outside of the project area but within the analysis area unclassified. The channels within the project area tend to be low velocity. Discharge data was collected on Cow, Big Grizzly and Freeman Creeks in 2002, the cubic feet per second (cfs) was 2.2, 2.5 and 2.7 respectively.

Known trout fisheries within the project area include tributaries of Freeman, Cow, Big Grizzly and Dan Blough creeks. Field surveys conducted for this project identified a number of springs, seeps and seasonal wetlands that are a part of the drainage network. Existing and abandoned roads, skid trails, or historic ditches have disturbed or diverted channels throughout the project area. This has caused some channels to abruptly stop, change direction or lose connectivity with the channel network. This is especially true of ephemeral stream types, the result of which is a limited function of these channels to transport water, wood, or sediment to lower reaches of the drainage network. Most stream channels are in fair condition. During field verification of the streams over 50 active headcuts and gullies were identified. Restoration of these headcuts and gullies will occur in 2005 as part of the Westside Lake Davis Restoration Categorical Exclusion (CE).

Table 3.79 Predominant soil types by watershed in the Freeman Project area.

Watershed	Map unit component	Slopes (%)	Max. erosion hazard rating	Compaction potential
Val (A)	Ramelli	0 to 2	L	slightly to moderately
	Etchen-Woodseye	2 to 30	H	Slightly
	Goodlow, Haplaquolls complex	0 to 10	M	Slightly
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Four Springs (B)	Ramelli	0 to 2	L	slightly to moderately
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Izzy (C)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Bonta-Toiyabe	2 to 30	H	slightly
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Riz (D)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Bonta-Toiyabe	2 to 30	H	slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Inville-Woodseye-Goodlow	10 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Marsh (E)	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Waca-Woodsey	30 to 50	H	slightly
Freeman (F)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Aiken	50 to 70	H	highly
	Fopiano-Franktown	0 to 30	H	slightly to moderately - highly
	Fapiano-Waca	0 to 30	H	highly to slightly
	Fapiano-Waca	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Goodlow, Haplaquolls complex	0 to 10	M	slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Haypress-Toiyabe	2 to 30	H	highly
	Hurlbut-Holland	30 to 70	H	moderately
	Waca-Woodsey	0 to 30	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Cow (G)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Dotta	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Aiken	50 to 70	H	highly

	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
Cow (G) Cont.	Haypress-Toiyabe	2 to 30	H	highly
	Haypress-Toiyabe	30 to 50	H	highly
	Hurlbut-Holland	30 to 70	H	moderately
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	0 to 30	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Round Hill (H)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Haypress-Toiyabe	2 to 30	H	highly
	Haypress-Toiyabe	30 to 50	H	highly
	Toiyabe-Haypress	30-70	VH	highly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Dan Blough (I)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately - moderately
	Haypress-Toiyabe	30 to 50	H	highly
	Tallac-Inville-Goodlow	15-65	M	slightly
	Toiyabe-Haypress	30-70	VH	highly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
Little (J)	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
	Ramelli	0 to 2	L	slightly to moderately
	Delleker-Fugawee, rubble land	10 to 70	H	moderately
	Fopiano-Franktown	0 to 30	H	highly to slightly
	Fopiano-Franktown	30 to 50	H	highly to slightly
	Fapiano-Waca	50 to 70	H	highly to slightly
	Haypress-Sattley	10 to 50	H	slightly to moderately
	Haypress-Toiyabe	30 to 50	H	slightly
	Tallac-Inville-Goodlow	15 to 65	M	slightly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly
East Humbug	Badenaugh, Bieber complex	2 to 5	L	slightly to moderately
(K)	Bucking, Haplaquolls complex	2 to 30	M	slightly to moderately
	Chaix-Holland	2 to 50	H	slightly to moderately - moderately
	Chaix, rock outcrop complex	50 to 70	H	moderately to slightly
	Chaix-Wapi	30 to 50	H	slightly
	Delleker-Fugawee, rubble land	10 to 70	H	moderately
	Fapiano-Waca	50 to 70	H	highly to slightly
	Gibsonville-Waca	50 to 75	H	slightly
	Haypress-Toiyabe	2 to 30	H	slightly
	Haypress-Toiyabe	30 to 50	H	slightly
	Haypress-Toiyabe, rock outcrop	2 to 50	H	slightly
	Tallac-Inville-Goodlow	15 to 65	M	slightly
	Waca-Portola	30 to 50	M	slightly
	Waca-Woodsey	30 to 50	H	slightly

Road Density and Stream Crossings

Road density within the analysis subwatersheds ranges from 0.01 to 0.03 mi^2 and averages about 0.020 mi^2 (Table 3.80). The HFQLG Pilot Project rates road density as low—less than 1 mile per square mile; moderate—2 to 3 miles per square mile; and high—greater than 3 miles of road per square mile of land. Most subwatersheds contain moderate to high road densities. Road-stream crossing density ranges from less than one per mi^2 to more than 12 per mi^2. Stream crossings are a frequent source of sediment supply to streams. Road densities and road-stream crossing range from low to high (Table 3.80).

3.8.5.4 Beneficial uses

Existing beneficial uses of surface waters within the Freeman landscape assessment area are found in the Central Valley Region Water Quality Control Plan (California Regional Water Quality Control Board 2004). This plan identifies beneficial uses for specific water bodies in the Central Valley Region and states that those uses generally apply to the tributary systems of those water bodies. Big Grizzly Creek flows from Lake Davis, part of the State Water Project, into the Middle Fork of the Feather a Federally designated Wild and Scenic River. Approximately 300 acres of land situated in the western portion of the project area drain into Little Grizzly Creek and thence to Indian Creek and the East Branch North Fork of the Feather River. Beneficial uses as listed in the in the Plan are identified in the Cumulative Watershed Effects and Soils Assessment (USFS PNF BRD 2006f).

3.8.5.5 Water Quality

Water quality data was collected in the project area as early as 1987. Temperature data and macroinvertebrates were collected and assessed to determine existing water quality and changes to water quality over a 15 year period.

Water Temperature

Water temperature increase is primarily an impact to cold-water fisheries and may occur both at the site of disturbance and downstream due to the additive effects of stream canopy removal through harvest operations, livestock grazing, wildfire or debris flows. Physical alterations of stream channels within meadows through over-grazing have lead to wide shallow channels that intercept greater influxes of incident radiation than the narrow deep channels, which were once common throughout the meadowlands. Stream temperatures were collected for Cow, Grizzly and Freeman Creeks in 1987, 1988 and 2002 and are presented in Table 3.81.

The data indicates there has been a steady decline in the temperature. This can be attributed in part to the restoration and revegetation work that has occurred along these stream corridors. Cold water fish like trout become stressed when stream temperatures rise above 72 degrees F. The data would suggest that the fisheries within these streams are improving.

Macroinvertebrates

Another way to assess water quality is by conducting macroinvertebrate analysis. Freshwater macroinvertebrate are everywhere; even the most polluted or extreme fast-running water habitats usually contain some representatives of this diverse and ecologically important group of organisms. The term macroinvertebrate refers to invertebrate fauna retained by a 500 mm net or sieve. Understanding the range of tolerance of individual species of invertebrate has provided an additional tool for assessing the effects of management activities in watersheds. The biological data presented in this report provides indicators of water quality and habitat as it relates to aquatic biota, including fish. Macroinvertebrate analyses were conducted by the National Aquatic Ecosystem Monitoring Center Laboratory.

Table 3.80 Subwatershed characteristics and description of road impacts in the Freeman Project area.

Analysis subwatershed	Subwatershed area mi^2	Miles of stream by type			Number of road-stream crossings	Miles of road	Road density mi^2/mi^2
		perennial	**intermittent**	**ephemeral**			
Val	1.37	1.0	1.1	1.3	7	5.9	.020
Four Springs	0.76	1.2	2.5		5	2.6	.016
Izzy	1.01	1.6	3.4		5	5.7	.027
Riz	0.73	4	0.4	0.5	2	4.5	.029
Marsh	0.76	2.1	0.2	2.5	8	2.0	.013
Freeman	5.85	10.9	5.6	4.4	13	27.2	.022
Cow	2.73	6.2	1.5	4.2	12	12.2	.021
Round Hill	0.69	2	4.4		1	1.4	.010
Dan Blough	1.5	2.1	0.8	0.7	12	5.6	.018
Little	0.47	1.3	3		2	2.3	.023
East Humbug	3.36	10.7	4.1	2.4	29	8.0	.011

Cow Creek

The 1987 analysis of the macroinvertebrate sampled in Cow creek indicated warm water with a high sediment load and few exposed gravels. Channel conditions were reported to be poor with lower dissolved oxygen levels. Channels exhibiting these conditions generally have less diverse populations of taxa most of which are sediment tolerant. Out of a total of 26 species found, Diptera, commonly associated with poor water quality, was the dominant species and represent greater than 75% of the overall population.

In 1995 conditions in Cow creek were comparative to 1987. Of the 27 macroinvertebrate species, the dominating types were sediment and organic enrichment tolerant. According to the report, the analysis indicates severely stressed conditions usually associated with the impacts of grazing. Biodiversity has improved and is rated good. The species composition indicates there is some potential for fish even though the species composition is an indication of very limited spawning substrate.

In the 1998 report the overall condition of Cow Creek upgraded from a past value of “severe stress conditions” to a value of “poor conditions”. Some clean water taxa were present and “indicated fairly good water quality” (Mangum 1998). The species composition in some areas indicated the riparian habitat was in good condition. Eight macroinvertebrate species were missing from the data normally found in past years. Some of those eight species are sediment tolerant. According to the analyzer their absence may be attributed to rotenone, which was applied in 1997, as a means to eradicate pike in Lake Davis and its contributing tributaries. Potential for fish and the possibility for limited suitable spawning gravels are indicated.

In the 2003 report, sample results indicate a similar population as 1998. A total of 19 species were found. Diptera continues to be the dominant taxa. Grazing impacts continue to have a negative impact on water quality and channel condition.

Table 3.81 Temperature data by stream for 1987, 1988 and 2002

Creek Name	Data Collection Year	Range for Maximum Temperature in Degrees F	Range for Minimum Temperature in Degrees F	Average Temperature in Degrees F Max Min
Cow	1987	86.2-56.7	61.2-40.8	72.3-48.6
Grizzly		86.9-62.8	65.5-47.1	72.4-53.8
Lower Freeman		80.4-58.5	63.3 45.0	67.9-52.9
Cow	1988	83.3-64.2	57.0-42.1	76.2-52.1
Grizzly		82.6-62.6	59.7-46.6	77.4-54.6
Lower Freeman		77.7-60.8	64.6-50.2	72.2-59.9
Cow	2002	73.4-61.1	58.8-42.8	70.8-52.3
Grizzly		76.1-60.8	67.1-53.4	69.8-61.7
Lower Freeman		71.2-53.8	63.1-48.0	65.1-57.7
Upper Freeman		68.4-50.9	54.1-41.0	65.1-57.7

Note: Temperature data was collected from July through September. Data loggers were programmed to collect data every hour.

Freeman Creek

The 1987 analysis of the macroinvertebrate sampled in Freeman Creek found a total of 28 species. Just under half of the population consisted of taxa that live in environments of moderate to higher water quality. Diptera, commonly found in warm water, sediment and nutrient loaded environments represented the rest of the macroinvertebrate population.

In 1991 a total of 39 macroinvertebrate species were found in lower Freeman Creek. Lower Freeman Creek is the portion of the reach east of Forest Route 10 and west of the lake. The upper portion of Freeman Creek is west of Forest Route 10. The majority of species were tolerant of moderate water quality conditions. A lesser number of high water quality tolerant species where found. The 1991 Annual Progress Report states that the water quality conditions show a negative trend compared to data from 1987. There is a higher level of diversity at this time, but areas of “fair condition and poor maintenance capability could be improved upon” (Mangum 1991). The macroinvertebrate biomass indicates it “could provide nutrients for a fairly good fishery” and some areas seem to indicate suitable substrate for spawning.

In 1991 upper Freeman Creek was found to have a total of 46 macroinvertebrate species. The report suggested water quality in the upper section of the creek was superior to the lower reach. The upper reach had moderately tolerant taxa, which indicate some organic enrichment and moderate amounts of sedimentation. The overall analysis indicated good water quality. It was reported there was excellent diversity of species. The large biennial stonefly has a 2 year nymphal stage confirming that this stream is perennial and indicating support for larger fish in the community. Clean water taxa indicates some suitable spawning substrate.

As of 1995, sediment and organic nutrients continue to be found in lower Freeman Creek. Conditions appear to be slightly better than 1991 but are still of lower quality than the conditions found in 1987. The macroinvertebrate biomass indicates support for a limited size and quantity of fish. Low populations of clean water species continues to indicate limited spawning gravels. Sediment tolerant species continue to dominate, good biodiversity is indicated and the riparian habitat condition is reported to be at least in fair condition.

The upper reach of Freeman Creek in 1995 showed continued existence of clean water taxa, indicating good water quality and good instream substrate. Riparian habitat is rated good to excellent. Diversity continues to be high but macroinvertebrate biomass numbers are slightly lower. The clean water species found indicate availability of suitable spawning gravels.

In 1998 for both upper and lower reaches of Freeman Creek water quality was similar to previous years. The resident populations of macroinvertebrate species would normally indicate ecosystem instability however this indication of instability may be explained by the 1997 rotenone application in this stream. Nineteen species appear to be absent compared to the previous years. The number and size of fish may be limited due to the low number of clean water species.

The 2003 report for upper Freeman indicates a slight drop in water quality as compared to 1998. Clean water taxa indicate water quality is still good but there has been a decline in taxa diversity, 34 species as compared to 37. Biomass indicates adequate nutrients for fish. Clean water species composition indicates availability of suitable spawning gravels.

Grizzly Creek

In 1991Grizzly Creek supported a total of 33 species of macroinvertebrate most of which tolerate poor water quality condition. Although the stream indicates good diversity it is noted that the clean water taxa have lower population ratios than the sediment tolerant species present. The existing conditions were not good when compared to the poor conditions indicated in 1987. As of 1991, the overall condition of this creek has dropped to “severely stressed” (Mangum 1991). The potential for fish appears to be fair but the stream may have limited spawning substrate due to sedimentation.

In 1998 Grizzly Creek water quality was similar to previous years; resident populations of macroinvertebrate could normally indicate ecosystem instability. However, this indication of instability may be explained by the 1997 application of rotenone. Nineteen of the species appear to be absent when compared to previous analysis. “High numbers of Simuliids indicate organic nutrient loading which is often associated with grazing activities. Clean water species had low numbers indicating poor habitat conditions although fish habitat and suitable spawning substrate are possible. Biodiversity indicates a rating of fair. Number and size of fish may be limited due to the low number of clean water species.

The 2003 Grizzly analysis indicates that 40 species were found. There is a greater diversity than in previous years. There was a slight increase in the clean water taxa but the overall population is weighted to the sediment tolerant species. Water quality is slightly better than the “severely stress” rating of 1998. The potential for fish appears to be good but there is still indication of limited spawning gravels.

3.8.5.6 Past, Present and Reasonably Foreseeable Future Actions

Past Activities

Resources within the project area have long been utilized. Local Native Americans utilized a wide variety of natural resources within the project area for thousands of years. Grazing and small scale dairying began as early as the 1860s. By the mid 1880s the emphasis within Grizzly Valley appears to have changed to ranging cattle beef and no small dairies survive into the 1900s (Kliejunas and Elliott 2006). By 1920 R.T. Jenkins had acquired at least some of the lands formerly held by George Mapes. Jenkins established a camp and ran thousands of head of sheep from this time until at least the early 1960s (Kliejunas and Elliott 2006). Beginning in the 1920s, concerns of overgrazing lead to increased restrictions on allotments managed by the Plumas National Forest.. Many of these allotments remain active today, although the numbers of cattle have been substantially reduced over the years. Currently, no sheep graze in Grizzly Valley but the overall pattern of seasonal range use has occurred for at least 130 years (Kliejunas and Elliot 2006). With this intensive grazing the meadowlands became compacted and experienced substantial surface erosion resulting in meadow stream systems that experienced degradation. Since that time period, most watersheds have experienced a slow recovery.

The history of logging in the project area is quite extensive and dates to the late 1920s. When the Western Pacific Railroad was completed through Plumas County in 1909 many sawmills were developed along the new route (Kliejunas and Elliott 2006). Among these was the Feather River Lumber Company (FRLC), who, in 1915, began using a narrow gauge railroad to bring logs to its mill located in Delleker. By the end of the decade, FRLC had penetrated the southwest end of Grizzly Valley and had constructed miles of temporary railroad spurs throughout the area. The company used caterpillar tractors and big wheels rather than steam donkeys due, in larger part to the comparatively gentile topography of much of the area (Kliejunas and Elliott 2006). Railroad logging operations ended in 1940 and by the early 1950s, the old mainline grade along the western end of the valley was converted into the main roadway 24N10 (Kliejunas and Elliott 2006). Between 1926 and 1992 it is estimated from Beckwourth Ranger District Timber Atlases and sale contracts that 90 percent of the project area was harvested using a combination of overstory removal, single-tree and group selection. More recent timber harvests within the project area include the Freeman Timber project, which was harvested in the mid-eighties. The Threemile, Summit and Westside Timber projects were harvested in the early-nineties. These recent projects harvested approximately 20 million board feet of timber through regeneration harvests, overstory removal and sanitation silvicultural prescriptions. Much of the area was salvage logged in 1990 and 1996. Timber harvesting had impacts on soils in several ways; compaction resulting from road, skid and landing construction; removal or displacement of topsoil; loss of soil due to mass movement or surface erosion. Mass movement is triggered by misplaced logging roads, because of raised piezometic pressures (Gray and Megahan 1981) and by reduced root tensile strength from decaying root systems of harvested trees. Loss of soil was generally caused by increased overland flow resulting from roads and landings and yarding operations. Changes to soil temperature have resulted from increased solar radiation. Soil moisture also changed because of decreased evapotranspiration and interception. Soil chemical and biological processes were probably altered. For example, incorporation of large volumes of fresh organic matter into the soil can shift the C/N ratios, while piling or chipping and removing organic matter from the site can reduce the nutrient available to the soil.

Present or Reasonably foreseeable future projects

Future activities include ongoing work within Humbug DFPZ, Long Valley KV and a hazard tree removal project. The effects associated with these projects are included in the analysis of cumulative effects as part of the existing condition. Public wood cutting would continue and would result in negligible increases in ERA. Analysis areas and temporal bounds differ and are dependant on the resource area. For example, effects to soils and water are considered where more than 1 % of the watershed is being impacted in watersheds greater than 400 acres. For this reason the cumulative effects discussed in this section may not completely address the entire list provided in Chapter 3 of the Freeman DEIS.

The Grizz DFPZ Proposed Action is currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows that approximately 73 acres of that project would fall within Val Watershed. Considering the proposed activity and the size of the watershed the estimated change in the overall Threshold of Concern (TOC) would be approximately 2%. The existing condition TOC is currently 5% in the upland and 4% in the sensitive area. After the implementation of the Freeman DFPZ and Group Select Project the TOC for the watershed would be some where between 11.4% and 12.3%, depending in which alternative is selected. Implementation of the Grizz PA within this watershed would cause the TOC to be exceeded. The Grizz DFPZ Environmental Impact Statement will further assess the effects of both projects on the water and soil resources.

Treatment to eradicate the pike from Lake Davis is being proposed and assessed by the State of California. The Proposed Action and alternatives are currently under development and could not be precisely evaluated at the time of this report. Preliminary analysis shows there are potential negative effects to the fishery, macroinvertebrate and water quality in all the streams within the Freeman Project area from both the eradication and the lowering of the lake. The Forest Service is proposing the following associated actions, 1) issuance of a special use permit for access through and use of National Forest lands to lake Davis and it's tributaries for the implementing the pike eradication program, 2) a Forest order to close the entire area to the public during this procedure and to close access to the lake bed as the lake level lowers.

Westside Lake Davis Watershed Restoration Project would occur in 2005. Under this action 50 headcuts and gullies would be restores within the Freeman Project area. Implementation of this project will improve channel stability and reduce sedimentation within 20 stream channels.

Grazing would be expected to continue on private and National Forest lands at current levels. Approximately 40 percent of the Humbug Allotment is within the Freemen Creek Watershed. Ninety-five cow-calf pairs are authorized for June to August. One hundred percent of Grizzly Valley is within the Freemen Creek Watershed. Five hundred and five cow-calf pairs are authorized for June to September. Approximately 50 percent of the Grizzly Valley Community Allotment is within the Freemen Creek Watershed. One hundred fifty seven pairs are authorized for June to September. One hundred and twenty pairs are authorized for June to September. The Lake Davis Allotment is within the Freemen Creek Watershed. It is currently vacant.

3.8.6 Environmental Consequences

The cumulative watershed effects analysis and soils assessment are presented in this section. For each alternative, anticipated effects to the environmental variables shown in Table 3.76 are discussed in turn.

3.8.6.1 Alternative 1 (Proposed Action)

Cumulative watershed effects analysis

While fire ignitions are expected to continue following the activities proposed in Alternative 1, fuel treatments are designed to give wildland fire managers "…a higher probability of successfully attacking a fire" (Agee et al. 2000) A future severe wildfire would have the effects described under Alternative 2, but implementation of Alternative 1 should reduce the likelihood of such an event. This would be due to the increased ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Under Alternative 1, the increase in ERA values range from 4% to 78% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 28% to 103% of the TOC when sensitive and uplands are assessed separately. The TOC of any given subwatershed when the entire subwatershed is assessed together remains below threshold and values range from 35 to 96. As a result, there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.78, Figures 3.16 and 3.17).

Direct Effects—ERA

Mechanical treatment would occur on 3,772 acres of the watersheds analyzed. Eight hundred forty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree. Aspen treatment would occur on 509 acres of which 350 acres would be in RHCAs. Equipment would be otherwise excluded from the RHCAs except at approved crossings, which would generally be located on existing skid trails. No skid trails were proposed within the RHCA. Instead, mechanical equipment would be required to transport material out of the RHCA to established skid trails. There is a 25 foot equipment exclusion zone for all aspen treatments within RHCAs. A 15 % slope restriction would be applied to all mechanical treatments within the RHCAs. Hand thinning, piling and underburn or underburn only would occur within the remaining RHCA's within the project area.

Under Alternative 1, there would be about 16 miles of system road re-construction, 0.3 miles of road relocation, 10 miles of road decommissioning and 2 miles of temporary road construction. Reconstruction and construction would increase ERA values, while road decommissioning would decrease ERA values. Temporary road construction would have a short term impact. This impact would be mitigated through the subsoiling of all temporary roads after use.

Figures 3.16 and 3.17 show the modeled increase in disturbed area to each analysis subwatershed due to the treatment activities proposed in Alternative 1.

Indirect Effects—ERA

Road decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope and/or seeding the affected area. These measures help initiate revegetation and recovery of the road area. Over time, decommissioned roads produce less sediment and surface runoff to adjacent streamcourses. As a result, their contribution towards the ERA of a watershed is reduced. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff and sediment production compared to subsoiling or cover cropping. Road construction would create new sources of sediment and disruption of hydrologic continuity on affected hillslopes. Reconstruction would consist of brushing, blading the road surface, improving drainage and replacing or upgrading culverts where needed. Short term increases in sediment may be offset by long term improvements to water quality as a result of improved road drainage and stream crossings. Harvest activities may locally alter soil moisture regimes and subsequent water yield due to altered interception and evapotranspiration. Harvested areas would be more susceptible to erosion and sediment transport to the channel network. Implementation of Best Management Practices would help mitigate these effects.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance (particularly due to road effects) and loss of ground cover. Silvicultural prescriptions for the project include harvests, underburning, grapple piling and mastication. Under these prescriptions, there would be canopy retention and surface vegetation recovery that would provide inputs to ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are described below.

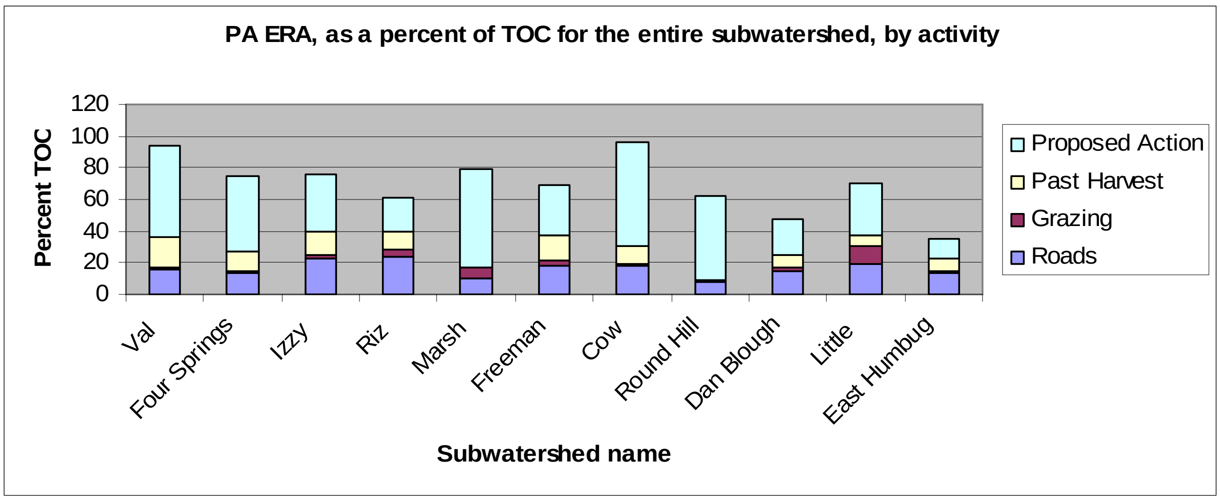

Figure 3.16 Alternative 1, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed.

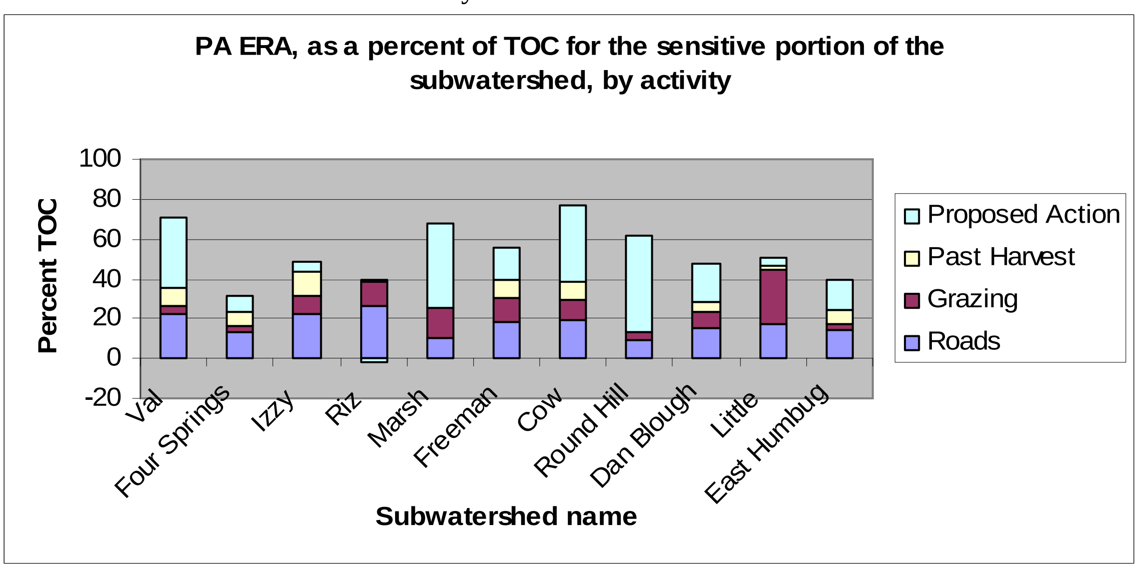

Figure 3.17 Alternative 1, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Two subwatersheds would be at high risk for cumulative effects (TOC of 9 percent in sensitive and 12 percent in upland). ERA increases would leave three subwatersheds at moderately high risk of cumulative effects (6 percent or greater TOC in sensitive and greater than 9 percent in the upland). Low to moderate increases in six other subwatersheds means those subwatersheds would be at higher risk of cumulative effects. However, these subwatersheds would still be within a low to moderate risk of cumulative effects. Expected increases in ERA in all subwatersheds are greater than 34% of the TOC, Figure 3.16 .

Soil Assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 soil standards, there would be a lower risk that soil productivity would be impaired. Alternative 1 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. Five watersheds would have a substantial amount of mechanical treatments (increase over existing of greater than one third of the watershed), so there would be a considerable amount of ground disturbance. Impacts on soil resources would be greater than alternatives 2, 3 and 4. Soil Quality Standards direct us to manage annual rate of loss through sufficient soil cover to prevent accelerated soil erosion from exceeding the rate of soil formation (The long-term average is approximately one ton/acre/year). One ton per acre is equivalent to the thickness of two sheets of paper. Accelerated soil erosion applies to human caused disturbance and does not account for the other disturbances, such as wildfire. It is not expected that hillside erosion over any given treatment area would exceed one ton per acre. However, as discussed above, on a site specific basis this erosion rate may be exceeded on individual landings, roads or stream channels. Modeling erosion rates requires a substantial amount of time; so two locations were selected within mechanical treatment areas where erosion rates were expected to be high because of geological type and length of slope.

One erosion response unit was selected from each a major soil type (Volcanic, Granitic) to assess erosion. As Elliot (2000) discusses, utilizing the WEPP model is considered an excellent model for estimating erosion, but as with all erosion models, estimates within ± 50% are good. Within cow watershed on erosive weathered granitics the existing erosion rate is estimated to be .04 tons per acres on well-forested sites (80% to 90%) with average slopes of 20%. Following treatment, the WEPP model predicted that erosion rates would increase by 60 percent to .10 tons per acre. Within Freeman watershed on volcanic soils the existing erosion rate is .06 tons per acre, on this forested site with 70% ground cover and slopes of 20%. Following treatment, the WEPP model predicted that erosion rates would increase by 30% to .09 tons per acre. None of these values approach 1 ton per acre.

Soil cover

Direct Effects—Soil Cover

It is difficult to accurately predict treatment effects on effective ground cover. Harvest operations may increase activity fuels and effective ground cover, while pile burning and underburning reduces the cover of these materials. Mastication would increase soil cover as materials are broadcast away from the machine. Westmoreland (2004) conducted post-harvest monitoring for ground cover in thinned units and areas harvested with group selection silvicultural techniques on the Plumas and Tahoe National Forests. Pre-treatment cover conditions were similar to those found within this project. Westmoreland reported an average absolute decrease in soil cover of 9%. Assuming the Freeman units undergo the same decrease, 13 additional units may not meet the standard. Approximately 43% of the area was sampled. The acres represented by these units equate to 35% of the sample area and 15% of the project area. The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83% to 61%. While differences in sampling method and intensities, as well as harvest and site preparation practices, complicate this type of comparison, it is reasonable to assume that effective ground cover would be decreased. Implementation of mitigation methods such as leaving chips on site would ensure the standards would still be met. There is a moderate risk that treated units would not meet the Regional standard following treatment.

Under Alternative 1 mechanical treatment would occur within units where slopes are equal to or less than 35% and 15% or less in the RHCAs.

The potential for erosion is also increased as ground cover is reduced. Skid trails void of vegetation tend to concentrate and direct flow. Burn piles are another way ground cover is reduced. However, concentrated flow is not associated with burn piles because even though they lack ground cover vegetation they are islands contained within vegetation. There is greater potential for vegetation loss associated with pile burning in Alternative 1 because it has the greatest amount of burn piles. Burn pile estimates range from 12 to 40 per acre. Tthis would equate to 1,848 to 6,160 piles. Ground cover lost is in the form of dispersed islands where sediment transport may be trapped by the surrounding vegetation and is not of the same concern as larger barren strips created from skid trails. Acres affected are presented in Table 3.82.

The potential for sediment transport to the stream channel would be greater in Alternative 1 because 841 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 350 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all alternatives sediment transport to the channels would decline because 10 miles of roads would be decommissioned. All other road actions are presented under Alternative 1.

Table 3.82 Potential for erosion due to loss of ground cover comparison by alternative in the Freeman Project area.

Type of Disturbance	Method of Disturbance	Acres by Disturbance Alternative	Range of Percent Acres Impacted	Duration of impact in years	Rationale
Loss of Ground Cover, Vegetation	Mechanical	Alt 1 3,772 Alt 3 3,574 Alt 4 3,507 Alt 2 0	12 to 25 percent	1 to 5	Recolonization is slower because the ground is compacted
Loss of Ground Cover, Vegetation	Hand Pile and Burn	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	0.5 to 2% at 12 piles per acres 5ft to 10ft in diameter 1.8 to 7% at 40 piles per acres 5ft to 10ft in diameter	0.5 to 5	Easily recolonizes from surrounding area
Loss of Ground Cover, Vegetation	Wildfire	Alt 1 Alt 3 Alt 4 Alt 2	0 to 100 percent of the project area. Risk would be reduced by acres treated. 0 to 100 of project area, analysis area or greater.	1 to 3	Recolonization dependant on fire intensity, some recolonization from surrounding area Large threat for invasive species Stand structure permanently altered

Indirect Effects—Soil Cover

A reduction in effective ground cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of ground cover across a large area would be more effective at intercepting surface water than large areas devoid of cover.

Cumulative Effects—Soil Cover

A reduction in ground cover is likely to be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. A wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone. See the discussion under Alternative 2, above.

Soil Porosity and Detrimental Compaction

Direct Effects—Soil Porosity and Detrimental Compaction

It is difficult to accurately predict treatment effects on detrimental compaction. The use of logging equipment and reoccurring stand entries increases the potential for soil compaction (Powers 1999). The relationship between compacted and heavily disturbed ground to the decline in soil productivity over time is well documented (Horwath, et al. 2000, Grigal 2000). The degree of soil compaction varies with soil texture and moisture content, while plant responses to compaction depend strongly on changes in the soil water regime (Gomez et al. 2002). Timber harvest and biomass removal would require the use of skid trails and landings.

Because the areas proposed for treatment have been harvested before, it is expected that as many as half the existing skid trails would be used for the proposed harvest. This would reduce the area disturbed by the creation of new skid trails. These reused skidtrails would be subsoiled as part of the Freeman Project. As a result the existing condition would be improved. However, monitoring on the Plumas, Lassen and Tahoe has shown this subsoiling to be only 66% effective. Table 3.83 shows the expected increase in skid trails and landings for each treatment unit surveyed. Although treatment prescriptions vary among the action alternatives, it is assumed that all action alternatives would require the approximately same amount of skid trails and landings to service the treated acres. As a Standard Operating Procedure (also referred to as Standard Management Requirement (SMR) all landings would be subsoiled after use to mitigate compaction effects.

Soil monitoring for HFQLG pilot projects has shown an absolute increase in detrimental compaction of 8% following thinning and group selection treatments (Westmoreland 2004). For any mechanical harvest, the extent and degree of compaction depends on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations and harvest equipment features. In addition to subsoiling, Freeman Project SOPs include other soil protection measures, such as wet weather standards, to minimize soil compaction. By following the SOPs, utilizing existing skid trails where feasible and adhering to the estimates of new skid trails, increases in detrimental compaction due to skid trails are expected to be minimized. In their existing condition, four units 1, 9, 48 and 74 are over 15% compacted. Assuming the Freeman units undergo the same decrease and assuming 100% subsoiling effectiveness two additional units would have compaction exceeding 15% of the unit. The acres represented by the existing plus the associated increase from these 2 units is 4% of the sample area and 2% of the project area. Assuming the Freeman units undergo the same decrease and assuming 66% subsoiling effectiveness, 15 additional units may experience increase over 15%. The acreage represented by the existing units plus the associated increase from these 15 units is 30% of the sample area and 13% of the project area. The sampled portion of the project area would experience an increase in area exceeding 15% compaction from 96% to between 92% and 66% dependant on subsoiling effectiveness (Table 3.83). Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

The potential for erosion is increased when equipment operates on slopes greater than 25% so higher erosion rates would be expected under Alternative 1. Skid trail density and the steeper slopes contribute to the higher erosion rates on these lands. When ground based harvesters operate over 25%, skid trails are installed perpendicular to the contour unless cut into the slope on a diagonal. Vertical skid trails require a much closer spacing. This results in an increase in bare soil and more disturbance of the soil between the skid trails. These skid trails are too steep to be subsoiled so soil porosity is decreased and the potential for erosion is increased.

Table 3.83 Existing and predicted percent increase of unit area in skidtrails and landings.

Unit	Percent of Transect in Skid Trail or Landing	Predicted Percent of Unit in Skid Trail or Landing Assuming 50% reuse, 100% Subsoiling Effectiveness and 8%Increase	Predicted Percent of Unit in Skid Trail or Landing Assuming 50% reuse, 66% Subsoiling Effectiveness and 8% Increase	Unit	Percent of Transect in Skid Trail or Landing	Predicted Percent of Unit in Skid Trail or Landing Assuming 50% reuse, 100% Subsoiling Effectiveness and 8% Increase	Predicted Percent of Unit in Skid Trail or Landing Assuming 50% reuse, 66% Subsoiling Effectiveness and 8% Increase
1	0.18	0.17	0.20	51	0.14	0.15	0.17
4	0.07	0.11	0.12	52	0.07	0.11	0.12
5	0.04	0.10	0.11	53	0.14	0.15	0.17
6	0.04	0.10	0.11	53	0.02	0.09	0.09
7	0.13	0.15	0.17	56	0.13	0.15	0.17
8	0.12	0.14	0.16	57	0.18	0.17	0.20
9	0.20	0.18	0.21	57	0.02	0.09	0.09
10	0.12	0.14	0.16	61	0.10	0.13	0.15
12	0.02	0.09	0.09	62	0.05	0.11	0.11
13	0.02	0.09	0.09	63	0.02	0.09	0.09
17	0.13	0.14	0.16	66	0.06	0.11	0.12
19	0.07	0.11	0.12	67	0.10	0.13	0.15
20	0.02	0.09	0.09	67	0.12	0.14	0.16
21	0.01	0.09	0.09	70	0.05	0.11	0.11
22	0.03	0.10	0.10	72	0.15	0.16	0.18
23	0.03	0.10	0.10	74	0.17	0.16	0.19
24	0.08	0.12	0.13	76	0.01	0.09	0.09
26	0.02	0.09	0.09	77	0.08	0.12	0.13
29	0.05	0.11	0.11	90	0.04	0.10	0.11
30	0.12	0.14	0.16	92	0.07	0.12	0.13
32	0.06	0.11	0.12	94	0.03	0.10	0.10
32	0.04	0.10	0.11	95	0.06	0.11	0.12
34	0.02	0.09	0.09	97	0.08	0.12	0.13
35	0.02	0.09	0.09	98	0.12	0.14	0.16
37	0.08	0.12	0.13	99	0.03	0.09	0.10
38	0.06	0.11	0.12	108	0.12	0.14	0.16
41	0.12	0.14	0.16	111	0.05	0.11	0.11
42	0.03	0.10	0.10	113	0.13	0.14	0.17
48	0.20	0.18	0.21	124	0.08	0.12	0.13

Indirect Effects—Soil Porosity and Detrimental Compaction

Increases in compacted areas are expected due to the need for new skid trails. In these areas, compaction may reduce the infiltration capacity, reduce available water in the soil, impede root growth and alter nutrient uptake and tree growth.

Cumulative Effects—Soil Porosity and Detrimental Compaction

Table 3.83 shows the predicted cumulative level of skid trail and landing cover for the treatment units. Four units have cumulative levels of compaction greater than 15% in their existing condition. Following the proposed activities, these same units would still be above 15% and 2 to 15 units would also experience increases sufficient to move them above 15%. Additional subsoiling of legacy skidtrails within these units will reduce compaction and leave them in an improved state, as discussed above under “Direct effects”.

Organic matter

Direct Effects—Organic Matter

Accurate prediction of treatment effects on surface fine organic matter is difficult. Mastication treatments are expected to increase cover of organic matter as masticated debris is broadcast away from the machine. Under this alternative organic matter and soil nutrients may be affected by this project though soil displacement via road and landing construction, prescribed burns, burn piles and removal of vegetative material from the site.

Underburn treatments may reduce organic matter, but burning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Pile burning would decrease surface fine organic matter locally, but over time adjacent trees and shrubs would provide litter to cover the burned area. Fireline construction around prescribed burn areas and handpiles would create bare soil conditions. Over time, adjacent trees and shrubs would provide organic cover. Cover of fine organic matter is expected to remain relatively similar to the existing condition. To meet standards, additional fine organic matter will need to be left on site.

Indirect Effects—Organic Matter

Local reductions in surface fine organic matter may have local effects on soil temperature. Large reductions in organic matter may result in greater temperature extremes in the soil, as previously discussed. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of surface fine organic matter (Erickson et al. 1985).

Cumulative Effects—Organic Matter

Following the proposed treatments, organic matter on the soil surface would decrease in some areas, due to mechanical displacement or consumption by fire, while organic matter would increase in other areas due to additions of masticated material. This may result in greater heterogeneity of the forest floor. Patches of organic matter would provide habitat for soil invertebrates and microorganisms. Patches of bare areas would be susceptible to local erosion.

Increases in woody materials on the forest floor due to mastication may cause short term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift 1977). Microclimate changes at the forest floor due to reduced canopy cover can alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Edmonds 1985). Under Alternative 1, 39%of the sample area and 17% of the projects area may not meet the standard for fine organic matter. Table 3.84 displays a comparison of the effects to soil productivity by alternative. Table 3.85 summarizes the existing condition and changes to ground cover, compaction and fine organic matter by alternative.

Table 3.84 Soil productivity comparison of Freeman Project alternatives.

Soil Productivity Indicator	Type of Disturbance	Acres of treatment by Alternative	Impact	Duration of impact in	Rational
Microbes	Mechanical	Alt 1 3772 Alt 3 3574 Alt 4 3507 Alt 2 0	Displacement or death	1 to 5 years	Recolonization is slower because the ground is compacted
Microbes	Hand Pile and Burn	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	No effect, displacement or death	0.5 to 5 years	This effect is based on temperature intensity and duration of burn. Recolonization occurs fairly quickly from the surrounding area
Nutrient Loss	Mechanical	Alt 1 3772 Alt 3 3574 Alt 4 3507 Alt 2 0	Approximately a direct proportion to the weight of the timber harvested	Can be long term	Returns in proportion as vegetation returns and litter and duff layers establish
Nutrient Loss	Hand Pile and Burn or	Alt 1 154 Alt 3 81 Alt 4 137 Alt 2 0	100 to 900 lbs per acre	Short term	Effect is localized

Table 3.85 Existing Condition and Changes to Ground Cover, Compaction and Fine Organic Matter by Alternative.

	Total acres proposed for treatment	Acres sampled	Percent area sampled	Acres outside of standard for ground cover (gc)	Percent area outside of standard for project area gc	Acres outside of standard for skid trails and landings (sl)	Percent area outside of standard for project area sl	Acres outside of standard for fine organic matter (fom)	Percent area outside of standard for project fom
Alt 2	5800	2490	0.43	414	0.07	92	0.02	971	0.17
PA	5794	2490	0.43	870	0.15	217	0.04	971	0.17
Alt 3	5579	2490	0.45	766	0.14	210	0.04	822	0.15
Alt 4	5488	2490	0.45	870	0.16	226	0.04	924	0.17

Soil Buffering Capacity and Sporax Effects

Soil buffering capacity is expected to remain largely unchanged by Alternative 1. Pile burning and underburning may cause short-term alterations to soil pH and nutrient cycling at a relatively small scale (Raison 1979). Sporax (common name borax; chemical name sodium tetraborate decahydrate) is not expected to change soil buffering capacity. Sporax is generally active in the soil. Boron from Sporax is adsorbed by the mineral portion of the soil and is absorbed from the soil by plants. Boron is an essential plant nutrient which naturally occurs in the soil at concentrations of 5 to 150 parts per million. Sporax remains unchanged in the soil for varying lengths of time, depending on soil acidity and rainfall. The average persistence is 1 or more years. Sporax is less persistent in acid soils and in areas with high rainfall. Soils in the project area are slightly acidic. Soil microorganisms do not break down Sporax. Sporax is partially soluble in water and the potential for leaching into ground water or surface water contamination is low (Information Ventures Inc. 1995). Alternative 1 treats 7.2 sq. feet per acre over 1,254 acres. This is approximately 0.14 pounds of borax per acre or a total of 176 pounds across the project.

3.8.6.2 Alternative 2 (No-action)

Cumulative Watershed Effects Analysis

Table 3.86 illustrates the changes in ERA values for the analysis subwatersheds over the range of action alternatives proposed for the Freeman DFPZ and GS Project. Existing ERA values, expressed as percent of the TOC, are shown in Alternative 2. Values for the action alternatives are shown as Alternative 1, 3 and 4. The TOC serves as a warning that cumulative watershed impacts may exist within a given watershed, which may adversely impact peak flows, water quality and/or channel stability. A value of 100% TOC indicates that the watershed is at its threshold. Values less than 100% indicate that the watershed is below its threshold, while values greater than 100%

indicate that the watershed has exceeded its threshold. The Region Five Soil and Water Conservation Handbook (USDA Forest Service 1988a) indicates that the TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. Susceptibility of disturbing activities increase as a watershed approaches or is impacted beyond the TOC. If the watershed is approaching or above the TOC, a more thorough investigation of the activities planned within the watershed is necessary.

Existing ERA values for the analysis subwatersheds currently range from 7% to 46% of the TOC (Table 3.86-Alternative 2). The percent of TOC varies across subwatersheds because past land management practices and natural disturbance events such as wildfire differ in type and intensity. Figures 3.13 and 3.14 show how the major land use activities contributed to the total ERA for each subwatershed. These activities include the existing transportation system, past public harvests, past private harvests and grazing. Past wildfires had no contribution to the ERA within any subwatershed and so they were not considered a major land use activity for this analysis. Reasonably foreseeable future projects were analyzed separately.

Currently each analysis subwatershed is well below the TOC (Figures 3.18 and 3.19). ERA values for the entire subwatershed range from 9 to 40 percent of threshold; contributing percents by land use activity are presented in Figure 3.18 and 3.19. Roads account for about 8% to 24% of the TOC in each subwatershed. Relatively little public or private timber harvests have occurred in these subwatersheds in the past decade. Harvest accounts for 0% to 20% of the disturbance within the subwatersheds. Grazing contributes 3% to 27% of the TOC. Large fires have not occurred within the analysis area in the past 25 years so they have no contribution to the TOC.

Since 1996 our ERA calculations have focused on the importance of near stream activities with respect to sediment yields and peak flows. Clearly, it has been shown throughout the literature over the past century that most sediment delivery originates within close proximity to stream courses, whether they are perennial, intermittent or ephemeral streams. To build more sensitivity into the ERA analysis, the Plumas National Forest’s cumulative watershed effect assessments now focus on the sensitive areas near the stream channel network including riparian areas, meadows and wetlands, as well as the total ERA values presented above and in Table 3.86.

Direct Effects—ERA

Under the No-action Alternative, the existing condition would be maintained. Given the assumption that fire, timber harvest, road construction and other watershed disturbance other than those listed in the Reasonable and Foreseeable Future Actions portion of this paper, do not occur, watersheds would continue to regain their inherent hydrologic character as stand growth continues. Ground cover conditions would improve and porosity of compacted soils increase, therefore ERA values would slowly decline to a baseline level over time. Improvements would not be made to the transportation system and no roads would be obliterated or relocated out of riparian areas, so watershed benefits and reductions in ERA values would not be realized. An opportunity will be foregone to treat heavy concentrations of fuels that would reduce the fire hazard and potential for large fires.

Table 3.86 Equivalent roaded acres by watershed in the Freeman Project area, presented as the percent of the threshold of concern for each alternative.

Analysis subwatershed by sensitive and upland (S) or (U)	ERA (% of Threshold of Concern)			
	Alt 1 (Proposed Action)	Alt 2 (No-action)	Alt 3	Alt 4
Val (S)	71	36	68	66
Val (U)	103	40	95	100
Four Springs (S)	32	23	31	29
Four Springs (U)	97	29	92	99
Izzy (S)	48	44	45	45
Izzy (U)	89	39	88	104
Riz (S)	37	39	48	48
Riz (U)	74	39	69	63
Marsh (S)	68	25	76	75
Marsh (U)	89	11	81	82
Freeman (S)	55	39	47	49
Freeman (U)	74	38	72	72
Cow (S)	76	38	62	78
Cow (U)	103	28	94	102
Round Hill (S)	61	13	65	70
Round Hill (U)	62	7	51	54
Dan Blough (S)	47	29	45	47
Dan Blough (U)	48	23	40	42
Little (S)	50	46	59	59
Little (U)	99	46	93	98
East Humbug (S)	42	24	41	55
East Humbug (U)	28	19	25	24

Indirect Effects—ERA

In the short term, water quality and downstream beneficial uses would remain unchanged. As watersheds recover from past management activities, there may be small improvements in water quality. Some sections of streams within these watersheds in poor to fair conditions would experience a very gradual, long-term improvement in channel stability as peak flows and sedimentation rates moderate. However, in the absence of road improvements, decommissioning or obliteration, the transportation system would continue to be a large contributor of sediment to the stream network. The density of roads and road-stream crossings would continue to impact the hydrologic regime in these subwatersheds.

Given the current fuel loading and subsequent increase in fuel loading resulting from the mortality caused by disease, insects or overstocking there is the probability that a large, intense wildfire would occur. Such a fire would be intense, destroying vegetation, ground cover and large organic debris within stream channels. As a result of these fires peak flows may increase five to ten times above existing levels and sediment loads could increase up to 50 to 100 fold.

On-site fishery habitat may be destroyed or severely reduced as the stream becomes devoid of cover, large organic debris and aquatic food. Jackson Creek, which burned in the Layman Fire in 1989, is a good example of the effects of intense wildfire on a native trout fishery. Native trout populations have dropped substantially since the fire. The decline is related the increase in water temperatures and suspended sediment. As sediment transported throughout the system settles out of the water column it in fills spawning gravels. Elevated temperatures resulting from loss of vegetative cover adversely affects egg survival and the growth of both juvenile and adult trout. Watershed and fishery impacts from large wildfires are discussed in further detail for the Jackson, Cottonwood and Clarks burns in the Tri-Forest Eastside Assessment available at the Plumas, Lassen or Tahoe National Forest Supervisor Offices. Seven stand replacing fires between 3,970 40,000 acres in size have occurred on the Beckwourth District since 1977. Most still have visible scars.

RHCAs would continue to function as unique habitat for wildlife and botanical diversity, but aspen stands would continue to decline in health and would continue to disappear from the landscape.

Cumulative Effects—ERA

In the event of a future severe wildfire, affected areas may be highly susceptible to erosion and generate large pulses of sediment to stream channels (Elliot and Robichaud 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

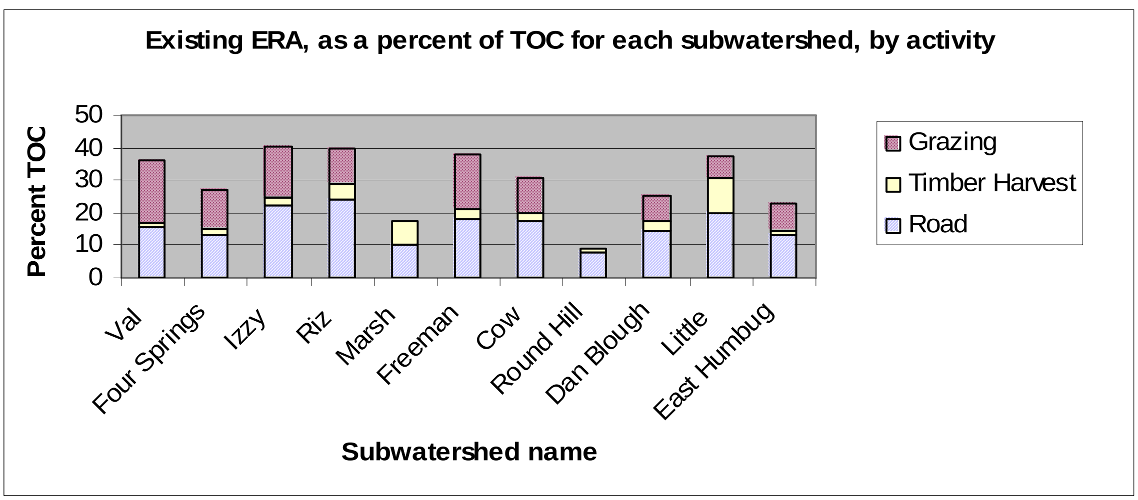

Figure 3.18 Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of TOC for each analysis subwatershed, broken down by activity. Analysis subwatersheds are shown by entire subwatershed.

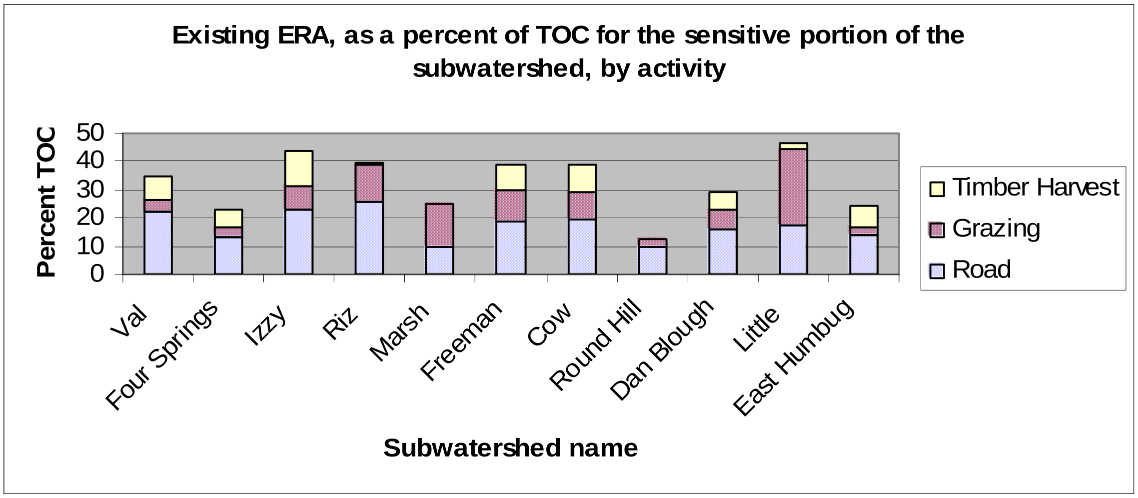

Figure 3.19 Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of TOC for each analysis subwatershed, broken down by activity. Analysis subwatersheds are shown for the sensitive portion of the subwatersheds.

Soil Assessment

Soil Cover

Effective ground cover is necessary to prevent accelerated soil erosion. Table 3.87 displays the current effective ground cover assessment in the 66 treatment units equaling 2,490 acres. The LRMP Standards and Guidelines for effective ground cover vary by the soil erosion hazard rating. For highly erodible soils the effective ground cover should be maintained at 60%. For moderately erodible soils effective ground cover should be maintained at 50%. For very highly and those less than moderately erodible the effective ground cover should be maintained at 70% and 40% respectively. Currently, on average, 53 treatment units meet the ground cover standard by meeting or exceeding these thresholds. However, 10 treatment units, 1, 19, 29, 35, 51, 52, 56, 58, 63 and 66 do not meet the standard. The acres represented by these units are 17% of the sampled area and 7% of the project area. The sample area represents 43% of the project area 3.76).

Direct effects—Soil Cover

Under the No-action Alternative, soil cover can be expected to increase as organic materials accumulate on the soil surface.

Indirect Effects—Soil Cover

As a result of increased soil cover, the risk of soil erosion may decline on forested hillslopes. Soil cover dissipates the energy of falling raindrops by through interception. At higher velocities falling rain causes rain splash, a force that sets soil grains in motion. The litter layer acts as a sponge increasing storage capacity and slows the velocity of overland flow. At high velocities overland flow results in rain-wash another erosive force. Without vegetative cover, an intense storm can generate huge quantities of sediment from hillsides (Cawley 1990). Reduced soil erosion helps retain soil nutrients and a favorable growth medium on site.

Cumulative Effects—Soil Cover

Under the No-action Alternative, soil cover can be expected to increase as organic materials accumulate on the soil surface. This description of limited disturbance within watersheds assumes that fires are controlled to spots less than 5 acres over the next 20 to 30 years.

However, a future high severity wildfire would likely consume organic materials on the forest floor and reduce soil cover below the LRMP Standard in the affected area. If soil cover is reduced to bare soil following a wildfire, the soil would be more susceptible to erosion (Table 3.82). In addition, fire can volatilize organic compounds in the soil, some of which migrate down a temperature gradient and condense on soil particles below the surface (DeBano 1990). As a result, hydrophobicity (a non-wettable layer) can develop below the surface This repellant layer can greatly reduce infiltration rates. During a precipitation event, soil above the non-wettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Factors such as soil texture, slope and post-burn precipitation intensity will affect the degree and type of post-fire erosion. Dry, coarse grained soils are particularly susceptible to this type of fire-induced hydrophobic condition (Clark 1994).

Soil Porosity

Soil porosity is the volume of voids compared to solids for a given volume of soil. The porosity of the soil is important for gas exchange and water movement into and through the soil. Ground based management activities can potentially reduce porosity or compact the soil. The actual effects depend upon soil type, equipment and operational factors. To limit the extent of compaction, the LRMP Standards and Guidelines indicate that no more than 15% of a stand should be dedicated to landings and permanent skid trails. Therefore, at least 85% of a stand should be in a non-compacted, productive state that is not a skid trail or landing. Table 3.88 shows the results of the compaction assessment in the 66 treatment units equaling 2,490 acres. On average, 62 units are currently below 15% compacted. However, one transect in unit 57 is above 15%. When averaged with the other transect in the respective unit, is below 15%. In units 1, 9, 54 and 74 the percent unit area in skidtrails and landings is greater than 15%. The acres represented by these units are 4% of the sampled area and 2% of the project area 3.76).

Direct effects—Soil Porosity

Under the No-action Alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension and decay, along with the burrowing action of soil dwelling animals, would contribute to the increase in soil porosity and decrease in compaction. In addition, incorporation of organic matter into the soil by biological processes such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

Cumulative Effects—Soil Porosity

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity (Clark 1994).

Organic Matter

Surface organic matter serves as a nutrient reservoir for plants and other organisms that inhabit the soil. As it is incorporated into the soil, it contributes positively to water-holding capacity, nutrient retention, infiltration and hydrologic function of the soil. Surface organic matter acts as a buffer to moderate extremes of soil temperature. The LRMP states that 50% cover of surface fine organic matter should be retained in all stands. Table 3.89 displays the results of the surface organic matter assessment in the 66 treatment units equaling 2490 acres. Currently, on average, 56% of the units meet or exceed the LRMP Standard. When more than one transect was conducted in a unit those transects were averaged. Six units 1, 7, 53, 61, 108 and 113 had less than 5% departure from the standard. Additionally seven units 26, 29, 34, 38, 41, 42 and 98 were less than or equal to a 10% departure. Eighteen units, 5, 9, 19, 22, 24, 35, 44, 47, 49, 51, 52, 56, 58, 59, 66, 67, 90 and 124 had departures ranging from 12% to 30% of the standard. In summary, 37 of the 66 units currently meet the standard. The acres represented by these units are 39% of the sampled area and 17% of the project area.

Table 3.87 Soil productivity assessments in sampled Freeman Project treatment units for average percent effective ground cover.

Unit	Erosion Hazard	Unit by Erosion Hazard (%)	LMP Ground Cover Standard	Existing Effective Ground Cover	Below Standard (%)	Unit	Erosion Hazard	Unit by Erosion Hazard (%)	LMP Ground Cover Standard	Existing Effective Ground Cover	Below Standard (%)
1	M		50	48	2	51	M	90	50	44	6
3	M		50	96		51	H	10	60	44	16
4	M		50	87		52	M	95	50	47	3
5	M	50	50	68		52	H	5	60	47	13
5	H	50	60	68		53	M		50	54	
6	M		50	92		56	M	93	50	51	
7	M		50	87		56	H	7	60	51	9
8	M		50	76		57	M		50	69	
9	M		50	70		58	M		50	48	2
10	M		50	74		59	M		50	60	
12	M		50	94		61	M	20	50	74	
13	M		50	88		62	M	80	50	80	
14	M		50	100		62	H		60	80	
17	M		50	68		63	H		60	55	5
19	M		50	47	3	64	H		60	83	
20	M	92	50	84		66	H		60	40	20
20	H	8	60	84		67	M	44	50	65	
21	M		50	91		67	H	56	60	65	
23	M	38	50	76		69	M		50	60	
23	H	62	60	76		72	M		50	83	
24	M	79	50	50		73	M		50	98	
24	H	21	60	50		74	M		50	70	
26	M		50	50		76	M		50	91	
29	M		50	44	6	77	M	20	50	73	
30	H		60	73		77	H	80	60	73	
31	M	88	50	70		78	M	88	50	89	
31	H	12	60	70		78	H	12	60	89	
34	M		50	50		79	M	58	50	81	
35	M		50	36	14	79	H	42	60	81	
35	H		60	36	24	90	H		60	60	
37	M		50	54		92	H		60	79	
38	M	83	50	62		94	H		60	67	
38	H	17	60	62		95	H		60	82	
41	M	88	50	62		96	H		60	95	
41	H	12	60	62		97	H		60	85	
42	M	97	50	80		98	M		50	83	
42	H	3	60	80		99	H		60	98	
44	M		50	38		108	H		60	70	
45	M		50	86		111	M	39	50	67	
47	M		50	57		111	H	61	60	67	
48	M	77	50	84		113	M		50	77	
48	H	23	60	84		124	M	40	50	73	
49	M		50	38		124	H	60	60	73	

Table 3.88 Results of soil field surveys for compaction in sampled Freeman Project treatment units.

Unit	Points Along Transect in a Skid Trail	Points Along Transect in a Landing	Number of Points in the Transect	Percent of Transect in Skid Trail or Landing	Unit	Points Along Transect in a Skid Trail	Points Along Transect in a Landing	Number of Points in the Transect	Percent of Transect in Skid Trail or Landing
1	9	0	50	0.18	51	6	1	50	0.14
4	6	0	90	0.07	52	4	0	60	0.07
5	2	0	50	0.04	53	7	0	50	0.14
6	2	0	50	0.04	53	1	0	50	0.02
7	8	0	60	0.13	56	7	2	69	0.13
8	6	0	50	0.12	57	9	0	50	0.18
9	10	0	50	0.20	57	1	0	50	0.02
10	4	2	50	0.12	61	5	0	50	0.10
12	1	0	50	0.02	62	3	0	60	0.05
13	1	0	60	0.02	63	1	0	60	0.02
17	5	0	40	0.13	66	3	0	50	0.06
19	2	0	30	0.07	67	6	0	60	0.10
20	2	0	100	0.02	67	4	3	59	0.12
21	1	0	80	0.01	70	3	0	60	0.05
22	3	0	100	0.03	72	6	0	40	0.15
23	3	0	90	0.03	74	5	0	30	0.17
24	4	0	50	0.08	76	1	0	90	0.01
26	1	0	50	0.02	77	4	0	51	0.08
29	5	0	100	0.05	90	2	0	50	0.04
30	6	0	51	0.12	92	5	0	70	0.07
32	3	0	50	0.06	94	1	0	30	0.03
32	2	0	50	0.04	95	3	0	50	0.06
34	1	0	60	0.02	97	8	0	100	0.08
35	1	0	50	0.02	98	3	0	25	0.12
37	4	0	50	0.08	99	1	0	40	0.03
38	3	0	50	0.06	108	7	0	60	0.12
41	3	3	50	0.12	111	3	0	60	0.05
42	2	0	60	0.03	113	9	0	70	0.13
48	14	0	70	0.20	124	4	0	50	0.08

Direct effects—Organic Matter

Under the No-action Alternative, surface organic matter can be expected to increase as organic materials accumulate on the soil surface.

Indirect Effects—Organic Matter

The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Table 3.89 Results of soil field surveys for fine organic matter in the Freeman Project area.

Unit	Duff & Litter				Woody Debris	Points in Transect	Percent Fine Organic Matter	Percent Departure From Standard
	.5-1"	1-2"	>2"	Mix of Size Classes	.25-3"			
1	16	7	0	0	1	50	48	-2
3	8	26	11	1	14	80	75	
4	7	20	8	2	23	90	67	
5	4	1	1	0	4	50	20	-30
6	8	13	5	2	11	50	78	
7	8	4	5	3	9	60	48	-2
8	10	6	3	1	11	50	62	
9	4	5	1	1	8	50	38	-12
10	8	3	1	2	11	50	50	
12	7	12	4	0	11	50	68	
13	12	10	5	2	9	60	63	
14	7	16	6	1	11	50	82	
17	8	7	0	3	2	40	50	
19	2	2	4	0	0	30	27	-23
20	18	16	6	0	12	100	52	
21	10	21	13	0	13	80	71	
22	19	3	0	0	1	100	23	-27
23	16	18	6	1	7	90	53	
24	10	4	1	1	3	50	38	-12
26	5	5	2	2	6	50	40	-10
29	27	8	4	3	1	100	43	-7
30	17	8	7	4	5	51	80	
31	14	8	2	1	4	50	58	
32	21	13	5	3	8	50	100	
34	19	2	4	0	1	60	43	-7
35	10	2	2	0	1	50	30	-20
37	19	3	1	1	1	50	50	
38	3	3	1	0	13	50	40	-10
41	5	3	6	0	7	50	42	-8
42	10	6	4	0	4	60	40	-10
44	22	0	0	0	0	60	37	-13
45	5	12	18	0	2	50	74	
47	1	1	2	1	7	47	26	-24
48	11	9	2	5	13	70	57	
49	7	0	0	0	1	50	16	-34
51	8	0	3	0	3	50	28	-22
52	12	4	1	0	6	60	38	-12
53	9	7	5	4	3	50		
53	12	2	1	0	5	50	48	-2
56	13	8	2	0	2	69	36	-14
57	15	8	4	0	5	50	64	
57	12	9	1	1	3	50	52	
58	8	3	0	0	0	50	22	-28
59	2	2	0	0	1	19	26	-24
61	13	6	4	1	8	50		
61	6	2	3	0	3	50	46	-4
62	28	5	4	0	6	60	72	

Unit	Duff & Litter				Woody Debris	Points in Transect	Percent Fine Organic Matter	Percent Departure From Standard
	.5-1"	1-2"	>2"	Mix of Size Classes	.25-3"			
63	9	4	10	1	6	60	50	
64	12	12	3	0	2	40	73	
66	11	0	0	0	3	50	28	-22
67	8	1	2	0	5	60	27	
67	2	3	1	0	5	59	19	
67	1	10	12	2	14	60	37	-13
69	13	5	1	4	4	50	54	
70	21	9	0	5	1	60	60	
72	18	36	13	2	2	40	178	
73	9	10	2	1	17	60	65	
74	3	7	2	0	6	30	60	
76	23	25	11	5	5	90	77	
77	18	11	2	1	4	51	71	
78	6	14	6	0	8	55	62	
79	19	12	5	1	6	85	51	
90	5	0	0	1	3	50		
90	8	4	1	0	7	59	27	-23
92	15	9	3	4	12	70	61	
94	16	13	1	0	4	30	113	
95	15	6	7	2	8	50		
95	19	9	1	0	6	75	58	
96	5	16	4	1	8	60	57	
97	19	18	10	2	16	100	65	
98	4	3	2	0	1	25	40	-10
99	4	6	0	0	20	40	75	
108	8	7	0	1	12	60	47	-3
111	12	8	1	2	12	60	58	
113	9	14	3	4	3	70	47	-3
124	10	2	1	0	0	41		
124	1	1	5	0	3	50	25	-25

Cumulative Effects—Organic Matter

Under the No-action Alternative, surface organic matter can be expected to increase as organic materials accumulate on the soil surface. However, a future wildfire could consume organic horizons on the forest floor, creating a non-wettable layer, as described above. Immediately following a fire, the affected stand may not meet the LRMP Standard of 50% cover of organic matter. However, within several months a thin layer of needlecast from scorched trees would increase cover of organic matter (Pannkuk and Robichaud 2003) Fires short-circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. When organic matter burns, essential nutrients can be transferred to the atmosphere through volatilization and ash convection (Raison et al. 1984). Nutrients may also be lost following fire due to leaching (Boerner 1982). Some nutrients are returned relatively quickly by terrestrial cycling pathways. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et. al. 1999). Such changes in the soil temperature regime would affect rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

3.8.6.3 Alternative 3

Cumulative watershed effects analysis

While fire ignitions are expected to continue following the activities proposed in Alternative 3, fuel treatments are designed to give wildland fire managers "a higher probability of successfully attacking a fire" (Agee et al., 2000) A future severe wildfire would have the effects described under Alternative 2, but implementation of the Alternative 3 should reduce the likelihood of such an event. This would be due to the enhanced ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Under Alternative 3, the increases in ERA values were predicted to range from 2% to 69% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 25% to 95% of the TOC when the sensitive and uplands are assessed separately. The TOC in any given subwatershed when the entire watershed is assessed together is below threshold and values range from 33% to 96%. As a result there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.86 Figure 3.20 and 3.21).

Direct Effects—ERA

Alternative 3 would reduce the amount of mechanical treatments by approximately 200 acres to 3,574, so there would be less ground disturbance from equipment, skid trails and landings. Seven hundred and fifty acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using these criteria for RHCA width delineation there was a 47 acre increase in the RHCAs. Aspen treatment would occur on 181 acres, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35% or less.

Decommissioning 10 miles of roads would result in long-term benefits to watershed resources resulting from a reduction in road density. Eight watersheds would experience offsets from the impacts of this action alternative thru the decommissioning of these roads. Road actions are presented in Alternative 1 and are the same for all action alternatives.

Indirect Effects—ERA

Indirect effects are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance and loss of ground cover. Silvicultural prescriptions for the Freeman Project include harvests, underburning and mastication. Under these prescriptions, there would be canopy retention and surface vegetation recovery that would contribute to rebuilding ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are displayed below.

The cumulative ERA values would not exceed the TOC in any subwatershed. ERA increases would leave four subwatersheds at moderately high risk of cumulative effects (greater than 6% TOC in sensitive and greater than 9% in the upland). Moderate increases in four subwatersheds would raise the disturbance levels to a moderate risk of cumulative effects. Increase in three subwatersheds means while they are at a higher risk, they are at a low risk for cumulative effects.

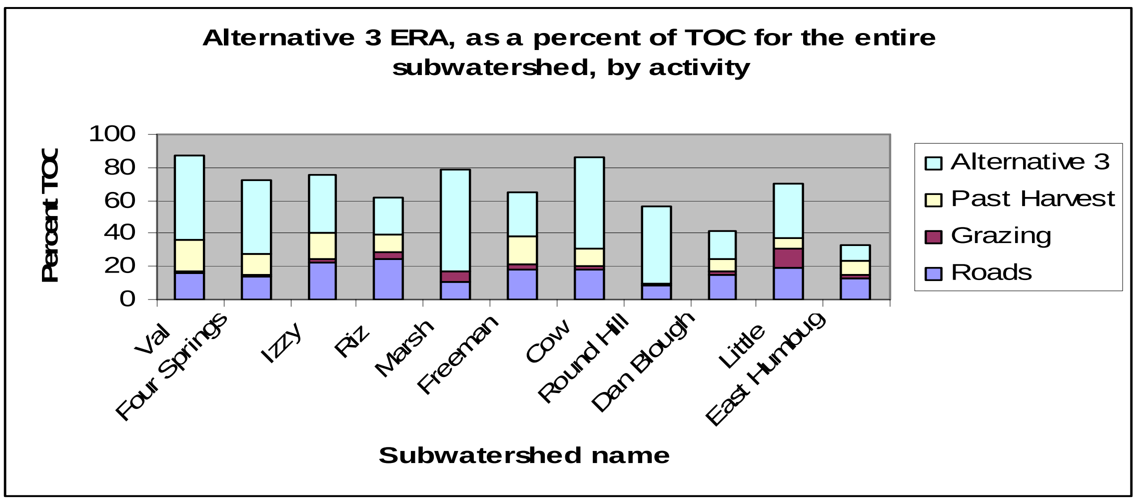

Figure 3.20 Alternative 3, Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed.

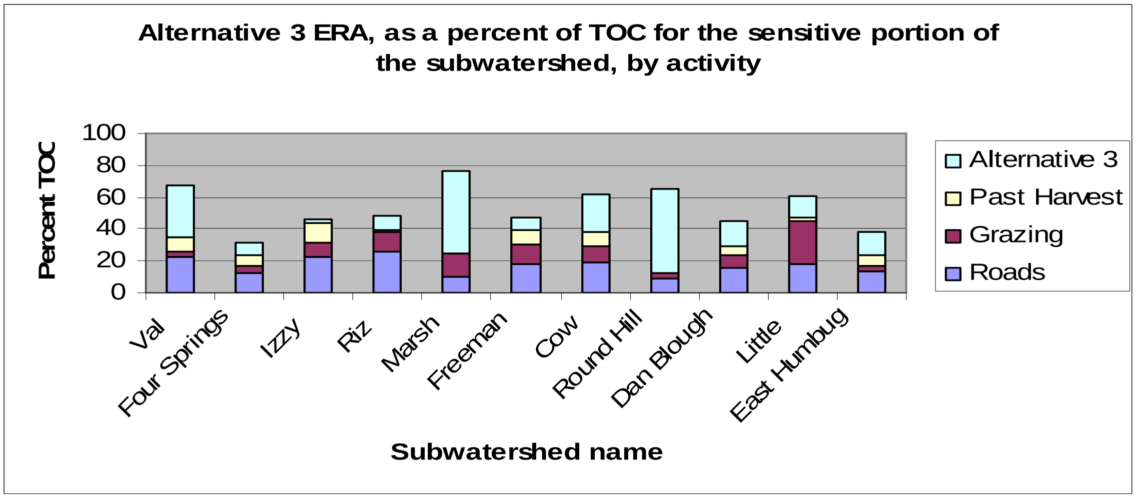

Figure 3.21 Alternative 3, Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Soil Assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 Soil Standards, there would be a lower risk that soil productivity would be impaired. Alternative 3 would have a moderate amount of mechanical treatment, so there would be a moderate amount of ground disturbance from equipment, skid trails and landings. This alternative would reduce the amount of mechanical treatments by approximately 200 acres to 3574, so there would be less ground disturbance from equipment, skid trails and landings. Approximately 29% of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the mechanical treatment ranges from 8.5% to 61%, eight subwatersheds are between 8.5% and 40%. Six watersheds would have a substantial amount of mechanical treatments (increase over existing of greater than one third of the watershed), so there would be a considerable amount of ground disturbance. Impacts on soil resources would be greater than Alternative 2 but less than Alternative 1 and Alternative 4.

Soil Cover

Direct Effects—Soil Cover

The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83% to 69%. Acres within units predicted to experience decreases in effective ground cover below the standard are 14% of the project area and 31% of the sample area. While differences in sampling method and intensities, as well as harvest and site preparation practices, complicate this type of comparison, it is reasonable to assume that effective ground cover would be decreased. Implementation of mitigation methods such as leaving chips on site would ensure the standards would still be met. There is a moderate risk that treated units would not meet the Regional standard following treatment.

There is reduced potential for vegetation loss associated with pile burning in Alternative 3 because of the number of burn piles. It is estimated there would be 972 to 3240 piles generated by this alternative. Acres affected are presented in Table 3.85.

Under Alternative 3 mechanical treatment would occur within units where slopes are equal to or less than 35% and 15% or less in the RHCAs. Mechanical treatment would occur within aspen units where slopes are equal to or less than 35%. The potential for sediment transport to the stream channel would be reduced in Alternative 3 because 750 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 181 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all alternatives sediment transport to the channels would decline because of the decommissioning of 10 miles of roads.

Indirect Effects—Soil Cover

Indirect effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects—Soil Cover

Cumulative effects to soil cover are expected to be the same under all action alternatives. See the discussion under Alternative 2 and 1.

Soil porosity and Detrimental Compaction

Direct Effects

In their existing condition, four units 1, 9, 48 and 74 are greater than 15% compacted. Assuming the Freeman units undergo an 8% decrease and subsoiling is 100% effective, 2 additional units may exceed 15% compacted. Assuming the Freeman units undergo an 8% decrease and subsoiling is 66% effective, 15 additional units may have compaction representing more than 15% of the unit. The acres represented by the existing plus the associated increase from these two units is 4% of the sample area and 8% of the project area. The acres represented by the existing plus the associated increase from these 15 units is 27% of the sample area and 12% of the project area. The project area would experience an increase in area exceeding 15% compacted from 96% to 84% to 69%, depending on subsoiling effectiveness. Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

Indirect Effects

Indirect effects to soil porosity and detrimental compaction are expected to be the same under all action Alternatives. Please see the discussion under Alternative 1, above.

Cumulative Effects

Cumulative effects to soil porosity and detrimental compaction are expected to be the same under all action Alternatives. Please see the discussion under Alternative 1, above.

Organic Matter

Direct Effects—Organic Matter

Accurate prediction of treatment effects on surface fine organic matter is difficult. Mastication treatments are expected to increase cover of organic matter as masticated debris is broadcast away from the machine. Under this alternative organic matter and soil nutrients may be affected by this project though soil displacement via road and landing construction, prescribed burns, burn piles and removal of vegetative material from the site.

Underburn treatments may reduce organic matter, but burning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers. Pile burning and would decrease surface fine organic matter locally, but over time adjacent trees and shrubs would provide litter to cover the burned area. Fireline construction around prescribed burn areas and handpiles would create bare soil conditions. Over time, adjacent trees and shrubs would provide organic cover. Cover of fine organic matter is expected to remain within acceptable threshold values.

Indirect Effects—Organic Matter

Indirect effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects—Organic Matter

Cumulative effects to organic matter are expected to be the similar under all action alternatives. Please see the discussion under Alternative 1. Under Alternative 3, 33% of the sample area and 17% of the project area may not meet the standard for fine organic matter.

Soil Buffering Capacity and Sporax Effects

Impacts to soil buffering capacity and Sporax treatments effects are expected to be the same under all action alternatives. Please see the discussion under Alternative 1. Alternative 3 treats 7.3 sq. ft. per acre over 1,333 acres. This is approximately .14 pounds of borax per acre or a total of 187 pounds of borax across the project.

3.8.6.4 Alternative 4 (Preferred Alternative)

Cumulative Watershed Effects Analysis

Under Alternative 4, the increase in ERA values were predicted to range from 2% to 74% of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 24% to 104% of the TOC when sensitive and uplands are assessed separately. The TOC in any given subwatershed when assessed together remains below threshold and values range from 39% to 96%. As a result, there are lower, moderate and higher risks that these treatments may stress the hydrologic system within individual subwatersheds (Table 3.86).

While fire ignitions are expected to continue following the activities proposed in Alternative 4, fuel treatments are designed to give wildland fire managers “a higher probability of successfully attacking a fire” (Agee et al., 2000). A future severe wildfire would have the effects described under Alternative 2, but implementation of Alternative 4 should reduce the likelihood of such an event. This would be due to the enhanced ability of fire management to suppress, control and contain fires that impact or start in the fuel treatments under 90th percentile weather conditions.

Direct Effects—ERA

Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3,507, so there would be less ground disturbance from equipment, skid trails and landings. However there is more mechanical thinning and less grapple piling and mastication in this alternative.

Seven hundred forty seven acres of RHCA would be treated mechanically. RHCAs widths were delineated at 150 feet, the height of a site potential tree unless the outer edge of the riparian vegetation was greater. By using this criterion for RHCA width delineation there was a 47 acre increase in the RHCAs.

One hundred eighty-one acres of aspen would be treated, all of which would be in RHCAs. Aspen treatments in RHCAs would be limited to slopes of 35% or less.

Under Alternative 4, there would be 10 miles of road decommissioning.

Indirect Effects—ERA

Indirect effects for Alternative 4 are expected to be the same as Alternative 1 and 3 please see previous discussion.

Cumulative Effects—ERA

Detrimental effects that may result from increases in ERA include fluvial erosion from treated hillsides, resulting in chronic sedimentation. Primary factors leading to this are reduction of canopy cover, ground disturbance (particularly due to road effects) and loss of ground cover. Silvicultural prescriptions include harvests, underburning and mastication. Under these prescriptions, there would be some canopy retention and surface vegetation recovery that would contribute to rebuilding ground cover. The group selection treatment would create small forest openings with associated disturbance from skid trails, site preparation and transportation needs, such as temporary roads. The most likely effect of increased fluvial erosion is a decline in coldwater fish habitat quality via infilling of pools, embedding of spawning gravels and related effects to aquatic insect communities. The risk of detrimental effects in the analysis subwatersheds are described below.

The cumulative ERA values would not exceed the TOC in any subwatershed. The upland portion of four watersheds would be at threshold. As a result one subwatershed would be at high risk for cumulative effects (TOC of 9% in sensitive and 12% in upland). ERA increases would leave the other three subwatersheds at moderately high risk of cumulative effects (greater than 6% TOC in sensitive and greater than 9% in the upland). Increases in four other subwatersheds means those subwatersheds would be at higher risk of cumulative effects and would be at a moderate risk for cumulative effects. Three subwatersheds would have increases in the ERA but would remain at a low risk of cumulate effects (Table 3.86, Figure 3.22 and 3.23).

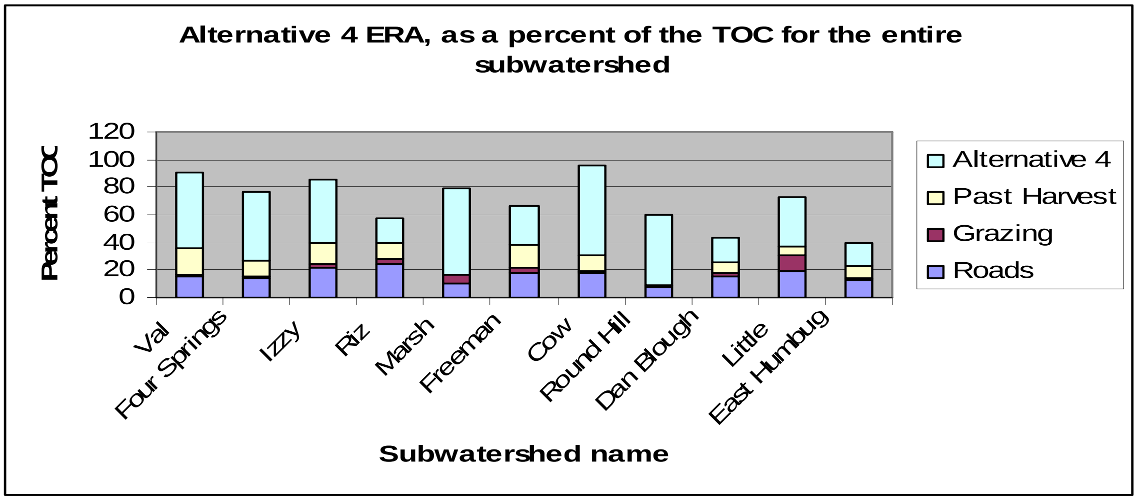

Figure 3.22 Alternative 4, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown by entire subwatershed

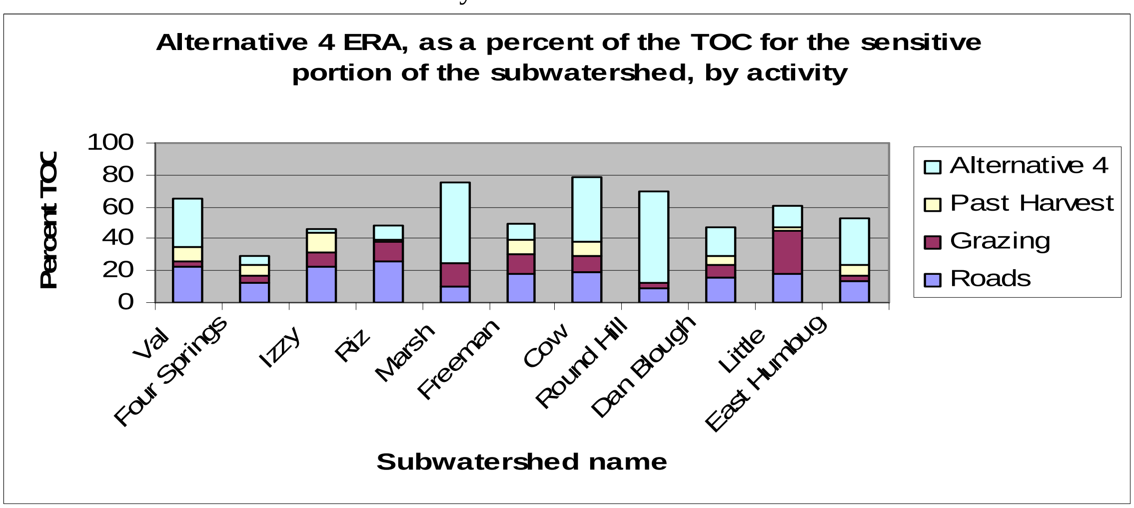

Figure 3.23 Alternative 4, the Proposed Action: Equivalent roaded acres (ERA), shown as a percent area for each analysis subwatershed, broken down by land use. Analysis subwatersheds are shown for the sensitive portion of the subwatershed.

Soil assessment

By following the standards contained in the PNF LRMP and USDA Forest Service Region 5 Soil Standards, there would be a lower risk that soil productivity would be impaired. Impacts on soil resources would be less than Alternative 1 and 3 but greater than 2. Alternative 4 would reduce the amount of acres treated mechanical by 265 acres from the Proposed Action and 65 acres from Alternative 3 to 3,507, so there would be less ground disturbance from equipment, skid trails and landings. However there is more mechanical thinning and less grapple piling and mastication in this alternative. Approximately 28.5% of the subwatersheds analyzed would be treated mechanical. Within individual watersheds the mechanical treatment ranges from 85 to 545, eight subwatersheds are between 85 and 40%. Alternative 1 and 3 have one more group select unit than this alternative.

Soil cover

Direct effects—Soil Cover

The sampled portion of the project area would experience a decrease in area meeting or exceeding the standard from 83% to 61%. Acres within units predicted to experience decreases in effective ground cover below the standard are 16% of the project area and 35% of the sample area. There is a moderate risk that treated units would not meet the Regional standard following treatment.

Under Alternative 4 mechanical treatment would occur within units where slopes are equal to or less than 35% and 15% or less in the RHCAs. Mechanical treatment would occur within aspen units where slopes are equal to or less than 35%.

Burn piles are another way ground cover is reduced. This alternative has greater potential for vegetation loss associated with pile burning than Alternative 3 but less than Alternative 1 because of the number of burn piles. It is estimated there would be 1,644 to 5,480 piles generated by this alternative. Acres affected are presented in Table 3.84.

The potential for sediment transport to the stream channel would be reduced in Alternative 4 because 747 acres of mechanical treatment would occur within 25, 50 or 100 feet of the stream channels. Of those acres a minimum of 181 would be within 25 feet. The proximity of mechanical treatment to the stream channel increases the risk of sediment transport into the channel.

In all action alternatives sediment transport to the channels would decline because of the decommissioning of 10 miles of roads.

Indirect Effects—Soil Cover

Indirect effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects—Soil Cover

Direct effects to soil cover are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Soil Porosity and Detrimental Compaction

Direct Effects—Soil Porosity

In their existing condition, three units 1, 9, 48 and 74 are more than 15% compacted. Assuming the Freeman units undergo the same decrease as reported in the HFQLG monitoring, 2 to 15 additional units may exceed 15% compaction depending on subsoiling effectiveness. The project area would experience an increase in area exceeding 15% compaction from 96% to 84% to 69% assuming, 100% and 66% effectiveness. Following treatment, these units would be reevaluated and additional subsoiling would occur in skid trails, landings and/or group selection areas to reduce the extent of detrimental compaction below the existing, pre-project condition.

Indirect Effects

Indirect effects to soil porosity are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects

Direst effects to soil porosity are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Organic matter

Direct Effects—Organic Matter

Direct effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1 and 3.

Indirect Effects—Organic Matter

Indirect effects to organic matter are expected to be the same under all action alternatives. Please see the discussion under Alternative 1.

Cumulative Effects—Organic Matter

Cumulative effects to organic matter are expected to be the similar under all action alternatives. Please see the discussion under Alternative 1. Under Alternative 4, 37% of the sample area and 18% of the project area may not meet the standard for fine organic matter.

Soil Buffering Capacity and Sporax Effects

Impacts to soil buffering capacity and Sporax treatments are expected to be the same under all action alternatives. Please see the discussion under Alternative 1. Alternative 4 treats 6.1 sq. ft.

per acre over 1,837 acres. This is approximately .12 pounds of borax per acre or a total of 220 pounds of borax across the project.

3.9 Threatened, Endangered and Sensitive Plant Species

3.9.1 Introduction

The following assessment is summarized from the botany biological evaluation (BE) for threatened, endangered and sensitive plants species for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006a). Forest Service Manual 2672.42 specifies that a biological evaluation (BE) be prepared to determine if a project may effect any Forest Service sensitive species or U.S. Fish and Wildlife Service (USFWS) threatened, endangered, or proposed species. The purpose of the BE is to describe the effects of the proposed project on all threatened, endangered and sensitive (TES) plant species of record in the analysis area. The BE is the source of the information found here in section 3.8 of this document. It is located in the project record.

3.9.2 Summary of Effects

3.9.2.1 Action Alternatives

The proposed activities would not affect any federally listed threatened, endangered, or candidate plant species because none of these species are known or are expected to occur within the analysis area.

Occurrences of the sensitive species Astragalus lentiformis, Botrychium minganense, Ivesia sericoleuca, Meesia uliginosa and Pyrrocoma lucida are known to exist within the analysis area. There will be no direct effects to these occurrences because they will be flagged and avoided. There is potential for indirect and cumulative effects. These effects will be minimized by flagging and avoiding known occurrences. These effects will be negligible and are not likely to lead toward federal listing.

3.9.2.2 Alternative 2 (No-action)

There will be no direct effects to threatened, endangered, or sensitive plant species. Indirect effects will be those associated with ongoing activities such as recreation and woodcutting. Lens-pod milk-vetch (*Astragalus lentiformis*) is a disturbance following species that may be adversely affected by the absence of treatment. The risk of a high intensity fire will continue to pose a threat to sensitive plants.

3.9.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for analyzing cumulative effects to sensitive plants is the project boundary. Sensitive plants are managed according to the PNF Interim Management Prescriptions (Hanson 2005). All known ecology, habitat, range and distribution information is considered in creating these prescriptions and they are periodically reviewed and updated by forest service botanists. Therefore, an analysis area equal to the project area insures adequate conservation.

Timeframe: The timeframe for determining cumulative effects depends on the length of time that lingering effects of the past action will continue to negatively impact the species in question. This will vary widely between species because some rare plants require and tolerate disturbances that would harm others. Past actions that occurred in the area of each sensitive plant occurrence are included in this evaluation if information is available. Where site-specific information is lacking, the general discussion of cumulative effects addresses the effects of disturbances likely to have occurred.

3.9.4 Analysis Method

The Freeman Project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for rare species. In the field, areas identified as potential habitat were surveyed at a high level of intensity (complete survey). Areas identified as potential habitat include openings in the forest, serpentine soils, meadows, riparian areas, seeps and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). Plant location data were recorded using Global Positioning Systems and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to rare species and identify potential detrimental treatments and designate “Controlled Areas.” Areas of concern were brought forward at planning meetings and appropriate mitigations will be enacted.

3.9.5 Affected Environment

The potential habitat of the some species (Table 3.90) may be treated under the Proposed Action since no occurrences were found. Although adequate botanical surveys have been performed in the project area, it is possible that isolated individuals may be present. Therefore, undiscovered individuals may be impacted inadvertently. For this reason (potential impact to undiscovered individuals) a determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. However, if any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard operating procedures (SOP’s), such as flagging and avoidance or a limited operating period (LOP). They will not be further analyzed in this document.

Occurrences of the sensitive species *Astragalus lentiformis*, *Botrychium minganense*, *Ivesia sericoleuca*, *Meesia uliginosa* and *Pyrrocoma lucida* were found within the analysis area. The following briefly summarizes the survey, habitat and distribution information about the threatened, endangered and sensitive species listed in relation to the project area.

Table 3.90 Habitat potential of the proposed project area for sensitive plants known or suspected to occur

Species	Known occ.	potential habitat	No habitat	Habitat unsuitable based on the following:
Allium jepsonii			X	No serpentine outcrops in the project area.
Arabis constancei			X	No serpentine outcrops in the project area.
Astragalus lentiformis	X			
Astragalus pulsiferae var.*coronensis*		X		
Astragalus pulsiferae var. pulsiferae		X		
Astragalus pulsiferae var. suksdorfii		X		
Astragalus webberi		X		
Botrychium ascendens		X		
Botrychium crenulatum		X		
Botrychium lineare		X		
Botrychium lunaria		X		
Botrychium minganense	X			
Botrychium montanum		X		
Botrychium pinnatum		X		
Bruchia bolanderi		X		
Calycadenia oppositifolia			X	Proposed project is too high in elevation.
Calystegia atriplicifolia ssp. buttensis			X	Proposed project is too high in elevation.
Clarkia biloba ssp. *brandegeae*			X	Proposed project is too high in elevation.
Clarkia gracilis ssp. *albicaulis*			X	Proposed project is too high in elevation.
Clarkia mosquinii			X	Proposed project is too high in elevation
Cypripedium fasciculatum		X		
Cypripedium montanum		X		
Frittilaria eastwoodiae			X	Proposed project is too high in elevation.
Hydrothyria venosa		X		
Ivesia aperta var. aperta		X		
Ivesia sericoleuca	X			
Ivesia webberi		X		
Lewisia cantelovii		X		
Lupinus dalesiae		X		
Meesia triquetra		X		
Meesia uliginosa	X			
Monardella follettii			X	No serpentine outcrops in the project area.

Species	Known occ.	potential habitat	No habitat	Habitat unsuitable based on the following:
Monardella stebbinsii			X	No serpentine outcrops in the project area.
Oreostemma elatum		X		
Packer eurycephalus var. *lewisrosei* *(Senecio eurycephalus* var. *lewisrosei)*			X	No serpentine outcrops in the project area.
Packera layneae (Senecio layneae)			X	No serpentine in the project area. Project area is too high in elevation.
Penstemon personatus		X		
Pyrrocoma lucida	X			
Rupertia hallii		X		
Scheuchzeria palustris var. *americana*			X	No floating bog or fen habitat in project area.
Sedum albomarginatum		X		
Silene occidentalis ssp. longistipitata		X		
Vaccinium coccinium		X		

Astragalus lentiformis (lens-pod milk-vetch): There are 55 documented occurrences of this perennial herb, all of which are located within the boundaries of the PNF. These occurrences are restricted to the Beckwourth Ranger District of the PNF. This plant is found on volcanic soils, between 4,500 and 6,500 feet in elevation in eastside pine, eastside pine/sagebrush scrub, or sagebrush scrub/grassy flats. It occurs in the edaphic specialists guild. This plant is known to grow in Plumas County from Squaw Valley, Lake Davis and Claireville Flat east to Frenchman Lake. The trend for this narrow endemic is unknown. Botanists on the Plumas National Forest have observed that it is a disturbance follower that probably evolved with the natural disturbance of fire. Threats from management activities include fire suppression, livestock grazing, timber harvest, road construction, mining, reservoir construction and utility line construction. However, as mentioned above, certain levels of soil displacement and disturbance may be beneficial. Four occurrences are known to exist in the project area, representing 7.2% of the known occurrences of this species on the PNF.

Botrichium minangense (moonworts): The moonworts are small inconspicuous, perennial ferns. They are distributed across North America (*B. ascendens* to British Columbia and Nevada, *B. crenulatum* to Washington and Utah and *B. montanum* to British Columbia and Montana) but nowhere are they abundant. According to some experts (Wagner and Devine, 1989) they should be regarded everywhere as threatened species. Overall plant numbers in California are low, i.e. occurrences often consist of only a few plants. It is difficult to tell the various *Botrychium* species apart. *B. crenulatum* and *B. ascendens* are known from two adjacent drainages, *B. montanum* from a single drainage on the Lassen National Forest near the Plumas National Forest. *B. lineare* is known in California from Fresno County. *B. ascendens* and *B. crenulatum* grow in moist meadows, while *B. montanum* is found in shaded coniferous forest areas near streams. They grow in moss, grasses, sedges and rushes and other vegetation. The *Botrychiums* can be hidden by the taller grasses and other vegetation growing with them. Moonworts are sensitive to drought and may not appear in dry years. *Botrychiuum* are closely associated with mycorrhizal fungi at all life stages, so the most important habitat requirements are probably maintaining shade, soil moisture and organic matter and avoiding disturbance such as defoliation or root/ mycorrhizal disruption. Surveys for these species have been conducted on the Plumas National Forest since 1994 and one occurrence of *Botrychium crenulatum* has been found. Four occurrences of *B. minangense* were found in the project area.

Ivesia sericoleuca (Plumas ivesia): This plant is found in the vernally wet parts of meadows and alkali flats and in vernal pools. These habitats are not widespread and are sensitive to changes in hydrology and to erosion. It is known to occur on National Forest system and private lands in Plumas, Placer, Sierra and Nevada Counties. Occurrences are known from the Plumas and the Tahoe National Forests. This plant has a downward trend across its range due to lack of reproduction and levels of disturbance that are occurring at known sites. Threats from management activities include recreation activities, off-road vehicle use, fuelwood gathering, target shooting, livestock grazing, mining, fire suppression, military practice camps, timber harvest activities such as landings, activity that changes the hydrology and/or increases erosion. The Tahoe, Plumas and Humboldt-Toiyabe National Forests have a conservation strategy in place for management of this plant. The most common management prescription is for protection from direct and indirect impacts. Three occurrences of this species were found in the project area (these three occurrences consist of a total of 12 sub-occurrences).

Meesia uliginosa (broad-nerved hump moss): *Meesia uliginosa* is strongly tied to montane fens within the Sierra Nevada bioregion. There are 22 known occurrences that have been documented in California since 1980 with the majority in the Sierra Nevada Mountains. In addition, there are occurrences that have not been rediscovered since 1980. One of the historical occurrences outside of the Sierra Nevada Mountains appears to be extirpated. The two most critical factors affecting the abundance and distribution of fen species such as *M. uliginosa* are hydrology and the nutrient concentration of incoming water. Changes in hydrology can occur through ditching, either intentional or inadvertent through road or trail construction or cattle trails. Direct trampling by livestock has also been identified as a threat. One occurrence is known to exist in the project area.

Pyrrocoma lucida (sticky Pyrrocoma): This plant is found in meadows and alkali flats in Plumas, Sierra and Yuba Counties. Occurrences are found on Plumas and Tahoe National Forest System and private lands. It is assigned to meadow, seep and vernally wet guilds. The trend for this plant is that it appears to be in decline. Sticky Pyrrocoma grows in habitats similar to *Ivesia sericoleuca*. These habitats are fewer in number. Also, most occurrences are either unprotected on private land or repeatedly grazed on National Forest System lands. Threats from management activities include reservoir development, meadow restoration, off-road vehicle use, recreation activities, fire suppression camps, military camps, prescribed burning and other fuel treatments, timber harvest associated activities such as landings, fuelwood gathering and land exchange. One occurrence of this species was found in the project area.

The following sensitive species have potential habitat in the project area but were not found during botanical surveys: *Astragalus pulsiferae* var. *coronensis*, *Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragaulus webberi, Botrychium ascendens, B. crenulatum, Botrychium lineare, B.lunaria, B. montanum, B. pinnatum,, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia aperta* var. *aperta ,Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae*, *Meesia uliginosa*, *Oreostemma elatum, Penstemon personatus, Rupertia hallii, Silene occidentalis* ssp. *longistipitata and Vaccinium coccineum.* The potential habitat of the above species may be treated under the Proposed Action since no occurrences were found. Although adequate botanical surveys have been performed in the project area, it is possible that isolated individuals may be present. Therefore, undiscovered individuals may be impacted inadvertently. For this reason (potential impact to undiscovered individuals) a determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. However, if any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard operating procedures (SOP's), such as flagging and avoidance or a limited operating period (LOP). They will not be further analyzed in this document.

Occurrences of the sensitive species *Astragalus lentiformis*, *Botrychium minganense, Ivesia sericoleuca*, *Meesia uliginosa* and *Pyrrocoma lucida* are found within the analysis area. Following is a discussion of the direct, indirect and cumulative effects of the Alternatives.

3.9.6 Environmental Consequences

An effects analysis is a part of the biological evaluation process and is required in cases where sensitive plants have been found within or near proposed project areas. Effects are described as direct, indirect and/or cumulative. The following summarizes the direct, indirect and cumulative effects of the project on the sensitive-status plant species listed in the introduction.

3.9.6.1 Alternative 2 (No-action Alternative)

Direct Effects

There would be no direct effects from the No-action Alternative other than those associated with current ongoing actions, e.g. grazing, recreation and woodcutting.

Indirect Effects

Indirect effects from the No-action Alternative would be those associated with continued habitat succession, ongoing activities (woodcutting and recreation), the current and future threats of noxious weed infestation and the current and future threat of wild fire. The effects of successional progression on the sensitive plants identified for this analysis area is not clear. There is a mix of seral stages within the analysis area. Those species residing in habitat currently meeting their ecological needs may maintain their current populations or experience a decline as forest canopies continue to close and more shade tolerant species out-compete these sensitive plant species for light and other resources. With the No-action Alternative, habitat succession could adversely affect the sensitive plant species in the analysis area. *Astragalus lentiformis* prefers earlier successional stages and would have to rely on natural disturbance factors under the No-action Alternative.

Woodcutting and recreation are anticipated to continue in the area and likely will continue to impact occasional individual sensitive plants. The degree of this impact is currently not preditable but is assumed to be similar to the present use.

Noxious weeds are known to occur in the project area in isolated locations and along roadsides. Ongoing use of forest roads and terrain by woodcutters and recreationalists is expected to continue contributing to the risk of noxious weed introduction. See Appendix B of the Botany Report, the noxious weed risk assessment for additional information on noxious weeds.

The No-action Alternative would not prescribe any fire; the risk of wildfire would remain. Wildfire is unpredictable, but given the fire history of the analysis area it is likely that wildfires will occur. As the effects of wildfire to sensitive plants in the analysis area are not fully known, predicting the effects of wildfire to sensitive plant populations is uncertain. From past experience the effects of fire suppression can have a larger effect than the wildfire itself. The overall effect depends on fire timing and intensity, which sensitive species are located in the analysis area and how those sensitive species are distributed. Thus, the response to wildfire would be species-dependant. Fire exclusion allows conifers seedlings to establish in forest openings and at the edges of meadows. Several sensitive plant species of the PNF grow in meadows and forest openings. The No-action Alternative can indirectly cause a loss of habitat for these plant species.

Cumulative Effects

Probably the most important factors contributing to potential cumulative effects of the No-action Alternative would include those associated with the potential for wildfire to act in excess of its historical intensity and the degree of successional progression to later seral stages. The project area has stands exhibiting signs of past timber management intermingled with stands exhibiting signs of fire exclusion. Quantifying the threat of wildfire to sensitive plant species is difficult but a wildfire threat exists to some extent in the project area. There is some potential for the lack of prescribed fire under the No-action Alternative to contribute toward declining habitat suitability for *Astragalus lentiformis* which has historically relied on some level of disturbance to maintain its place in the plant community.

3.9.6.2 General Effects of the Action Alternatives

Direct Effects

Direct effects occur when sensitive plants are physically impacted by activities associated with fuels management, mechanical or hand treatment. Direct impacts can physically break, crush or uproot sensitive plants by driving over them, by covering them, by falling trees on them, or by burning them. Direct impacts to sensitive plants can physically damage the sensitive plant or the habitats where they grow. When too much of an individual plant is damaged, that plant may experience altered growth and development and reduced or eliminated seed-set and reproduction. If the disturbance is severe, it can kill sensitive plants. These impacts to individual plants can reduce the growth and development, population size and potentially the viability of a sensitive plant species across the landscape. For annual plant species, the timing of impacts is critical. Management actions which take place after annuals have set seed have much less impact than management actions performed prior to seed-set. Direct effects being considered in this discussion include those associated with: timber falling, skidding, yarding, hand mechanical fuels treatment, skid trail ripping, road construction, prescribed fire, prescribed fire control lines and slash pile burning.

Hand and mechanical treatment could cause detrimental effects to all of the sensitive species found in the project area. Mastication, mechanical and hand thinning have the potential to directly impact sensitive plants by crushing plants, displacing soil and plants, or smothering plants with slash or soil. Even those sensitive species which may benefit from a more open canopy could suffer adverse direct effects as a result of hand or mechanical treatment.

Direct effects to the known populations of *Astragalus lentiformis*, *Botrychium minganense*, *Ivesia sericoleuca* and *Meesia uliginosa* will be minimized by flagging and completely avoiding these populations. It is unlikely that there will be any direct effects to these four species. Standard management requirements common to all action alternatives will minimize or eliminate potential adverse direct impacts.

Prescribed fire may also cause detrimental direct effects. Any of the sensitive plant species might be burned or scorched. Burning hand piles could potentially eliminate the herbaceous layer below the pile for years after the pile has burned. Fire lines could also cause direct effects to all sensitive plant species in the project area if not located outside of sensitive plant occurrences.

Borax Application

Boron, the main break-down product of borax, is a naturally occurring element that plants need, although large amounts of borax can be toxic to plants and microorganisms. Terrestrial plants are normally rich sources of boron and boron is an essential trace element for higher plants (Eisler 1990).

Sensitive Plants

It is unlikely that application of borax in the project area will affect sensitive plant populations. Although individual plants may be affected, it is unlikely to lead to a loss of population viability. This possibility is mitigated by the protection of sensitive plant populations in designated control areas (see Appendix C, the Botany Protection Plan). The use of the control areas is in accordance with the PNF Interim Management Prescriptions (Hanson 2005) for sensitive plant species. Borax will not be applied within these control areas.

There is potential for one sensitive plant species, *Meesia uliginosa*, to be affected by borax application. Bryologists have surveyed the project area and one occurrence of *Meesia uliginosa* has been found. This moss species has been found growing on soil at the base of lodgepole pine stumps in the project area. The occurrence will be protected by flagging and avoiding; it will not be disturbed. No other sensitive plant species are known to occur on conifer stumps and therefore are unlikely to be affected by the application of borax. In California, *Meesia uliginosa* has only been found in fen or "wet meadow" habitats (Dillingham 2005). Fens and wet meadows will not be disturbed by Freeman Project activities.

Indirect Effects

Fuels management, mechanical or hand treatment can indirectly impact sensitive plants by causing changes in vegetation composition and successional pathways of that vegetation, changing local hydrologic patterns in sensitive plant habitat, changing the fire regime or by changing the soil characteristics of the habitat. Some of these changes may result from shifts in hydrologic, solar and soil characteristics of their habitat. Management actions can also lead to changes in forage condition and this can lead to changes in the foraging behavior of livestock and wildlife within the analysis area. New use patterns can result in different potential impacts to sensitive species. Indirect effects can also occur from noxious weed invasion or from impacts to pollinators or mycorrhizae associated with sensitive plant species. Indirect impacts can have positive or negative effects.

Some indirect effects, such as noxious weed invasion, potentially pose a highly negative impact to all plant habitats, although different habitats may be invaded by different species of noxious weeds. In riparian areas or wet meadows, Canada thistle (*Cirsium arvense)* and perennial pepperweed (*Lepidium latifolium*) may invade with potentially adverse results. Upland areas may be invaded by a host of noxious weeds such as yellow star thistle (*Centaurea solstitialis*), the knapweeds (*Centaurea* spp.), or annual grasses such as medusahead (*Taeniatherum caput-medusae*). These noxious weeds can lead to habitat changes that are detrimental to sensitive plant species. Noxious weeds, once established, could indirectly impact sensitive plant species through allelopathy (the production and release of plant compounds that inhibit the growth of other plants), changing the fire regime, or direct competition for nutrients, light, or water. Subsequent weed control efforts such as hand-pulling, hoeing, mowing, or herbicide application could also negatively impact sensitive plants.

Prescribed Fire

Indirect effects from prescribed fire could impact sensitive plant species by causing noxious weed invasion, changes in vegetation structure and changes in local hydrological function. These potential effects result from removal of vegetation and opening up the area to additional light. The level of indirect effects from fire may vary depending on the seasonal timing of the fire, the intensity of the fire and the sensitivity of the individual species to fire. While fire is detrimental to some species (particularly those which inhabit the interior forest), fire suppression is detrimental to plants which inhabit forest openings. No single fire regime would be advantageous to all species. Thus, response to fire will be highly species-dependent with changes being beneficial to some sensitive plant species and detrimental to others.

Hand or Mechanical Treatments

Some sensitive plant species may benefit from mechanical or hand treatment. These species colonize open areas, multiply rapidly and persist for a short while. They may be out-competed by other colonizers, or they may persist until woody species move in and shade them out. They are well adapted to take advantage of the high-light intensities found in forest openings. These species have become less common as result of fire suppression. Mechanical or hand treatment may have a beneficial effect on these species since such treatment will maintain areas in a more open condition. However, beneficial indirect effects could easily be overcome by negative direct effects (trampling), excessive soil disturbance (leading to soil erosion or degradation of the seedbed) and noxious weed introduction and spread.

By contrast, species which inhabit the interior forest are adapted to closed canopy forests and low light conditions. Such species thrive in cool, moist and shaded conditions. Changing the vegetation structure to more open, warmer and drier conditions, regardless of the method, would be detrimental to these species. Furthermore, many of these species, (particularly the *Cypripedium* spp.), have complex mycorrhizal associations. Mycorrhizae require organic matter found in the duff layer and mechanical treatment is much more likely to disturb and disrupt the duff layer.

Changes in hydrologic function resulting from the use of hand or mechanical treatment could potentially impact sensitive plant species. Concerns regarding changes in hydrologic function resulting from the use of hand or mechanical treatment are similar to those from prescribed fire. The primary difference is the level of soil disturbance resulting from the use of mechanical equipment. Some areas (those that are particularly steep or have loose soils) would be at more risk than others. Heavy soil disturbance exacerbates soil erosion and sedimentation. A more open environment with increased runoff could increase erosion in the uplands as well as peak flows, scouring and sedimentation in the riparian zones. Erosion in the uplands could remove organic matter and soil cover leading to changes in microclimates. Increased flows could result in stream downcutting and the subsequent drying of adjacent areas. Sedimentation could affect seed germination and recruitment.

Indirectly, prescribed fire, mechanical and hand treatment activities have the potential to enhance or impair sensitive plant habitat through modifications resulting from changes in the canopy coverage (increasing light distribution and intensity) and the moisture regime. If the species is one that prefers early or mid- seral conditions (such as *Astragalus lentiformis* or *Lupinus dalesiae*) then the proposed activities could enhance habitat for these species. Early seral species would benefit from increased light on the forest floor and in some cases from mild disturbance creating a mineral seedbed. If however, the species is one that prefers late seral conditions (such as *Cypripedium fasciculatum*) then the proposed activities could be detrimental. Late seral species grow under conditions of less light intensity, higher moisture and higher levels of organic material in the soil. Some of the late-seral species (including *Cypripedium fasciculatum*) are dependent upon mycorrhizal associates. These mycorrhizal associates grow in thick organic matter and decreasing the moisture levels (by opening the stand) or reducing the duff layer (by prescribed fire or increased temperatures) would be detrimental to both the *Cypripedium* and the mycorrhizal associate. Thus, the indirect effects would be species-dependant. The same is true for under burning. Fire has the additional dimension of thermal effects to the soil/duff layer, its seed bank biology and nutrient cycling (generally, but not necessarily positive effects). The effects of spring burning versus fall burning to sensitive plant habitats are not well documented. However, since a fall burn seems to be more similar to the natural fire regime it is assumed that the plant species would be more adapted to a fall burn.

It is possible that potential habitat for several sensitive species of moonworts (*Botrychium* species) may be affected by thinning treatment in riparian areas. These riparian areas may include moonwort habitat. *B. minganense* is usually associated with riparian areas, small streams or fens running throughout coniferous forests. The area has been adequately surveyed by qualified botanists. Any known moonwort populations will be protected. They will not be disturbed. Details of protections can be found in Appendix C, the Botany Protection Plan. Standard Operating Procedures will be followed and require that equipment be excluded from within 25 feet of any stream course in an aspen treatment area.

The potential to introduce noxious weeds with machinery traveling through the project area also presents a threat to sensitive plants. Noxious weeds can also be brought into the area in road materials and mulch. Once established, noxious weeds can be difficult to control and eliminate from an area. Noxious weeds displace native plant habitat and degrade watershed functions. If the Standards and Guidelines such as inventory, avoiding noxious weed areas with timber and fuels management activities, cleaning equipment, using weed free material and mulch and avoiding spread are followed the threat from noxious weeds will be greatly minimized.

Cumulative Effects

Past and current activities have altered sensitive plant populations and their habitats. The effects of past activities are built in to this analysis in that they are largely responsible for the existing landscape. It is unclear if the sensitive species included in this analysis have always been rare or were once more common but currently rare due to past land use practices. Very little is known about population dynamics and metapopulations (a population of populations) of sensitive species such as how long individuals live, how long colonies persist, how often are new colonies formed and how long seeds persist in the seed bank. A thorough understanding of species population dynamics and metapopulations would be necessary in order to accurately assess the cumulative impacts of past, present and future projects on a species. This cumulative effects analysis is based on what is known about species distribution, ecology and life history. Current management direction is designed to eliminate or reduce possible negative cumulative impacts by protecting sensitive plant species from direct and indirect impacts. The following discussion provides an explanation of why this type of management is effective in reducing cumulative impacts to sensitive plants.

MacDonald (2000) reports that a critical step in cumulative effects analysis is to compare the current condition of the resource (in this case sensitive plants) and the projected changes due to management activities (in this case fuels management, mechanical or hand treatment) with the natural variability in the resources and processes of concern. This is difficult for sensitive plants since long-term data are often lacking and many sensitive plant habitats have a long history of disturbance, i.e. an undisturbed reference is often lacking. For some species, particulary those which do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site changes to sensitive plants is an effective way of reducing cumulative impacts. "If the largest effect of a given action is local and immediate, then these are the spatial and temporal scales at which the effect would be easiest to detect. If one can minimize the adverse effects at this local scale, it follows that there would be a greatly reduced potential for larger-scale effects" (MacDonald, 2000). For other species, particularly those which are disturbance tolerators or fire-followers, minimizing on-site changes could be detrimental. These species tolerate or benefit from on-site changes which result in opening the stand, reducing the potential for stand-replacing fire and increasing light reception in the understory. Thus, the response of sensitive plant species to the management activities is species-dependent.

Past and present forest management activities have caused changes in plant community structure and composition across the forests. Management activities that have cumulatively impacted sensitive plant occurrences on the forests include: historic grazing, timber harvest, fire suppression, prescribed fire, mining, recreational use, road construction, urban development and noxious weed infestation. These cumulative impacts have altered the present landscape to various degrees. However, cumulative, direct and indirect effects can be minimized by following Forest Service Standards and Guidelines and by implementing mitigation measures to monitor or offset impacts to sensitive plants species. With these protective measures in place, cumulative effects are less likely to be adverse.

SOPs common to all action alternatives will minimize potential adverse direct effects to sensitive plant species. Minimizing direct effects is the largest individual factor in diminishing cumulative effects to sensitive plant species. The Proposed Action may improve the quality and amount of suitable habitat for sensitive plants species that tolerate or prefer moderate disturbance conditions.

Astragalus lentiformis is a locally abundant species found in open pine forests with sparse duff; it responds favorably to disturbance. Its range is restricted to the southeast portion of the Beckwourth Ranger District of the Plumas NF. Suitable habitat for this species may have been lost in the past due to fire suppression and vegetation management practices. A lack of thinning in early seral forest and a resulting dense canopy cover would leave less area available for *A. lentiformis*. This species would benefit from opening the stand, reducing the potential for stand-replacing fire and increasing light reception in the under story. Annual grazing in the Grizzly Valley Allotment will continue to impact this species. PNF botanists have observed that *A. lentiformis* tolerates moderate grazing. Cumulatively, if moderate disturbance is applied on a landscape level this should benefit this species in a wider area. It is unlikely that the Freeman Project will have any adverse cumulative effects on this species because adequate surveys have been done and known populations will not be disturbed.

Botrychium minganense is a perennial fern that occurs in seeps, springs, fens and riparian habitats in coniferous forests. It is rare in California and known from Butte, Fresno, Plumas and Tehama Counties. All occurrences have few individuals. Actual trends in these occurrences are hard to determine since the sporophytes do not appear above ground every year and many occurrences were only recently located. Soil disturbance can be very detrimental, especially if it is occurring on a regular basis. Soil disturbance includes grazing and trampling by livestock and OHV, where a little disturbance and compaction is tolerated but heavy disturbance will kill individuals. Changes in the hydrologic regime (from erosion, roads, grazing, etc.) may also potentially threaten occurrences. Hot fires have been shown to be detrimental, especially if the conditions are very dry during the burn. Habitat for this species may have been lost as a result of previous management activities. A shelterwood treatment removed canopy cover around a site of *Botrychium minganense* (BOMI 11-003B) in 1990. The site was prepared for planting in 1991 and planted in 1996. The effects of these activities on BOMI 11-003B cannot be accurately described because this occurrence was not known until 2004.

Grazing in the Grizzly Valley Allotment will continue to impact *Botrychium* plants. A project planned to be implemented in 2006 will erect fences around four known *Botrychium* occurrences to prevent impacts from grazing and trampling. One *Botrychium* site (BOMI 11-004) is within the DFPZ. Future maintenance of DFPZs can potentially impact this occurrence. The site will be flagged and avoided at the time of any future maintenance. Therefore DFPZ maintenance will not cause cumulative effects to this species.

It is unlikely that the Freeman Project will have any adverse cumulative effects on this species because adequate surveys have been done and known populations will not be disturbed. The project area has also been surveyed for seeps, springs and fens which are considered special habitats and are suitable habitats for *Botrychium* species. These known special habitats will be protected.

Ivesia sericoleuca is found in gently sloped vernally saturated meadows. Based on lack of reproduction and evidence of disturbance to all known occurrences this plant appears to be declining across its range. On the Plumas, livestock grazing and trampling appears to cause a decrease in reproductive potential and recruitment at some locations. Cattle trails can create channels through wet meadows causing the meadow to be drained of the seasonal moisture needed by *I. sericoleuca*. Changes to the hydrological regime as a result of road construction and maintenance, watershed restoration and grazing may have adversely affected habitat. Throughout the range of the species, hydrologic changes to meadow habitats continue to threaten habitat availability. Habitat for this species may have been lost as a result of previous management activities. It is unlikely that the Freeman Project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed and vernally moist meadows will not be degraded.

Meesia uliginosa is found in very wet meadows and boggy areas in openings of mixed conifer forests. No trend data are available for this species. Cattle often impact the habitat for the species and there are hydrological concerns with the habitat. There is only one known population of *Meesia uliginosa* in the Plumas National Forest. This population was found in 2004 during pre-project surveys for the Freeman Project. The plants are growing on stumps of lodgepole pines surrounded by a perennially saturated meadow. The removal of lodgepole pine trees probably improved conditions for *M. uliginosa*. It is likely that other populations of this very small moss exist in the Plumas NF but have been overlooked. Any activities that have caused changes to the hydrology of wet meadows could have reduced the area of potential habitat. Cattle trampling can harm individual plants and habitat. Conifer encroachment into meadows as a result of fire suppression may have reduced the area of suitable habitat. It is unlikely that the Freeman Project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed and its habitat will not be degraded.

Pyrrocoma lucida is found in vernally moist meadows and alkali flats. This species is locally abundant. It has been disturbed by grazing and individuals may have been destroyed. *Pyrrocoma lucida* plants are green and palatable in mid-summer when most other herbs have become desiccated and it is likely that reproduction has been decreased due to grazing. Changes to the hydrological regime as a result of road construction and maintenance, watershed restoration and grazing may have adversely affected habitat. If a wet meadow were drained early in spring or remained flooded throughout the summer *Pyrrocoma lucida* could be harmed. If the hydrologic change were permanent the area would no longer be suitable habitat. For these reasons habitat for this species may have been lost as a result of previous management activities. It is unlikely that the Freeman Project will have any adverse cumulative effects on this species because adequate surveys have been done, known populations will not be disturbed and vernally moist meadows will not be degraded.

Noxious weeds will continue to pose a threat to native plant habitat and sensitive plant species. With timber and fuel activities of the Proposed Action that will open the stand, noxious weeds can more easily invade the area. Forest management activities in the past have probably spread noxious weeds and created habitat for them. Weed seeds can be spread by vehicles and disturbed areas are prone to noxious weed infestation. Many other factors contribute to weed spread; all types of forest recreation, wood cutting, state highways and county roads through the National Forest, grazing and activity on adjacent privately owned land all contribute to weed spread. Following Standards and Guidelines would greatly reduce the cumulative effects of noxious weeds. A foreseeable future action is a chemical noxious weed treatment along roadsides within the Plumas-Sierra Weed Management Area. One known weed site in the Freeman Project area is expected to be analyzed for chemical treatment. Following Standards and Guidelines found in the HFQLG SEIS ROD (2003) for chemical weed treatments would greatly reduce the cumulative effects of spraying noxious weeds. See Appendix B Noxious Weed Risk Assessment.

Cattle grazing in the project area will continue to have effects on sensitive plant habitats and noxious weeds. Grazing has occurred in the Beckwourth Ranger District for at least the previous 150 years. Cattle can damage sensitive plants, degrade their habitats and spread noxious weeds. Freeman Project activities are unlikely to add to the effects of grazing on sensitive plants because of the extensive surveys done and the mitigations to known sensitive plant populations. The Freeman Project is unlikely to cause any changes to grazing practices that would impact sensitive plants because meadows are not being treated. Meadows are the primary use areas for grazing.

The Lake Davis Pike Eradication project may affect sensitive plant habitats by altering the hydrology of nearby wet meadows. Several sensitive plants have habitat in vernally moist areas. It is possible that the proposed draw down of Lake Davis would cause these areas to be drained at an unnatural time of year. Those plants whose habitat is in vernally moist meadows may be adversely affected. These potential effects will be analyzed in the environmental document for that project and will be mitigated appropriately.

The Lake Davis Pike Eradication project may affect the spread of noxious weeds. There are known populations of Canada thistle (*Cirsium arvense*) and tall whitetop (*Lepidium latifolium*) on the shore of the lake. As the water level is drawn down more habitat becomes available for these and other weed species. Although any new individuals would likely die when the lake level is returned to normal, it is possible that the seed bank of these weeds would be greatly increased. Vehicle access to the Freeman Project is by way of Lake Davis. There is a potential for weed seeds to be spread by vehicles passing these weed sites. Standard weed precautions will be followed during implementation of both the Freeman and Lake Davis Pike Eradication projects and will minimize the risk of noxious weed infestation. These known weed sites will not be disturbed by project activities. Details of noxious weed sites, risks and treatments can be found in Appendix B, the Noxious Weed Risk Assessment.

Watershed restoration projects have occurred in the Freeman Project area over the past several years. Changes in hydrology can affect sensitive plant habitats. These projects were evaluated prior to implementation and any effects to sensitive plants were mitigated. These projects were designed to restore the natural hydrological regime. Overall, sensitive plant habitat should increase as a result of the restoration. Standard weed precautions were followed during implementation.

It is also likely that future management actions would include recreation, some prescribed fire and timber management activities. Standards and Guidelines apply to all foreseeable future actions and would reduce cumulative effects on sensitive plant species. Standards and Guidelines can be found in the HFQLG SEIS ROD (2003).

The extent of cumulative effects depends on the management of potential direct and indirect effects, as well as the attributes of the sensitive plant species located within the analysis area, their distribution within the analysis area and the ability to design future projects with sensitive plant attributes in mind. Overall, management of the direct and indirect effects through project design and mitigation measures is assured to minimize the potential for cumulative effects. Adverse cumulative effects are not expected as a result of implementation of the Freeman Project for the following reasons:

The project area has been adequately surveyed for sensitive species.

Known occurrences of sensitive species will be protected by flagging and avoiding.

Proposed treatments would lead to a mosaic of habitat types in the project area, providing additional potential habitat for the species which inhabit forest openings.

By reducing potential direct and indirect effects through botanical surveys, project design and protection of existing sensitive plant populations, cumulative effects are expected to be minimal.

3.9.6.3 Differences in Effects of the Action Alternatives

Alternative 1 (Proposed Action)

The following sensitive species have potential habitat in the project area but were not found during botanical surveys: *Astragalus pulsiferae* var. *coronensis, Astragalus pulsiferae* var. *pulsiferae, Astragalus pulsiferae* var. *suksdorfii, Astragaulus webberi, Botrychium ascendens, B. crenulatum, B. lineare, B.lunaria, B. montanum, B. pinnatum,, Bruchia bolanderi, Cyrpipedium fasciculatum, Cypripedium montanum, Hydrothyria venosa, Ivesia aperta* var. *aperta ,Ivesia webberi, Lewisia cantelovii, Lupinus dalesiae, Meesia uliginosa, Oreostemma elatum, Penstemon personatus, Rupertia hallii, Silene occidentalis* ssp. *longistipitata and Vaccinium coccineum.* The potential habitat of the above species may be treated under the Proposed Action since no occurrences were found. Although adequate botanical surveys have been performed in the project area, it is possible that isolated individuals may be present. Therefore, undiscovered individuals may be impacted inadvertently. For this reason (potential impact to undiscovered individuals) a determination of "may impact individuals but not likely to cause a trend toward federal listing or loss of viability" has been made for these species. However, if any of these species with potential habitat but no known occurrences in the project area are found during project implementation they will be protected by applying the standard operating procedures (SOP’s), such as flagging and avoidance or a limited operating period (LOP).

The Proposed Action may improve the quality and amount of suitable habitat for sensitive plants species that tolerate or prefer moderate disturbance conditions.

Of the total 645 acres of aspen treatment units, 350 acres are within RHCA's. Under the Proposed Action, within RHCA's only hand treatment will occur on slopes greater than 15%. Under Alternatives 3 and 4 there will be 233 acres of aspen treatment units. All 233 of these acres are within RHCA's. Under Alternatives 3 and 4, the slope restriction will change from the 15% in the Proposed Action to 35%. Only hand treatment will occur on slopes greater than 35% within RHCA's.

Alternative 1 will cause greater disturbance because it treats a greater number of acres. This corresponds to a greater risk of weed infestation in the short term. Over the long term, the resulting increase in health of the treated aspen stands is likely to have a favorable affect on native plant communities.

Alternative 3

Direct Effects:

This alternative decreases the size of the units planned for aspen treatments resulting in a decrease in the number of acres of aspen treatments, from 645 to 233. Under this alternative the extended treatment zone of up to 150 feet around the aspen stands would not be treated. The aspen treatments areas would be defined by the extent of riparian vegetation and only aspen stands within that vegetation would be treated. Aspen treatment units would range from 1 to 31 acres in area. Additionally, Alternative 3 would evaluate the upper diameter limit of conifer retention, based on whether the conifers were there previous to the aspen. These changes would result in a greater number of conifers left within some aspen stands and greater canopy cover around some aspen stands.

This alternative also changes the delineation of RHCAs and treatments for fuels reduction, bald eagle habitat improvement and forest health improvement. Alternative 3 does not add any direct effects to sensitive plants because all of the changes result in reductions in treatment area.

The reduced amount of disturbance may pose less risk of noxious weed infestation because less suitable habitat would be available.

Indirect Effects:

The reduction in acres of aspen stands released from conifer competition may affect potential habitat for sensitive plants that inhabit riparian or wetland areas. Riparian areas in the Beckwourth Ranger District are potential habitat for several sensitive species of moonworts (*Botyrchium* species). Species of moonworts are usually found in moist riparian areas with filtered sunlight but may grow in moist forest openings. Under this alternative thinning will occur within the aspen stands as described in the Proposed Action with the exception of the 150-foot extended treatment area around the stands. The extended treatment zone will not be part of the Aspen treatment under this alternative. The extended treatment zone will not receive the aspen release treatment. Other types of treatment may occur in parts of the extended treatment zone where they are overlapped by some other type of treatment unit designated by Alternative 1 (the Proposed Action). Alternative 3 will result in a greater canopy cover in aspen stands after project implementation. It is unlikely that potential habitat for moonworts will be adversely affected by the lack of thinning in these buffer areas. But they may be affected if the lack of thinning in aspen stands leads to greater risk of stand replacing fire. A stand replacing fire may have adverse effects on potential habitat of moonworts. If moonworts were destroyed in a fire that also removed 100% of the canopy cover, it would be unlikely that they would reestablish in the site.

Other indirect effects would be the same as those of the Proposed Action.

The area has been adequately surveyed by qualified botanists. Any known sensitive plant populations in riparian areas will be protected. They will not be disturbed. Details of protections can be found in Appendix C, the Botany Protection Plan.

Alternative 3 may pose a slightly lower risk of noxious weed infestation because less area will be disturbed.

Cumulative Effects

The cumulative effects of this alternative on sensitive plants will be the same as those of Alternative 1, the Proposed Action.

Alternative 4 (Preferred Alternative)

Direct Effect

The direct effects to sensitive plants would be the same as those of the Alternative 1.

Indirect Effect

The indirect effects to sensitive plants would be the same as those of Alternative 3.

Cumulative Effect

The cumulative effects to sensitive plants would be the same as those of Alternative 1.

3.9.7 Determinations

3.9.7.1 Action Alternatives

All action alternatives may impact individuals but are not likely to cause a trend toward federal listing or loss of viability to: *Astragalus lentiformis*, *Ivesia sericoleuca*, *Meesia uliginosa*, *Astragalus pulsiferae var. pulsiferae*, *Astragalus pulsiferae var. suksdorfii*, *Astragaulus webberi*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lineare*, *Botrychium lunaria*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Cyrpipedium fasciculatum*, *Cypripedium montanum*, *Hydrothyria venosa*, *Ivesia* aperta var. *aperta*, *Ivesia sericoleuca*, *Ivesia webberi*, *Lewisia cantelovii*, *Lupinus dalesiae*, *Meesia triquetra*, *Oreostemma elatum*, *Penstemon personatus*, *Pyrrocoma lucida*, *Rupertia hallii*, *Silene occidentalis* ssp. *longistipitata*, *Vaccinium* *coccinium*. Although known occurrences will be protected, undiscovered occurrences of sensitive plants may exist in the project area. For this reason the aforementioned plant species may be impacted. The project area has been adequately surveyed for sensitive species and such impacts are expected to be minimal.

3.9.7.2 No-action Alternatives

The No-action Alternative will not affect: *Astragalus lentiformis*, , *Astragalus pulsiferae* var. *pulsiferae*, *Astragalus pulsiferae* var. *suksdorfii*, *Astragaulus webberi*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lineare*, *Botrychium lunaria*, *Botrychium minganenese*, *Botrychium montanum*, *Botrychium pinnatum*, *Bruchia bolanderi*, *Cyrpipedium fasciculatum*, *Cypripedium montanum*, *Hydrothyria venosa*, *Ivesia aperta* var. *aperta*, *Ivesia sericoleuca*, *Ivesia webberi*, *Lewisia cantelovii*, *Lupinus dalesiae*, *Meesia triquetra*, *Meesia uliginosa*, *Oreostemma elatum*, *Penstemon personatus*, *Pyrrocoma lucida*, *Rupertia hallii*, *Silene occidentalis* ssp. *longistipitata*, *Vaccinium coccinium*.

3.10 Special Interest and Management Indicator Plant Species

3.10.1 Introduction

Special interest species make an important contribution to the forest biodiversity and should be maintained under the provisions of the National Forest Management Act (NFMA). Therefore, they must be addressed appropriately through the National Environmental Policy Act (NEPA) process. Appendix A, the Botany Report, of the Biological Evaluation for Threatened, Endangered and Sensitive Plants is located in the project record and is the source of the information found here in section 3.9 of this document.

There is one occurrence each of the special interest plants, *Carex sheldonii* and *Trifolium lemmonii* in the project area.

The Beckwourth Ranger District has potential habitat for two Management Indicator Species (MIS): Quincy lupine and cryptic catchfly; they are discussed below as selected project level MIS. None of these species is known to occur in the analysis area.

3.10.2 Summary of Effects

3.10.2.1 Action Alternatives

The occurrences of Sheldon's sedge (CASH 11-013) and Lemmon's clover (TRLE 11-036) are outside of any treatment units and will not be disturbed by project activities. The action alternatives are unlikely to cause any adverse affects on these species.

3.10.2.2 Alternative 2 (No-action Alternative)

This alternative is unlikely to cause any adverse affects on *Carex sheldonii* and *Trifolium lemmonii*.

3.10.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for analyzing cumulative effects to special interest plants is the project boundary. Special interest plants are managed according to the PNF Interim Management Prescriptions (Hanson 2005). All known ecology, habitat, range and distribution information is considered in creating these prescriptions and they are periodically reviewed and updated by forest service botanists. Therefore, an analysis area equal to the project area insures adequate conservation.

Timeframe of Analysis: The timeframe for determining cumulative effects depends on the length of time that lingering effects of the past action will continue to negatively impact the species in question. This will vary widely between species because some rare plants require and tolerate disturbances that would harm others. Past actions that occurred in the area of each special interest plant occurrence are included in this evaluation if information is available. Where site-specific information is lacking, the general discussion of cumulative effects addresses the effects of disturbances likely to have occurred.

3.10.4 Analysis Methodology

The Freeman Project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for special interest plant species. In the field, areas identified as potential habitat were surveyed at a high level of intensity (complete survey). Areas identified as potential habitat include openings in the forest, serpentine soils, meadows, riparian areas, seeps and springs. Other areas with little to no potential habitat were surveyed at a less intense level (cursory survey). Plant location data were recorded using Global Positioning Systems and the data were then entered into a Geographic Information System (GIS). Treatment units were added to the GIS to analyze proximity to rare species and identify potential detrimental treatments and designate "Controlled Areas." Areas of concern were brought forward at planning meetings and appropriate mitigations will be enacted.

3.10.5 Affected Environment

The following briefly summarizes the survey, habitat and distribution information about the special intrest and management indicator species listed in the introduction in relation to the project area.

The R-E-D code for special interest plants is defined by the California Native Plant Society (CNPS) and gives indications of rarity, which addresses numbers of individuals and distribution within California; endangerment, which addresses the plant's vulnerability to extinction for any reason; and distribution, which describes the overall range of the plant. A value of 1, 2, or 3 is assigned to each category; higher numbers indicate greater concern (California Native Plant Society 2001).

3.10.5.1 *Carex sheldonii (*Sheldon's sedge)

Carex sheldonii is a sedge that occurs in marshes, swamps and riparian areas in lower montane coniferous forests. It is found in northeast California and parts of the Great Basin. The CNPS includes it on List 2 (plants rare, threatened, or endangered in California but more common elsewhere) and gives it an R-E-D code of 2-2-1, indicating a plant of limited distribution, that is endangered in some parts of its range and is widespread outside of California.

3.10.5.2 *Trifolium lemmonii* (Lemmon's clover)

Trifolium lemmonii is a perennial herb that occurs on volcanic soils, low sage flats and open terraces in open yellow pine forest. It is found in Nevada, Plumas and Sierra Counties and in the state of Nevada. The CNPS includes it on List 4 (plants of limited distribution, a watch list) and gives it an R-E-D code of 2-2-2, indicating that it is of limited distribution, endangered in some parts of its range and rare outside of California.

3.10.5.3 *Lupinus dalesiae* (Quincy lupine)

Lupinus dalesiae is a Region 5 Sensitive Species on the Lassen and Plumas National Forests. For the Plumas, it is also a Management Indicator Species within the Sensitive Plant Group found in Appendix G of the Forest Land & Resource Management Plan.

Lupinus dalesiae occupies sites of open canopy in mixed conifer forests on metasedimentary or metavolcanic soils mainly in the Highway 70/89 corridor from Lake Almanor to Sloat in central Plumas County with isolated occurrences in Butte, Yuba, Sierra and Nevada counties, California. *Lupinus dalesiae* has a limited range but is abundant within its specific habitat.

Lupinus dalesiae occurs within 1,713 acres of suitable habitat within the Forest. *Lupinus dalesiae* habitat on the Plumas National Forest appears to be stable.

Within its known range on the Plumas and Lassen National Forests there are 131 and 19 occurrences respectively; as well as scattered occurrences on adjacent private lands. The California Natural Diversity Database documents 162 occurrences in California.

The PNF currently has 131 known occurrences. An occurrence is defined as all plant locations within ¼ mile of each other. For *Lupinus dalesiae*, there are 564 plant locations that make up the 131 occurrences on the Forest. At the time the Forest Plan was developed in 1988, the number of occurrences for *Lupinus dalesiae* was simply stated as “many”. The number of known occurrences has increased over the years since development of the Forest Plan. These occurrence records are attributed to increased survey efforts for Sensitive Plants across the Forest as a result of pre-project planning and landscape assessments. With the implementation of Interim Management Prescriptions, the population trend for *Lupinus dalesiae* appears to be stable on the PNF.

3.10.5.4 *Silene invisa* (Cryptic Catchfly)

Silene invisa is a Special Interest species on the Plumas National Forests. It is also a Plumas National Forest Management Indicator Species within the Sensitive Plant Group found in Appendix G of the Forest Land & Resource Management Plan.

This species occurs on 953 acres of suitable habitat on the Plumas National Forest. Habitat for *Silene invisa* appears to be in and adjacent to red fir forest stands and on the eastern edge of the range of the species in mixed conifer stands. This species is also found along the upland margins of alder thickets, meadow edges, ephemeral stream banks and forest edges. The habitat trend for *Silene invisa* appears to be stable on the Plumas National Forest.

The California Natural Diversity Database currently has no data on *Silene invisa*. This species is known from scattered locations within the Plumas National Forest. On the Plumas NF, there are currently 26 documented occurrences. An occurrence is defined as all plant locations within ¼ mile of each other. For *Silene invisa*, there are 134 plant locations that make up the 26 occurrences currently on the Plumas.

When the Forest Plan was developed in 1988, documented occurrences of *Silene invisa* were 4 for the Plumas. Many of the occurrences documented since development of the Forest Plan are attributed to increased survey efforts for Sensitive Plants across the Forest as a result of pre-project planning and landscape assessments. With the implementation of Interim Management Prescriptions, the population trend for *Silene invisa* appears to be stable on the Plumas National Forest.

3.10.6 Environmental Consequences

3.10.6.1 Action Alternatives

Direct and Indirect

Botanical surveys have been done and known populations of special interest plants will be undisturbed by the project. Both of the special interest plant species found in the project area are not within treatment units. The activities proposed by this alternative are unlikely to have direct effects on special interest plant species because they will not be disturbed.

The project is unlikely to have direct impacts to MIS populations. Adequate plant surveys were done and no MIS plants were found in the project area. Potential direct, indirect and cumulative impacts would be the same as those discussed on page 43 of the Botanical Evaluation for Threatened, Endangered, or Sensitive Plants.

Carex sheldonii

There is one occurrence of Sheldon's sedge in the project area. It is approximately 200 feet west of County Road 126 and ¾ miles east the nearest project activity. It will not be disturbed by the Freeman Project. Suitable habitat for this species in the project area has been surveyed.

Trifolium lemmonii

There is one occurrence of Lemmon's clover in the project area. It is farther than 500 feet from any treatment unit or project activity. It will not be disturbed by the Freeman Project. Suitable habitat for this species in the project area has been surveyed.

Lupinus dalesiae

Risks and threats to the species include road construction and maintenance, timber site preparation and release, landing placement, mining activity, urban development and OHV use.

Management concerns from risks and threats have been addressed through Interim Management Prescriptions for Sensitive Plants and Special Interest Plants on the Plumas National Forest. For *Lupinus dalesiae* the following interim management prescriptions apply. Establish a set of key occurrences to protect at least 30% of the known occurrences within a Level 5 Watershed from all ground disturbing actions (*Lupinus dalesiae*—A Botanical Investigation 1989). In selecting Key Occurrences, give priority to those residing in settings undisturbed (at least recently) by management activities. Additional occurrences may be protected with appropriate rational. The level of impact to be incurred by non-key occurrences should be determined as each project is designed and analyzed and should follow the following strategy.

Avoid building landings, temporary roads and fire control lines through known occurrences. Avoid sub-soiling through known occurrences. Strive to apply mechanical treatments after seed-set. Avoid machine piling within known occurrences. To the degree possible, lop-and-scatter hand fuel treatments to avoid creating piles within known occurrences. If pile burning is necessitated by other resource issues, work with the District Botanist to avoid placing piles on individual plants within the occurrence to the degree feasible. Strive to apply prescribed fire in the fall.

Silene invisa

Threats to this plant from management activities include timber harvest activities, grazing, road building, mining and facility developments.

Management concerns from risks and threats have been addressed through Interim Management Prescriptions for Sensitive Plants and Special Interest Plants on the Plumas. *Silene invisa* has a prescription to lessen effects from Forest management actions that includes assessing the genetic contribution to species diversity and viability of an occurrence should be evaluated at the site specific level during both project planning and environmental analysis phases of a project.

Cumulative Effects

Overall, the direct and indirect effects on *Carex sheldonii* and *Trifolium lemmonii* from this alternative would be negligible to minor; therefore, there is a low risk of cumulative effects. Past projects have affected existing occurrences of these plants. If existing management guidelines, such as rare plant surveys and protection of known rare species locations remain in place, the cumulative effects of proposed and future projects are likely to be negligible.

3.10.6.2 Alternative 2 (No-action)

The direct, indirect and cumulative effects of this alternative would be negligible for *Carex sheldonii* and *Trifolium lemmonii* because the known populations of these plants are not located in treatment units. Adequate surveys have been done.

3.10.7 Determinations

3.10.7.1 Action Alternatives

The Action Alternatives may impact MIS and/or special interest plant species but are not likely to lead to a trend to federal listing.

3.10.7.2 Alternative 2 (No-action)

The No-action Alternative will not impact MIS or special intrest plants.

3.11 Economic Effects

3.11.1 Introduction

The following assessment is summarized from the economics report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006j)

The HFQLG FEIS, Appendix S and Appendix T describe the direct, indirect and cumulative socioeconomic impacts of implementing the HFQLG Pilot Project. Therefore, this economic analysis will not revisit the information presented in the HFQLG FEIS, but will focus only on those revenues and treatment costs associated with implementing thinning and fuels reduction treatments within the Freeman Project area. The purpose of this economic analysis is to display the revenues and costs associated with each of the alternatives for comparison purposes.

In addition, this analysis does not include monetary values assigned to resource outputs such as wildlife, watershed, soils, recreation, visual and fisheries. It is intended only as a relative measure of differences between alternatives based on those direct costs and values used. Other values are discussed in the appropriate sections of the Freeman Project Environmental Impact Analysis.

3.11.2 Summary of the Effects

This economic analysis for the Freeman Project is focused on those revenues and treatment costs associated with implementing fuel reduction treatments, group selection and individual tree selection.

3.11.2.1 Action Alternatives

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternative 1 would generate more harvest revenue, timber yield taxes, employment opportunities and employee-related income than alternatives 3 or 4 (Table 3.93). In addition, alternative 4 would contribute more DFPZ and biomass volume harvested to the Pilot Project area than alternatives 1 and 3 (Table 3.95). Alternative 1 would contribute more sawtimber volume harvested to the Pilot Project area than alternative 3 and 4 due to greater treatment of Aspen stands.

3.11.2.2 Alternative 2 (No-action)

Implementation of the No-action alternative would have a negative impact on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the No-action alternative were implemented, additional funds would be needed to conduct fuel reduction treatments or wildlife habitat, meadow and streambank restoration.

3.11.3 Scope of the Analysis

Geographic Analysis Area: The social and economic environment of the Plumas National Forest is described in the Forest's 1988 Land and Resource Management Plan (LRMP), as amended by the Herger-Feinstein Quincy Library Group Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) of 1999; a final supplemental FEIS and ROD addressing DFPZ maintenance adopted in 2003; and the Sierra Nevada Forest Plan Amendment (SNFPA) final supplemental EIS and Record of Decision (ROD) of 2004, amending the LRMPs of all national forests in the Sierra Nevada.

The geographic boundary for the social and economic analysis for the HFQLG pilot project encompasses the counties located within the core and peripheral areas (HFQLG FEIS, Appendix S, page S-7). The core area of the QLG region contains the three counties of Lassen, Plumas and Sierra. The peripheral area of the QLG region contains five counties that surround the core area. These counties are Butte, Nevada, Shasta, Tehama and Yuba. The focus of the socioeconomic analysis is on 41 communities within the HFQLG region (HFQLF FEIS, Appendix T, Table T-1). The Freeman Project is part of the HFQLG pilot project and this economic analysis will be based on the incremental effect of the Freeman Project within the HFQLG Pilot Project region.

Time Frame Boundary: As stated above, this economic analysis will not revisit the information presented in the HFQLG FEIS, but will focus only on the time frame associated with implementing thinning and fuels reduction treatments for the Freeman Project. The time frame for completing the timber harvest removal would take approximately 2 to 3 years. The time frame for DFPZ construction activities would take an additional 3 to 6 years after timber harvest removal is completed.

3.11.4 Analysis Methodology

This economic analysis focuses on those revenues and treatment costs associated with implementing group selection and fuel reduction treatments in the Freeman Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality and fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used. Other values are discussed in the appropriate sections of this document.

Timber harvest values used in this economic analysis were based on the California State Board of Equalization Timber Harvest Values (January 1, 2005 – June 30, 2005). Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Mechanical (mastication, grapple pulling), manual (hand cutting, hand piling) and prescribed fire (underburning, pile burning) treatments are based on the latest service contract prices, Knutson-Vandenberg and brush disposal sale area improvement plans.

3.11.5 Affected Environment

The Plumas National Forest (the Forest) contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area and (2) through direct and indirect contributions to local county revenues. The Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets. Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra and Yuba Counties. The percentage of Plumas National Forest land in local counties is shown in Table 3.91.

Table 3.91 Percentage of Plumas National Forest lands by county (based on GIS data).

County	County Acres	Beckwourth Ranger District (acres)	Feather River Ranger District (acres)	Mount Hough Ranger District (acres)	Total Plumas National Forest Lands in Each County (acres)	Plumas National Forest Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

The two employment sectors most related to forest planning processes are the timber industry and tourism. They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal employers generally do not break down employment data into these categories.

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, (2) timber yield taxes and (3) Receipt Act payments or payments from the Secure Rural Schools and Community Self-Determination Act of 2000. Of these, the Receipt Act or Secure Rural Schools and Community Self-Determination Act payments are by far the most noteworthy in terms of total contributions to each county and are therefore most likely to be affected by Forest land management decisions.

Payments in Lieu of Taxes. Payments in Lieu of Taxes are administered by the Bureau of Land Management and apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county. Payments are made annually and are based on local population, federal acreage in the county and other federal payments during the preceding fiscal year. The minimum payment is 75 cents per entitlement acre. The county may use these funds for any purpose. The Forest has no control over the disbursement of these funds and the amount disbursed every year is unaffected by Forest land management decisions.

Timber Yield Taxes. The second source of revenues to local government is the timber yield tax, administered by the State Board of Equalization. The Forest does not pay this tax; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and public lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state and approximately 80 percent is returned to the counties from which the timber was harvested. Decisions about the amount of timber to be offered for sale each year on the Forest can affect the amount of revenues disbursed to the counties.

Receipt Act. Receipt Act payments are distributed pursuant to the National Forest Management Act (Public Law 94-588). Under this law, 25 percent of National Forest revenues are allocated to the state in which the Forest is situated. The amount returned is based on the National Forest acreage within each county. According to state law, Receipt Act funds must be divided evenly between public schools and public roads of the county or counties in which the National Forest is located and may not be spent on anything else.

Receipt Act payments are based on 25 percent of the total revenues collected from timber, grazing, land use, recreation, power, minerals and user fees. Within the 11 western states, however, payments are based on 50 percent of revenue from grazing. Historically, at least 90 percent of total revenues have come from timber sale receipts. As a result, the amount of money available for distribution each year fluctuates widely, depending on the amount of timber harvested on National Forests.

Secure Rural Schools and Community Self-Determination Act. Congress passed the Secure Rural Schools and Community Self-Determination Act in 2000, offering counties an alternative to the Receipt Act. Under the Self-Determination Act, a state's three highest payment amounts between 1986 and 1999 are averaged to arrive at a "compensation allotment" or "full payment amount." A county may choose to continue to receive payments under the Receipt Act or to receive its share of the state's full payment amount under the Secure Rural Schools and Community Self-Determination Act. National Forests and other federal agencies that contribute to the 25 percent fund would have to generate approximately $56.4 million in total revenues in order to offset the $14 million that the counties receive under the Secure Rural Schools and Community Self-Determination Act.

Counties can receive variable, revenue-dependent payments under the Receipt Act or receive stable funding for local schools and roads under the Secure Rural Schools and Community Self-Determination Act. The legislation promotes local involvement, decisions and choice by creating well-balanced resource advisory committees that recommend forest projects to the Secretary of Agriculture or advise counties on county project proposals. Counties that elect to receive the full payment amount under the Secure Rural Schools and Community Self-Determination Act and receive more than $100,000, are required to allocate 15 to 20 percent of their funding to projects under Title II or Title III (see Table 3.92). Like traditional 25 percent funds, Title I funds are expended for public schools and roads. Title II funds are allocated for projects on federal lands or projects that benefit federal lands. Resource Advisory Committees are established to determine

Title II fund distribution. Title III funds are allocated for county projects that include search and rescue, community service work camps, easement purchases, forest-related education opportunities, fire prevention and county planning, or cost-share for urban community forestry projects. The Secure Rural Schools and Community Self-Determination Act full payment amounts (fiscal year 2005) for the five counties containing Plumas National Forest lands are shown in Table 3.92.

Table 3.92 Secure Rural Schools and Community Self-Determination Act full payment amounts to counties for fiscal year 2005.

County	Full Payment Amount	Title I Funds	Title I Percent of Full Payment	Title II Funds	Title II Percent of Full Payment	Title III Funds	Title III Percent of Full Payment
Butte	$895,320	$716,256	80%	$0	0%	$179,064	20%
Lassen	$3,876,372	$3,294,916	85%	$581,456	15%	$0	0%
Plumas	$7,258,972	$6,170,126	85%	$816,634	11%	$272,211	4%
Sierra	$1,848,005	$1,570,804	85%	$92,400	5%	$184,801	10%
Yuba	$238,982	$191,186	80%	$0	0%	$47,796	20%
Total	**$14,117,651**	**$11,943,288**		**$1,490,490**		**$683,872**	

Relative to the local economy, there is a potential to harvest 9–14 million board feet of timber over several years as part of the Freeman Project. The five Counties can expect to receive 25 percent of the revenues generated from this timber sale through the Receipt Act or receive full payment from the Secure Rural Schools and Community Self-Determination Act. 100 percent of the Freeman Project area is located in Plumas County. Employment opportunities would be created from proposed thinning and biomass removal, fuels reduction, site preparation and planting activities. Furthermore, indirect and induced economic employment and monies would be generated when income received by contractors and the timber industry is re-spent within the local economy.

3.11.6 Economic Consequences

Economic consequences are a measure of the overall value of the four alternatives considered in this analysis. The level and mix of goods and services available to the public varies by alternative, resulting in a range of impacts on the social and economic environment. The impacts discussed in this section include estimated government expenditures and revenues, as well as monetary impacts on local communities.

Direct monetary impacts are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments and direct, indirect and induced job opportunities.

In general, the monetary value of each alternative depends on the amount and method of timber harvest and the acreage planned for fuels reduction treatments. Areas with positive timber harvest values would pay for associated fuels reduction activities on those acres. Fuels reduction treatment costs that exceed harvest revenues would become service contracts to be financed through appropriated funds when available.

The HFQLG Act final EIS and Record of Decision described the economic impacts of implementing the Pilot Project. This economic analysis does not revisit the information presented in the final EIS and Record of Decision, but for comparison purposes, it focuses only on those revenues and treatment costs associated with each of the alternatives.

3.11.6.1 Action Alternatives

Direct and Indirect Effects

Employment

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Freeman Project would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking and fuel supplies. Induced effects are driven by wages. Wages paid to workers by the primary and service industries are circulated through the local economy for food, housing, transportation and other living expenses. The sum of direct, indirect and induced effects is the total economic impact in terms of jobs, which typically range from 10 to 15 jobs per million board feet of timber harvested.

Revenue to the Government

Net revenue is the difference between the revenues generated by an alternative and the costs required to implement the alternative. In this analysis, revenues come from harvest of timber.

Payments to Counties

Local counties receiving payments through the Receipt Act rather than the Secure Rural Schools and Community Self-Determination Act would share part of the revenues generated from the timber harvest. The actual payment amount depends on estimated stumpage value and the price bid by the purchaser awarded the timber sale contract.

Treatment Costs

Treatment or management costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments and mitigation measure requirements, as well as costs of resource enhancement measures not associated with the sale of timber. Costs vary widely depending on the amount of mechanical, manual, or thermal treatments prescribed; the board feet of sawlogs or tons of biomass removed per acre; and the accessibility of the treatment units.

Net harvest revenues for group selection, thinning and biomass removal would generate $798,000 for alternatives 1, $78,000 for alternatives 3 and $47,000 for alternatives 4. Total project cost would be -$1,050,000 for alternatives 1, -$1,815,000 for alternatives 3 and -

$1,517,000 for alternatives 4. The economic analysis does not take into account nonpriced benefits such as reduced fire hazard.

Considering logging costs and slash treatment and regeneration costs, treating groups by helicopter would have a net value of negative $4,360 per acre or a present value of minus 127 percent. Considering logging cost and slash treatment, treating thinning by helicopter would have a net value of negative $1,324 per acre. This logging would be very difficult to complete due to the scattered logs and difficulty of finding the logs through the forest canopy and obtaining a full payload.

Thinning, biomass removal and fuel treatments would directly generate 247 full-time employment opportunities for alternative 1, 176 full-time employment opportunities for alternative 3 and 203 full-time employment opportunities for Alternative 4. All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies and fuel suppliers) that serve the timber industry. There is also an induced effect that is driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation and other living expenses.

The sum of direct, indirect and induced effects is the total economic impact in terms of jobs. In addition to the direct employment that would result from the harvesting and fuel reduction treatments in Alternatives 1, 3 and 4 and the indirect benefits of jobs in sawmills and energy generation plants, there would be some additional benefits to the local economy as wages earned by those employees are spent on living expenses. Alternative 1 would generate an estimated 310 direct, indirect and induced jobs, Alternative 3 would generate an estimated 240 direct, indirect and induced jobs, Alternative 4 would generate an estimated 248 direct, indirect and induced jobs.

Nonpriced Costs and Benefits

It should be noted that all costs and values are not represented in the economic analysis. Calculations do not include costs and values for those items that cannot be estimated in dollar terms. The economic analysis does not take into account nonpriced benefits such as improved long-term wildlife habitat, improved watershed conditions, improved fish passage and reduced fire hazard. The various habitat improvement opportunities, which are not funded from the project's timber receipts, may be funded through other sources such as watershed improvement needs, Resource Advisory Committees, wildlife habitat improvements, Knutson-Vandenberg, or other appropriated funds. Examples of costs not estimated in dollar terms are the reduction in scenic value in the early years of fuels treatments, air pollution from wildfires, or reestablishing a forest following a stand-replacing wildfire.

For a detailed discussion of these nonpriced benefits and costs, refer to the appropriate resource section in this document. These nonpriced benefits and costs will be considered along with the net economic value of each alternative in order to make a judgment as to which alternative offers the best overall mix of costs and benefits to society.

Table 3.93 summarizes the economic impacts of alternatives 1-4 on the local economy.

Cumulative Effects

Each of the action alternatives would result in the same cumulative effect—an increase in the overall economic activity in the HFQLG Pilot Project area. Though it is not a requirement, it is assumed in this analysis that most products from HFQLG projects will be processed locally due to high hauling costs of products and equipment. Likewise, it is also assumed most employment will largely be derived from Butte, Lassen, Plumas, Sierra and Yuba counties. The Freeman timber sale revenues and service contract employment would complement all other HFQLG funded projects across the forest. Economic goals for the project as a whole across the Pilot project area are discussed in the HFQLG Final Environmental Impact Statement. Table 3.94 displays the Pilot Project accomplishments of DFPZ and group selection acres treated and sawlog and biomass volumes harvested over the past three years (Reference HFQLG oracle Database).

Table 3.93 Comparison of economic impacts by alternative for the Freeman Project area.

Revenue/Cost/ Employment	Alt. 1	Alt. 2	Alt. 3	Alt. 4
Total Sawlog Volume (mmbf)	13.9	0	8.9	9.9
Total Biomass Volume (mtons)	57.3	0	51.7	63.2
Total Cost	$2,251,000	$0	$1,881,000	$2,041,000
Net harvest revenues	$798,000	$0	$78,000	$47,000
% Above Value	26%	0	4%	2%
DFPZ Service Contract	($841,000)	$0	($864,000)	($779,000)
Area Thin Service Contract	($1,007,000)	$0	($1,030,000)	($785,000)
Total Project Value	($1,050,000)	$0	($1,815,000)	($1,517,000)
Direct jobs	247	0	176	203
Indirect jobs	63	0	64	45
Total direct and indirect jobs	310	0	240	248
Total employee-related income	$13,341,000	$0	$10,340,000	$10,667,000

The Freeman Project contribution to the Pilot Project region by alternative is displayed in Table 3.95. For DFPZ acres treated, the contribution to the Pilot Project region would be the same for all alternatives. For group selection acres and the amount of sawlog and biomass volume harvested, alternative B would provide the most contribution to the Pilot Project region, followed by alternative C and the least contribution coming from alternative D. There are no past projects that are still in operation and contributing toward economic stability from the Freeman Project area. See Appendix F of this EIS for the complete economic analysis, by alternative.

Table 3.94 Pilot Project region averages of acres treated and volume harvested.

	FY 2003	FY 2004	FY 2005	Pilot Project Average
DFPZ Acres Accomplished	24,442	36,635	21,073	27,383
Group Selection Acres Accomplished	-0-	1,738	1,792	1,177
Sawlog Volume Offered CCF	41,418	203,012	143,373	129,268
Biomass Volume Offered CCF	44,402	198,204	129,814	124,140

Summary of Cumulative Effects

This economic analysis for the Freeman Project is focused on those revenues and treatment costs associated with implementing fuel reduction treatments, group selection and individual tree selection. Implementation of the No-action alternative would have a negative impact on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. If the No-action alternative were implemented, additional funds would be needed to conduct fuel reduction treatments or wildlife habitat, meadow and streambank restoration.

All action alternatives would provide employment opportunities and generate harvest revenues and timber yield taxes. However, alternative 1 would generate more harvest revenue, timber yield taxes, employment opportunities and employee-related income than alternatives 3 or 4 (Table 3.93). In addition, Alternative 4 would contribute more DFPZ and biomass volume harvested to the Pilot Project area than alternatives 1 and 3 (Table 3.95). Alternative 1 would contribute more sawtimber volume harvested to the Pilot Project area than Alternative 3 and 4 due to greater treatment of Aspen stands.

Table 3.95 Freeman Project contribution to the Pilot Project area

	Alt 1.	Alt 2.	Alt 3.	Alt 4.
Proposed DFPZ Acres Percent contribution	1,357 5.0%	0	1,485 5.4%	1,885 6.9%
Proposed Group Selection acres Percent contribution	175 14.8%	0	175 14.8%	174 14.7%
Proposed Sawlog Volume MMBF	13.9	0	8.9	9.9
Proposed Sawlog Volume CCF Percent contribution	27,600 21.3%	0	17,800 13.8%	19,800 15.3%
Proposed Biomass Volume Tons	60,000	0	55,000	66,000
Proposed Biomass Volume CCF Percent contribution	24,000 19.2%	0	22,000 17.6%	26,400 21.2%

Conversions: MBF = 2 CCF; Tons = 0.4 CCF

3.11.6.2 Alternative 2 (No-action)

Direct and Indirect Effects

This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local counties. No additional employment opportunities or wages paid to primary and service industry employees would be circulated through the local economy.

Local industries would lack opportunities or business that would be provided from fuels reduction, site preparation or timber harvest activities. The local economy also would fail to receive benefit from associated employment, such as in food, lodging and transportation businesses. Fuel reduction activities in the creation and maintenance of DFPZs would not occur thereby further negating opportunities for long-term employment and rural community stability. Table 3.93 summaries the economic impacts of alternatives 1, 2, 3 and 4 on the local economy.

Under the No-action alternative, wildlife habitat, meadow and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Freeman Project area would continue to pose a very high fire hazard to the surrounding areas. If the No-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should fire reoccur in the Freeman vicinity.

Cumulative Effects

The No-action alternative would result in a negative effect on local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. These local industries currently lack opportunities related to fuels reduction, site preparation and timber harvest activities; the action alternatives would provide those opportunities. The local economy would also not receive benefits from associated employment, such as in food, lodging and transportation businesses. Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures, could reduce or eliminate future economic and environmental opportunities from National Forest lands. The continuation of current conditions under Alternative 2 would preclude opportunities for long-term employment and rural community stability because the fuel reduction activities related to the creation and maintenance of DFPZs would not occur.

Under the No-action alternative, wildlife habitat, meadow and streambank restoration and enhancement could not take place without appropriated money from Congress. In addition, dense standing trees and down woody material in the Freeman Project area would continue to pose a very high fire hazard to the surrounding areas. If the No-action alternative were implemented, additional money would be needed to conduct any fuel reduction treatment, as well as possible elevated fire suppression costs should fire reoccur in the Freeman Project vicinity. Table 3.93 above summarizes the economic impacts of all alternatives on the local economy.

3.12 Transportation System Effects

3.12.1 Introduction

The following assessment is summarized from the economics report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006j). The purpose of the National Forest road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. The road system and improvements should minimize adverse effects on watershed and wildlife values. Roads near streams or in riparian zones have the greatest probability of intercepting, concentrating and diverting flows from natural flow paths and should therefore be minimized where feasible. Road-stream crossings have the potential for failing and diverting water and should therefore be minimized where feasible. Roads can reduce and fragment wildlife habitat, but they can also provide access for habitat protection from wildfire and treatments designed to improve habitat quality. Roads should be minimized where adverse effects outweigh benefits to wildlife.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through for road construction, reconstruction, or relocation) include the following:

- Accommodation of the 100-year flood at stream crossings, including streamflow, bedload and debris;
- No diversion of streamflow along roads in the event of crossing failure;
- No diversion of natural hydrologic flow paths at stream crossings, including paths of streamflow, surface runoff and groundwater; and
- No roads located in wetlands and meadows and minimization of road effects on natural flow patterns in wetlands and meadows.

3.12.2 Analysis Methods

The transportation system for the Freeman Project area was evaluated through a roads analysis. The following needs were identified based on that analysis and known access needs for proposed DFPZ and group selection treatments:

- Road reconstruction and maintenance are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to the DFPZ and group selection treatment areas. Reconstruction and road maintenance are also necessary to reduce erosion and sedimentation and to provide for public safety.
- Road decommissioning is needed to reduce erosion, sedimentation and soil compaction and to reduce road density and wildlife impacts.
- Closure of spur roads is needed to reduce erosion, sedimentation, soil compaction and impacts to wildlife.

- Culvert replacement, removal, or upgrade is needed to improve watershed connectivity.
- Temporary road construction is needed to access group selection and DFPZ units where existing road access is absent.
- Two classified road relocations are needed to provide access to treatment areas where existing road access is impacting watershed and heritage resources.
- Harvest landing construction and reconstruction are needed to facilitate removal of wood products.

3.12.3 Affected Environment

One major arterial route accesses the project area: the Lake Davis Road (Plumas County Road 112) on the northeast side on Lake Davis. The Freeman Project area is considered to have a fully developed arterial and collector road system.

There are a total of approximately 82.4 miles of existing classified roads in the project area. In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads and skid trails in the project area. There are 0.9 miles of Level 1 roads assigned to intermittent service. There are 49.5 miles of Level 2 roads assigned where management direction requires the road to be open for limited passage of traffic. There are 31.5 miles of Level 3 roads where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. There are 0.5 miles of Level 5 roads where management direction requires the road to provide a high degree of user comfort and convenience at moderate travel speeds.

3.12.4 Environmental Consequences

3.12.4.1 Action Alternatives

Direct Effects

Approximately 0.9 miles of existing classified road could potentially be closed with barriers upon project completion (see Table 3.96). In addition to the information contained in the tables in this section, Figures I.2, I.3 and I.4 in Appendix I depict the proposed transportation system changes.

The Freeman Project proposes road decommissioning (see Table 3.97) approximately 6.0-miles of existing system roads, 1.9-miles of non-system roads. An additional 0.7-mile of system road would be reduced to single-track, in order to provide for recreational opportunities near Lake Davis. Decommissioning would include recontouring, removing drainage structures, subsoiling, restoring vegetative cover and/or blocking access. Decommissioning of roads would reduce equivalent roaded acres (ERA) values, thereby lowering cumulative watershed impacts and soil compaction. None of the roads proposed for decommissioning are needed for the long-term transportation system. Portions of roads are in poor locations within RHCAs and are causing direct stream impacts. Roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts. Proposed road decommissioning, closure, or reconstruction would contribute to watershed restoration, including meadow enhancement, fish passage and stream stabilization. There are many unsurfaced roads in the Freeman Project area that are contributing to degradation of water quality and aquatic habitat.

Table 3.96 Potential road closures under the Freeman Project.

Freeman Road Closure Opportunities					
Road No.	**Classified**	**Location Township/Range Section**	**Classified Miles**	**Dead End**	**Loop**
1	23N16Y	23/13 S 9	0.23	Yes	
2	24N42XA	24/12 S26	0.30	Yes	
3	24N84X	24/12 S24	0.40	Yes	
Classified Road Mileage			**0.93**		
Miles—Number of Dead-end Roads			**0.93**	**3**	
Total			**0.93**		

Through project planning, the public was given the opportunity to participate and comment on proposed road closures and decommissioning. The Plumas National Forest is currently undergoing an off-highway vehicle (OHV) route inventory and designation process. Roads proposed for decommissioning or closure in this project are creating unacceptable resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts on the resource.

Table 3.97 Freeman Project classified and unclassified road decommissioning opportunities.

Road Number	**Location Township/Range Section**	**Classified Miles**	**Unclassified Miles**	**Dead-end Spur**	**Loop Road**
24N07B	23/13 S4	0.30		Yes	
24N07C	23/13 S4 & S3	0.26		Yes	
24N10D	24/13 S33	0.62		Yes	
24N12B	24/13 S31	0.49		Yes	
24N43X	24/12 S26 & S35	1.35			Yes
24N55	23/13 S7	0.19			Yes
24N57C	24/12 S27	0.25		Yes	
24N57D	24/12 S27	0.19		Yes	
24N57E	24/12 S26	0.04		Yes	
24N57F	24/12 S26	0.13		Yes	
24N61A	24/12 S27 & S28	0.17		Yes	
24N71Y	24/13 S33	0.76		Yes	
24N74Y	23/13 S8	0.19			Yes
24N89YA	23/12 S1	0.25		Yes	
24N89YB1	23/12 S1	0.25		Yes	
24N89YB2	23/12 S1	0.61		Yes	
U-----	Numerous		1.91	Yes	
Classified Road Mileage		**6.05**			
Unclassified Road Mileage			**1.91**		
Total Classified and Unclassified		**7.96**			

Approximately 16 miles of existing classified roads would be reconstructed prior to project use (Table 3.98). Reconstruction would consist of brushing, blading the road surface, improving drainage and replacing/upgrading culverts where needed. 0.45-mile of system road would be relocated. Hazard trees would be removed. Identification of hazard trees would follow guidelines in the Plumas National Forest Roadside/Facility Hazard Tree Abatement Action Plan (2003).

Approximately 17 temporary roads would be built, totaling 2-miles, are needed to implement planned activities. Most are less than 100' in length and are needed to place landings beyond visually sensitive locations. These roads would be decommissioned upon completion of the project.

Existing harvest landings in group selection units and DFPZs would be reconstructed and new ones would be constructed.

Table 3.98 Freeman Project proposed road reconstruction.

Road Number	Miles	Maintenance Level	Road Number	Miles	Maintenance Level
23N22Y	2.8	2	24N11X	1.2	2
23N88	1.5	2	24N42X	0.3	2
24N07	3.2	2	24N55	0.9	2
24N07A	0.4	2	24N57	1.6	2
24N10B1	0.4	2	24N61	1.2	2
24N10C	1.8	2	24N70Y	0.5	2
24N84X	0.1	2			
Total miles 14.4					

The road improvements proposed in the action alternatives would provide access needed for the DFPZ and group selection units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of stand-replacing fire through intensive vegetation manipulation at a lower cost because of the improved access. The action alternatives would generate traffic from log trucks, chip vans and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements.

Indirect Effects

No right-of-ways are need for this project.

Cumulative Effects

A net reduction of approximately 8.0 miles of classified and unclassified roads in the action alternatives would occur after proposed road decommissioning is completed. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

Past, Present and Reasonably Foreseeable Future Actions

Other than ongoing routine road maintenance, past, present and future projects in the vicinity of the Freeman Project have not impacted nor are they expected to impact the transportation system in the project area.

3.12.4.2 Alternative 2 (No-action)

Direct Effects

Reconstruction of classified roads would not occur and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity. There would be no increase in hazards to driver safety from logging traffic. Classified roads, unclassified roads and abandoned skid trails would not be decommissioned and would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels.

Roads would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed. Fire access would be restricted because some roads would remain, or become, impassable.

Indirect Effects

No rights-of-way would be needed for the normal road maintenance completed in this area.

Cumulative Effects

No reduction in classified or unclassified roads would occur during normal road maintenance completed in this area.

3.13 Noxious Weed Effects

3.13.1 Introduction

The following assessment is summarized from the botany noxious weed risk assessment for the Freeman Project, incorporated here by reference (USFS PNF BRD 2006b). This Noxious Weed Risk Assessment has been prepared to evaluate the effect of the Freeman Project on California Department of Food and Agriculture (CDFA) listed noxious weeds and other invasive non-native plant species. This assessment is in compliance with the Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988), the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (USDA Forest Service 1999), the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement Record of Decision (USDA Forest Service 2001), Executive Order on Invasive Species (Executive Order 13112),and the direction in the Forest Service Manual section 2080, Noxious Weed Management (amendment effective since 11/29/95) (USDA Forest Service 1991), which includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project. The overriding principle stated in these documents is that "…it is much cheaper to prevent an infestation from becoming established than to try to eliminate it once it has begun to spread, or deal with the effects of a degraded plant community." Specifically, the manual states: 2081.03 - Policy. When any ground disturbing action or activity is proposed, determine the risk of introducing or spreading noxious weeds associated with the Proposed Action.

1. For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation.
2. Use contract and permit clauses to prevent the introduction or spread of noxious weeds by contractors and permittees. For example, where determined to be appropriate, use clauses requiring contractors or permittees to clean their equipment prior to entering National Forest System lands.

2081.2. Prevention and Control Measures. Determine the factors that favor the establishment and spread of noxious weeds and design management practices or prescriptions to reduce the risk of infestation or spread of noxious weeds.

Where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:

1. First Priority: Prevent the introduction of new invaders,
2. Second Priority: Conduct early treatment of new infestations and
3. Third Priority: Contain and control established infestations.

The California Department of Food and Agriculture's noxious weed list (http://www.cdfa.ca.gov) divides noxious weeds into categories A, B and C. A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds, eradication or containment is at the discretion of the County Agricultural Commissioner. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

3.13.2 Summary of Effects

3.13.2.1 Action Alternatives

The overall risk of noxious weed establishment as a result of Freeman Project implementation is moderate. This determination is based on the following:

1. Mapping of noxious weed species,
2. Small size of existing known populations,
3. Continued treatment of known populations,
4. Standard Management Requirements,
5. Low intensity underburns.

The overall net benefits of the Freeman Project are likely lead to reduced future risk of noxious weed establishment in much of the project area. These benefits include promoting native plant communities (i.e. aspen communities) and reducing risk of stand-replacing fire.

3.13.2.2 Alternative 2 (No-action)

If no action is taken the risk of noxious weed infestation will be low. Non-Proposed Action dependent factors will not change. These include: inventory, known noxious weeds, non-project dependent vectors (e.g. recreationalists, woodcutters, vehicle traffic) and existing habitat vulnerability. Inventory and control activities would continue as part of the part of the PNF noxious weed program.

However, the absence of treatment could lead to an increased risk of catastrophic wildfire and degraded aspen communities. These results can indirectly increase risk of noxious weed infestation.

3.13.3 Scope of the Analysis

Geographic Analysis Area: The Freeman Project area is approximately 14,967 acres. The area of analysis for noxious weed risk assessment includes the surrounding land up to 1 mile from the project boundary. Access routes to the project area were also considered in analyzing the risk of noxious weed infestation.

Timeframe: The earliest noxious weed records for this analysis area are from 2000. These records and any subsequent records of noxious weeds in the area were considered in this analysis.

Analysis Methods

Surveys

Noxious weed surveys targeting roadsides, landings and campgrounds within DFPZ and Group Select boundaries were conducted in 2004 beginning May 17, 2004 and continuing to August 13, 2004. The noxious weed surveys were conducted in conjunction with rare plant surveys. Although surveys focused on areas within the project boundaries, adjacent roads and landings were surveyed as well. Access routes into the project area were also considered in this noxious weed risk analysis. Greg Jennings Botanical Consulting of Eureka, CA and PNF botanists conducted noxious weed surveys in the project analysis area. Adequate noxious weed surveys have been completed within and adjacent to the project area.

The risk of noxious weed establishment takes into account a variety of factors:

1. Mapping of noxious weed species,
2. Size of existing known populations,
3. Treatment of known populations,
4. Standard Operating Procedures or Standard Management Requirements,
5. Intensity of underburns.

3.13.4 Affected Environment

There are two known occurrences of the A-listed weed species spotted knapweed (*Centaurea maculosa*) in the analysis area. There are two known occurrences of B-listed weed species in the analysis area, tall whitetop (*Lepidium latifolium*) and Canada thistle (*Cirsium arvense*). Tall whitetop occurs in three sites and Canada thistle in six sites. There are two known occurrences of C-listed weed species field bindweed (*Convolvulus arvense*) in the analysis area. These occurrences are summarized in Table 2.9 in Chapter 2.

A-listed weeds: eradication or containment is required at the state or county level. The two spotted knapweed sites are located outside of the analysis area but both are along roads that may be used to access to the project. One site, CEMA4_003, is along county road 112 (forest road 175). It was visited by forest service botanists in September 2005. Only two plants were found and both were pulled. The second spotted knapweed site is along county road 126. It was visited by forest service botanists in July 2005 and no knapweed plants were found. Plumas county employees treated the site by hand pulling the weeds in 2004 (Tim Gibson personal communication). There is likely to be a seed bank in the soil and the area will continue to be considered a noxious weed site. Both of these spotted knapweed sites will be revisited in summer of 2006 and mechanically treated as necessary. These sites will be flagged and avoided and will not be disturbed by the Freeman Project.

B-listed weeds: eradication or containment is at the discretion of the County Agricultural Commissioner. Three tall whitetop sites are located along county road 112 (forest road 175) at the north end of Lake Davis. They are not in treatment units but are along an access route. All three of these will be flagged and avoided and will not be disturbed by the Freeman Project. They have been treated by hand pulling in 2004 and will be monitored and treated as necessary again in 2006.

Six sites of Canada thistle are known within the analysis area. None of these are located in a treatment unit or along access routes. One Canada thistle site (CIAR_054_001) is on forest road 24N13Y and is less than one tenth of a mile from unit 62. This site will be flagged and avoided.

C-listed weeds: require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner. Two sites of field bindweed are located in the project area along forest road 24N10. This weed is common throughout California. It does not pose a serious threat to wildland habitats (CDFA 2006). The County Agricultural Commissioner does not require treatment of this weed species.

Klamathweed can be found along most Forest Service roads on the Plumas National Forest that are not shaded by over-story canopy. Plants are usually scattered within the road prism, rarely forming dense stands or invading the adjacent forest. Plant distribution appears to be most heavily concentrated at the lower elevations (1000-4000 ft) with plants becoming less common at the higher elevations. The Freeman Project area is generally above five thousand feet; therefore Klamathweed is far less common in the project area. The biological control agents *Chrysolina quadrigemina* and *C. hyperici*, leaf-feeding flea beetles and *Agrilus hyperici* a root-boring beetle largely control Klamathweed. These biological control agents have reduced infestations by 97% to 99% since 1940 (California Department of Food and Agriculture 2004). No other action is prescribed for controlling Klamathweed.

Bull thistle is common along most Forest Service roads on the Plumas National Forest. Like Klamath weed, bull thistle is found along roads that are not shaded. Bull thistle is most common in disturbed areas with little to no canopy cover. It was probably introduced in North America during colonial times. It is naturalized and widespread throughout North America and is on every other continent except Antarctica (Bossard 2000). Although not native, bull thistle plants provide forage for many native insect species. Butterflies and bees are frequently observed on these plants. Furthermore, it does not spread by rhizomes or other creeping roots and does not produce allelopathic chemicals like some other A and B rated noxious weeds (Bossard 2000). Two biocontrol insects (*Urophora stylata* and *Rhinocyllus conicus*) have been released and help reduce population levels. Bull thistle is widely distributed along PNF roads and other disturbed areas.

Overall, risk of noxious weed infestation resulting from the project is moderate. Although several occurrences of high priority species exist in the area, they all have very few individuals and have been previously treated. None are within treatment units. They will not be disturbed by project activities.

Vulnerability to noxious weed invasion and establishment is greatly influenced by plant cover, soil cover and over-story shade. These factors vary widely across the project area. Wildland fire and logging are sources of disturbance that can greatly alter vulnerability to noxious weed invasion. Analysis of wildland fire, timber harvest and thinning related disturbances occurring from 1995-2005 in the project area was done. No high intensity, stand replacing fires have occurred within this time frame. Several timber harvests have occurred in the area. There are ongoing recreational activities in the project area, including hunting and off-road vehicle riding. The area provides access to Lake Davis. The combination of current condition, ongoing activity and moderate risk of wildfire result in a moderate vulnerability to noxious weed invasion in the project area.

Non-project dependent weed vectors include: roads, personal woodcutting, grazing allotments, commercial timber harvest in adjacent lands and recreational activities including camping, hiking, horseback riding and hunting. The areas at greatest risk in this proposed project area are those located next to roads. Roads provide dispersal of exotic species via three mechanisms: providing habitat by altering conditions, making invasion more likely by stressing or removing native species and allowing easier movement by wild or human vectors. These factors contribute to a moderate risk of noxious weed invasion.

3.13.5 Environmental Consequences

Action Alternatives

Direct and Indirect Effects

Treatments are broken down into three types of treatments for the noxious weed assessment: high, medium and low. The “high disturbance” treatments are Mechanical thin/Groups (3,076 acres) and Aspen thin (233 acres). “Medium disturbance” treatments are: Mechanical /Hand Fuel Treatment (3,066 acres). “Low disturbance” Treatments are: Hand thin/Helicopter Thin (244 acres) and Underburn (2,807 maximum possible acres)

Mechanical thinning, group selection and aspen thinning are considered as high disturbance treatments because the removal of canopy and amount of ground disturbance is greater than other treatment methods planned to be used in this project. These treatments create potential habitat for noxious weeds by removing canopy cover and disturbing soil. Soil disturbance associated with mechanized thinning may create conditions that favor the establishment of early seral (i.e. pioneer) species. Many noxious weeds are adapted to such environments. Mechanical thinning involves use of vehicles and equipment which can carry noxious weeds into the disturbed areas. Some native plant species will also colonize areas that have been highly disturbed. SOPs, including vehicle washing, are in place to prevent the introduction and spread of weeds (Appendix D).

Hand thinning operations result in much less disturbed soil. As a result this treatment is considered to have a decreased probability of establishing noxious weeds as compared to mechanical treatments.

Underburning in the mixed coniferous forest associated with the Freeman DFPZ/GS should not create environmental conditions favorable to noxious weed invasion. The prescribed underburns will occur in the spring or fall when fuel moisture levels, temperature and humidity are favorable for a low intensity burn that will not completely remove the duff layer nor remove the canopy. Data suggest the degree of fire-induced disturbance is an important factor in post-fire noxious weed invasion. According to Crawford (cited in Keeley 2001), studies of high and low intensity burns showed that noxious weed invasion is favored when fire intensity is sufficient to open the canopy and destroy the litter layer. Also, Brooks et al (citing Keeley et al in preparation) explains how recent studies throughout the southern Sierra Nevada have shown cheatgrass (*Bromus tectorum*) invasions to be the most preditable in forest patches that were burned with high intensity. He explains that such impacts could be potentially more profound now due to unnaturally high fuel loads. A goal of the Freeman Project underburns is to reduce the unnaturally high fuel loads that would support a high intensity wildfire and result in favorable conditions to noxious weed invasion.

Soil disturbance associated with mechanized thinning, fireline construction and road construction may create conditions that favor the establishment of early seral (i.e. pioneer) species. Many noxious weeds are adapted to such environments. Also, many native species such as *Lupinus* spp., *Ceanothus* spp., *Clarkia* spp. and many grasses readily establish in disturbed areas. Consequently, the creation of a disturbed area does not necessarily translate into the creation of habitat populated only by noxious weeds.

A second important element in noxious species establishment is sunlight. Keeley (2001) explains that most alien species are highly intolerant of shading. Fuels reduction treatments will maintain 40% canopy cover. This should help prevent the establishment of many invasive species that require high levels of sunlight.

There are high-priority weeds located in the analysis area. Each of these occurrences is very small and they are few in number. They are not in treatment units and will not be disturbed by project activities. Control activities in 2004 have treated all tall whitetop infestations in the Freeman DFPZ/GS project area. Sites not treated were those that were not relocated in the 2004 field season. The spotted knapweed along the access route to the project area has been treated by hand pulling in 2004 and 2005. Continued hand-pulling and monitoring of weed populations is planned for 2006 field season.

The cost to control these small infestations is relatively small. A catastrophic wildfire could create conditions that would favor a broad scale infestation that would be difficult and expensive to control. The Freeman DFPZ/GS project would reduce the threat of catastrophic wildfires and may promote the establishment of native species that have coevolved with frequent low-intensity fires in this region of the Sierra Nevada Mountains.

The implementation of the Freeman Project is predicted to result in a low potential for weed introduction and spread if all SOPs are adopted and all road decommissioning and closure is implemented. If no noxious weed SOPs are incorporated into the project it is likely that new weeds will be introduced and become established in project created suitable habitat. SOPs and the design of the Proposed Action would decrease the risk associated with habitat alteration expected as a result of the project and increased vectors as a result of project implementation. Habitat vulnerability and non-project dependent vectors would not be changed by the SOPs. However, monitoring during project implementation and post project, avoidance of known sites and treatment of any weed populations discovered during implementation will greatly reduce the chances of an uncontrollable spread of weeds in the project area.

Application of borax is highly unlikely to create habitat for noxious weeds. An accidental spill may create potential habitat for noxious weeds by killing vegetation. Known infestations of noxious weeds are mitigated by avoidance during or removal before project activity. An accidental spill would most likely be very small and would affect a very small area.

The overall risk of noxious weed establishment as a result of Freeman Project implementation is moderate. Based on the following:

1. Mapping of noxious weed species,
2. Small size of existing known populations,
3. Continued treatment of known populations,
4. Standard Operating Procedures (or Standard Management Requirements) and
5. Low intensity underburns.

The Freeman Project will result in ecological and economic benefits. While the project poses a risk of noxious weed spread and establishment, these risks are minimized by the SOPs discussed above. The overall net benefits of the Freeman Project are likely lead to reduced future risk of noxious weed establishment in much of the project area. These benefits include promoting native plant communities (i.e. aspen communities) and reducing risk of stand-replacing fire.

Cumulative Effects

The effect of past activities on noxious weed species in the analysis area is largely unknown. The earliest record of noxious weeds in the project area is from 2000. In general, the lack of information makes it very difficult to draw definitive conclusions regarding the effects of past project activities on noxious weed introduction and spread.

While it is often difficult to make conclusions regarding the effects of past activities on noxious weed introduction and spread, the presence of noxious weeds suggests that past activities have had an effect. Previous timber harvests have created habitat for noxious weeds. The group select treatment method will add to this potential habitat. If noxious weeds were to be brought into the project area it is possible that these potential habitats will be infested.

Alternative 2 (No-action)

Direct,Indirect and Cumulative Effects

If No-action is taken the risk of noxious weed infestation will be low. Non-Proposed Action dependent factors will not change. These include: inventory, known noxious weeds, non-project dependent vectors (e.g. recreationalists, woodcutters, vehicle traffic) and existing habitat vulnerability. Inventory and control activities would continue as part of the part of the PNF noxious weed program.

However, the absence of treatment could lead to an increased risk of catastrophic wildfire and degraded aspen communities. These results can indirectly increase risk of noxious weed infestation.

3.14 Recreation and Visual Quality Effects

3.14.1 Introduction

The following aaessment is summarized from the recreation report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006i). The Freeman Project has areas within the Lake Davis Recreation Area. The recreation analysis includes the effects of this project on recreationalists, the facilities and the roads within the Recreation Area. The Lake Davis east side recreation sites are within the project area. The short term and long term effects as well as benefits are included in the analysis.

A portion of the project is under the LRMP prescriptions of visual retention. Visual retention requires the maintenance of a natural-appearing landscape where management and other activities are generally not evident to the casual forest visitor. Areas just beyond the visual retention zone are classified as visual partial retention where activities must remain visually subordinate to the characteristic landscape.

3.14.2 Summary of the Effects

3.14.2.1 Action Alternatives (Proposed Action)

The general effects for all the Action Alternatives are similar in their effects on recreation. With all Action Alternatives the locations of the proposed area thin treatments are adjacent to the fishing access and boat launch roads.

Thinning activities would have a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. These values promote and benefit recreation. However, for all action alternatives the logging activity may have short term impacts including traffic and noise. This could discourage people from coming to recreate at Lake Davis or cause them to leave the area early. Reduced tourism could have a negative effect on community economic stability. Part of this project is to burn residue slash. The smoke from burning would affect the air quality in the Recreation Area. Some people may leave the area because of smoke.

Proposed road work will reconstruct current roads to provide better access while closures of resource damaging roads may reduce access for Off Highway Vehicle (OHV) users. Decisions regarding the transportation system are being coordinated with ongoing planning for the Travel Management Rule. It is anticipated that the 24N10 road will be chip sealed to the Camp 5 road within the next five years. This road and other fishing access roads may be damaged by the heavy logging equipment. The chipseal surface would be damaged if logging occurs during wet winter conditions.

For all Action Alternatives, the treatment of aspen will enhance recreation. Alternative 1 may have a short term detrimental effect due to the variable width extended treatment zone. Aspen treatment in alternatives 3 and 4 will have very similar effects on recreation.

If winter logging occurs and roads are plowed for access this would impact recreation opportunities, such as snowmobiling and skiing. There are currently two winter recreation events at Lake Davis, a snowmobile poker run and dog sled races.

3.14.2.2 Alternative 2 (No-action Alternative)

The No-action Alternative 2 would not reduce the risk of fire or improve stand health. A fire or tree mortality from over stocking would destroy the forest around the lake. This would greatly reduce the visual quality of the Recreation Area. However, the lack of thinning and its associated activities such as logging traffic or slash burning would not have a negative impact on recreation.

Alternative 2 would not treat any aspen. This would have a short-term positive effect because there would not be any gaps in aspen stands from conifer removal. However, the long-term effect would be negative as aspen stands decline over time.

There would be no changes to the transportation in the No-action Alternative.

3.14.3 Scope of the Analysis

Geographic Analysis Area: The geographic boundary for the cumulative effects analysis is the Freeman project area and the boundary of the Lake Davis Recreation Area. The rationale for this boundary is that the effects of noise, traffic, smoke and scenic values would easily occur across the lake impacting the Recreation Area.

Timeframe of Analysis: In the analysis of the Proposed Action, current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of man including the lake, all the facilities and the use levels. These were incorporated in the analysis for the existing environment. The timeframe that these cumulative effects would impact recreation is during the project and for a few years beyond its completion. During the actual project implementation there will be disturbance from logging and follow up burning. Visual effects from treatment may linger for several years and may include such things as skid trails, burn piles and charring from underburning remain visible.

3.14.4 Analysis Methodology

Camping use numbers were from the campground concessionaire’s use and revenue reports. These numbers are relatively accurate because they are tracked regularly. The numbers used for the day use facilities are from the Forest Service Meaningful Measures information. These numbers are estimates from visual observations when site visits are made. The Plumas National Forest Land and Resource Management Plan give general direction on managing the Recreation Areas. Recreation Area maps were used for boundaries. Other information comes from the professional judgment of the District recreation staff.

3.14.5 Affected Environment

The Lake Davis Recreation Area is a major recreation destination on the Plumas National Forest. The lake and its facilities are very popular with recreation visitors and local residents. The lake is well known throughout California for its excellent fishing opportunities. The Recreation Area includes: Three family campgrounds with a total of 186 family sites; an undeveloped overflow camping area; four boat launches with parking lots and accessible toilets; nine fishing access sites; one dump station; and an information kiosk. Lake Davis Recreation Area is operated by concessionaire under a special use permit. Approximately 260,000 visitors come to Lake Davis each year. Recreational opportunities include camping, hiking, boating, fishing, swimming, biking, wildlife watching and picnicking. Winter recreation includes ice fishing, cross country skiing, ice skating, snowmobiling, sled dog racing and snow play.

Developed sites within the project area include: Eagle Point, Jenkins Point, Cow Creek, Big Grizzly and Freeman Creek Fishing Accesses, as well as Old Camp five boat launch facility. These are all day use sites and they are only closed by weather.

Eagle Point Fishing Access, road 23N10Y, has a graveled surface. Other improvements include a vault toilet and barriers to keep the public from driving off road. Use capacity at this site is 42 Persons At One Time (PAOT). It is estimated that: 82 days is high use with 40% occupancy; 9 days holidays with 70% occupancy; 120 days moderate shoulder with 30% occupancy; and 154 days low with 5% occupancy.

Jenkins Point Fishing Access, road 24N70Y is a native surface road. The road is in poor condition but use at this site is high with 5 to 15 vehicles most weekends and 1 to 5 vehicles during the week. This area is closed during the winter by snow.

Cow Creek Fishing Accesses, road 24N10B, has graveled surface to where the road splits and then is native surface on both spurs beyond this. On road 24N10B a vault toilet is at the end of the access. The road 24N10B1 is scheduled for reconstruction with this project. Use capacity at this site is 100 PAOT’s. It is estimated that: 42 days is high season with 60% occupancy; 9 days holidays with 80% occupancy; 164 days moderate with 20% occupancy and 150 days low/closed with 0% occupancy.

Freeman Fishing Access, road 24N79Y has a graveled surface. This site ends at Freeman Creek with a short hike to the lake. This site is not used very much because of the distance from the lake.

Big Grizzly Fishing Access, road 24N84X is native surface and provides parking and access to the Grizzly Creek for fishing. This site has only moderate use.

Old Camp five boat launch has a paved access road 23N13Y, paved parking with an accessible fishing levy, boat ramp, dock, bulletin board and toilet building. This site is very popular with the public, with fishing and boating being the main activities. Use capacity for this site is 88 PAOT’s. It is estimated that: 92 days are high use with 45% occupancy; 9 days holiday with 75% occupancy 120 days moderate with 30% occupancy and 144 days low/closed with 0%

occupancy. This boat ramp is one of two that can operate when the lake has low water. Use here is expected to increase when the 24N10 road is chip sealed in the future.

In June the Rotary Club sponsors a fishing derby at Lake Davis. This annual recreation event was designed to highlight fishing at the lake after the first treatment for Northern Pike. This event has occurred since 1999 and it is expected to continue into the future.

Most of the recreational use outside the recreation area is dispersed activities that include hiking, horseback riding, mountain biking, Christmas Tree cutting, dirt biking, pleasure driving, ATV riding, wildlife watching, hunting, fishing, camping, firewood gathering.

During the winter Lake Davis is also used by recreationalists. It is identified as a winter snowmobile area, with marked trails. These trails are not groomed, but they include the road around the lake, 24N07 to 24N12 loop and the Jackson Creek Trail. In February the Rotary Club holds a snowmobile poker run, using some of the roads within the project area. This annual recreation event has been occurring for at least ten years. Another recreation event that occurs at Lake Davis is the Dog Sled Races. In the past this occurred on the 24N10 road, but last year the event was moved to Honker Cove and the County Road 112.

3.14.6 Environmental Consequences

3.14.6.1 Action Alternatives

Direct and Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

With all Action Alternatives the locations of the proposed area thin treatments are adjacent to the fishing access and boat launch roads. This would have a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. Improving Forest Health would insure that this area remains well stocked and pristine. These values promote and benefit recreation.

Part of this project is to burn residue slash. The smoke from burning would effect the air quality in the Recreation Area. The timing that the burning occurred would determine how much of an impact this had. The recreation season starts Memorial Day weekend and continues through Labor Day weekend. June and July are the most popular months at the lake. Although there is a substantial amount of day use mid April through May there is not as much overnight activity. Some people may leave the area because of smoke. To minimize these effects burning should occur before Memorial Day and not on weekends.

The treatments proposed in all of the action alternatives will be minimized because the effects on visual quality with landing and skid trail layout are designed to move material away from the visually sensitive road. Stumps will also be cut low.

Improve Bald Eagle Habitat

For all Action Alternatives improving Bald Eagle Habitat may increase numbers of eagles at Lake Davis. This would have minimal direct effect on Recreation.

Contribute to the Economic Stability of the Local Community

For all action alternatives if the logging activity discourages people from coming to recreate at Lake Davis this could have a negative effect on community economic stability. Tourism is an important part of the economy of Plumas County. Many people would choose to stay and shop in these communities while visiting Lake Davis. Any actions that may turn visitors away, causing them to leave early or not even come to the area could effect tourism dollars, therefore economic stability.

Improve Aspen Stands

Improving Aspen stands would benefit recreation because of the opportunity to view fall colors. The Proposed Action Alternative 1 would benefit the Aspen stands the greatest but would not be as aesthetically appealing because of the large clearings around the stand. Both Alternative 3 and 4 improve Aspen stands but are more aesthetically appealing because they do not cut the buffer zone around the Aspen stand.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

With all Action Alternatives, the increased high use of logging trucks would change the recreational values for persons seeking recreation opportunities during this time period. Logging trucks, heavy equipment and water trucks would increase the potential hazards encountered by users of the road system. The 24N10 road is wide enough for two way traffic. Other fishing access roads are not wide enough for two way traffic and require pulling over for passage. Mitigation for this would be to sign roads for logging truck traffic. Any road closures on the 24N10 road or fishing accesses would impact users. Closures should be minimized as much as possible to reduce impacts. Weekend closures should be avoided. Fishing access roads are used most heavily in the spring and fall. Heavy equipment on both the 24N10 road and fishing accesses may damage road surfaces. The 24N10 road from the intersection with West St. to Old Camp 5 Boat Launch is scheduled to have a chipseal surface installed within the next five years. This was a Capital Investment Program grant to enhance recreation, specifically boating at Old Camp 5. To mitigate the impacts of heavy equipment on these roads, the logging contract would require any damage to the roads be fixed, with a surface replacement clause in the contract. If winter logging occurs this would have a more serious impact on the chipseal surface. Chip seal is not designed to be plowed and have heavy equipment traffic during the wet winter months..

Noise levels from the equipment would be elevated which may have an effect on individuals that are recreating in the area. This would probably be loud enough to carry outside the project area across the lake to the campgrounds. The noise could cause visitors to leave the Recreation

Area early because their experience is being impacted. Some wildlife limited operating periods (LOP) may help recreation by prohibiting activity until later in August and September, when use is lower. However the area between Old Camp 5 Boat Launch and beyond the 24N71Y road has no LOP. Therefore activity could occur during the peak summer months. To minimize some of the impacts of the noise on the recreation area, early morning starts and weekend operations should be avoided.

Decisions regarding the transportation system are being coordinated with ongoing planning for designation of Off-highway vehicle routes. Justification for closing or decommissioning certain roads before the completion of the forest wide OHV analysis process has been documented in the Proposed Action. Road decommissioning or closures within the Recreation Area include: 24N71Y, 24N84X and a non-system spur off the Cow Creek Fishing Access 24N10B. Road 24N71Y has been closed for at least eight years with no public access. Road 24N84X is the Grizzly Creek Fishing Access road; this road is approximately ¼-mile and ends in a parking area. The parking area has barrier posts around it closing the remainder of the road. The beginning ¼-mile portion of the road would be reconstructed. The remainder of the road would remain closed leaving a trail for foot travel along the creek. The non system road off the cow creek road is a short spur that dead ends. This site is not used very often by the public because it is a long hike to the lake. Decommissioning this road would have minimal impact on public access.

Other transportation projects within the Recreation Area include the rerouting and reconstruction of 24N70Y. This road goes thru an archaeological site and is in poor condition. The public has complained about the condition of this road for years. However because of the archaeological site and lack of funds few improvements have occurred. Rerouting and reconstructing it would benefit recreation opportunities. The 24N10B1 spur road may be reconstructed with this project. This is a popular fishing access that gets very muddy during the spring and fall. Spring and fall are optimum times for fishing. Therefore reconstruction would benefit recreation opportunities.

Outside the Recreation Area 23N16Y will be closed to motorized vehicles but will remain open to non motorized use, including leaving the existing roadbed for a single track non-motorized trail. This would benefit recreation opportunities providing much needed trails in this area. All other roads that will be decommissioned are small spurs that did not go anywhere or roads that were causing egregious resource damage. Decommissioning these roads would have minimal impacts on public access.

Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

The thinning of trees along the Fishing Access roads will open up the stand and allow enough space for vehicles to drive off road. It is against regulations to drive off road in a developed recreation area. In order to prevent this from occurring during this treatment a buffer of trees would be left along the roads keeping the spacing too tight for vehicle traffic.

Improve Bald Eagle Habitat

For all action alternatives improving Bald Eagle Habitat may increase numbers of eagles at Lake Davis. If more eagles were at the lake this would offer the public more opportunities to see them when bird watching or participating in other activities. However more nesting eagles may lead to more restrictions on recreation development and activities. This could limit future expansion and would have an indirect effect on Recreation.

Contribute to the Economic Stability of the Local Community

For all action alternatives having viable communities would benefit recreation. Many people would choose to stay and shop in these communities while visiting Lake Davis. Without these services individuals may choose not to come to this area.

Improve Aspen Stands

Encouraging tourism in the fall to see the trees turn colors is one of the goals of the Plumas County Visitors Bureau. As these Aspen stands grow and offer more opportunities for viewing fall colors, which benefits recreation.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

Some members of the public may be upset with the closing of roads before the completion of the forest wide OHV analysis process. At initial meetings with the public they were told that roads would be closed after they had been through the process not before.

Cumulative Effects

Present projects around the lake which will occur in the summer of 2006 include the water and toilet improvements at Lightning Tree Campground and the rerouting and graveling of the Bluff Cove Fishing Access road. All these projects benefit recreation. The 24N10 widening and chip sealing will occur within the next five years and extend from the intersection with West St. to the Old Camp 5 turnoff. An Environmental Assessment and Decision Notice were completed for this road improvement project. The improvements at Lightning Tree Campground will include developing a water system and installing toilets. An Environmental Assessment and Decision Notice were completed for this project. The Bluff Cove Fishing Access improvements will reroute and gravel the existing access and close all unnecessary portions of the road. An Environmental Assessment and Decision Notice were completed for this project.

A future projects is the Lake Davis Pike Eradication Project by the California Department of Fish and Game (CDFG) which will have cumulative impacts on recreation. Pike are a nonnative invasive fish species illegally introduced to California. In 1994 Pike were discovered in Lake Davis. In 1997 a chemical treatment was conducted to remove pike from Lake Davis and its tributary streams. Pike were rediscovered in Lake Davis in May 1999. In 2000 the CDFG and the Lake Davis Steering Committee developed a management plan to suppress the pike population, contain it within Lake Davis and to remove as many pike as possible from the reservoir. In September 2003 CDFG evaluated the previous 31/2 years of pike removal and data indicated pike numbers continued to increase in spite of the concerted control efforts. The Forest Service in cooperation with CDFG is preparing a joint Environmental Impact Statement and Environmental Impact Report to eradicate northern pike from Lake Davis and its tributaries, with a proposed date of fall 2007. The environmental analysis includes extending the Mallard Cove Boat Ramp. The treatment that occurred in 1997 had a noteworthy impact on recreation, reducing the number of campers from 26,145 in 1997 to 19,702 in 1998 (accurate numbers are only available for camping). Camper use remained low in 1999 (20,524) and then started to increase. Use for 2000 and 2001 showed higher levels than 1997 with 38,854 and 30,746 respectfully. Use has decreased since 200l: in 2002 there were 24,668 campers; 2003 had 14,853; 2004 had 21,925; and 2005 had 21,569. The fluctuation in use numbers is caused in some part by the negative publicity surrounding the lake. Also lake levels have been lower due to weather and the need to keep it from spilling over the dam. It is anticipated that if draining and treating the lake does occur, use will drop appreciably.

An Environmental Assessment and Decision Notice have been completed to install toilets at the end of the Freeman Fishing Access, road 24N74Y and Fairview Point Fishing Access, road 24N55Y, but funding to complete this project is still being pursued.

The Off Highway Vehicle (OHV) Route Designation process is also occurring. This process has identified and mapped OHV routes. This includes system roads as well as non system roads and user created routes. This information will be analyzed to determine which routes will be included in the OHV route system. An EIS is going to be prepared for this process and it is scheduled to be completed by December 2008. The Freeman Project area has routes identified within it.

If the lake is lowered with the proposed treatment for the Pike eradication project, a future plan is to extend the ramp at Honker Cove during that time. The actual proposal for this plan is being developed to analyze the effects. Prior to implementation the project would be analyzed, including cumulative effects. Extending the ramp would benefit recreation opportunities.

There are also future plans to upgrade the parking area at Old Camp 5 boat ramp. The actual proposal for this plan has not been developed to analyze the effects. Prior to implementation the planned parking area upgrade will be analyzed, including cumulative effects.

3.14.6.2 Alternative 2 (No-action)

Direct and Indirect Effects

Reduce Hazardous Fuels and Improve Forest Health

The No-action Alternative 2 would not reduce the risk of fire or improve stand health. A fire or tree mortality from over stocking would destroy the forest around the lake. This would greatly reduce the visual quality of the Recreation Area.

Improve Bald Eagle Habitat

The No-action Alternative 2 would not improve Bald Eagle habitat. This would have little effect on recreation. Two pair of eagles already nest at the lake and are often observed by the public

Contribute to the Economic Stability of the Local Community

The No-action Alternative would not have a direct effect on recreation. However, since Alternative 2 would not contribute to economic stability, tourism would be indirectly affected by a potential lack of available service.

Improve Aspen Stands

The No-action Alternative would not remove any aspen. There would not be any direct aesthetic impacts to visitors viewing the aspen foliage change in the fall. However, over time, these aspen stands would ultimately be overtopped by conifer competition. Future visitors would have decreased opportunities to view aspen foliage changes in the fall.

Provide Access Needed to Meet Other Project Objectives and Reduce Transportation System Impacts

The No-action Alternative would not have any direct or indirect effects on recreation.

3.15 Range Effects

3.15.1 Introduction

The following assessment is summarized from the range effects report for the Freeman Project, which is incorporated here by reference (USFS PNF BRD 2006h). Livestock grazing is authorized in the Freeman Project area. Livestock grazing permits are issued for a ten-year period on specific portions of the project area. An analysis conducted according to the National Environmental Policy Act (NEPA) is required in order to ensure that the Freeman Project Purpose and Needs do not conflict with Range as a Resource.

3.15.2 Summary of Effects

3.15.2.1 Action Alternatives

The general effects for all the Action Alternatives are similar in their effects on range. Livestock may experience stress from being moved to avoid conflicts with project activities. Range improvements such as fencing and water trough maintenance may be impacted by project implementation. Permittees may also experience some short term inconvenience as they attempt to coordinate with project implementation activities.

3.15.2.2 Alternative 2 (No-action)

The range resource would be unaffected by the No-action Alternative. Livestock grazing activities by the permittees would remain the same.

3.15.3 Scope of Analysis

Geographic Analysis Area: The cumulative effects analysis for range includes the land area encompassing all the allotments in or partially within the project area. The area of cumulative effects analysis was bounded in this manner because: 1) all range permits are organized by the 'allotment'. The allotments are referred to by name in the Forest Plan and are mapped in GIS layers. 2) Project activities; Rx burn, logging, on one part of the allotment effect livestock management on the rest of the allotment in the Annual Operating instructions.

Timeframe of Analysis: In assessing cumulative effects for Range, impacts of past actions were included for actions implemented since 2001. Actions preceding that date were not included because the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) required consistent year end use monitoring at Key Areas. Prior to 2001, use monitoring is sporadic in the 2,210 allotment folders at the Beckwourth Ranger District. Similarly, impacts of reasonably foreseeable actions were not included beyond the length of the 10 year term grazing permit and the reason for not analyzing cumulative effects beyond that year is the Term grazing Permit is the document which authorizes grazing on the allotment.

3.15.4 Analysis Methodology

Several types of Range monitoring have been conducted over the years. The data is stored in the 2230 Allotment folders at the Beckwourth Ranger District. Annual monitoring may include range readiness, permit compliance checks and year end use checks. Year end use for the past five years is summarized in Appendix 2 of the Range Report. A GIS layer of the Key Areas is located on the Plumas National Forest (PND) GIS database. Long term monitoring includes 1960's Parker Three Step condition and trend monitoring, Wiexleman's Long term Meadow Monitoring and Froli's Rapid Assessment of Meadow Condition and Trend. Vegetation type mapping was done for each allotment in the 1960s. A GIS layer was created from the 2230 allotment folders and show primary range and vegetation types. Those GIS layers are stored are also stored in the PNF GIS database.

3.15.5 Affected Environment

The Range resource consists of the permittee, their permitted livestock and the allotment. The allotment includes range improvements such as fences, gates and cattle guards, forage and livestock water sources. The Plumas National Forest sells forage and water to the permittee for his permitted livestock, per the Standards and Guides in the 1988 Plumas National Forest Land and Resource Management Plan as amended by the 2004 Sierra Nevada Forest plan Amendment. This Range analysis reports on the impact of the Proposed Action and alternatives to the permittee; his permitted livestock; and the allotment. This range analysis report does not analyze the impacts of the cows to the vegetation, hydrology, wildlife, heritage, or recreation resources, although livestock use is considered in some of the cumulative effects analyses done for the Freeman Project. Livestock impacts to the other resource areas will be discussed in detail in upcoming Forest-wide Range NEPA analyses. Allotments in the Freeman area are scheduled for analysis later in 2006, with a decision expected by the summer of 2007.

There are portions of four allotments within the Freeman Project area. Those allotments are:

- Grizzly Valley
- Grizzly Valley Community
- Long Valley
- Humbug.

Grizzly Valley Allotment has one permittee. The allotment is managed with a three pasture rotation system. There are 505 pair permitted cattle cow-calf pair from June 16 to September 15th. Grizzly Valley Allotment borders Lake Davis on three side, the north, south and west. Pastures were designed with fences running northeast so all three pastures have access to Lake Davis. Livestock are moved with cowboys on horseback through all three pastures in a rotation system. A rotation system means all cattle are in one pasture for about a month; then all cattle are moved to the next pasture when use standards are met. Livestock moves and use standards are pre-planned each spring between the Forest Service Range Manager (Range Conservationist) and the rancher (permittee). The plan is called an 'Annual Operating Instruction' and is approved by the District Ranger each year prior to livestock being turned out onto the forest. Grizzly Valley Allotment is unique on the forest with the number of meadows, with creeks running through them, pockets of aspen and views of Lake Davis. All pastures are timbered with most of the grazing occurring in the meadows.

Grizzly Valley Community Allotment has two separate permittees with a three pasture rotation system with 277 cattle cow/calf pair permitted from June 16th to September 15th running together on a community allotment. Grizzly Valley Community Allotment has one large meadow divided into two pastures. All pastures are timbered.

Long Valley Allotment is currently vacant. It is a sheep allotment that was last grazed in 1993 with 600 dry ewes from June 18th to July 24th. It is timbered with a few riparian stringers.

Humbug Allotment has one permittee with season long grazing with 95 cattle cow/calf pair permitted from June 1st to August 1st. Dan Blough is a nice meadow in the northwest corner of the allotment. The majority of the allotment is timbered. Cattle are fenced off from access to Lake Davis by the Holding Field Pasture of the Grizzly Valley Allotment.

3.15.5.1 Historic

Grazing has occurred on these allotments since the 1870's prior to the establishment of the Plumas National Forest in 1905. Actual use records are maintained in the 2210 allotment folders in the Beckwourth Ranger District. Current grazing is at its lowest compared to historic use.

Three of the permittees on the active allotments are small family ranches whose grandparents homesteaded the area. One permittee is a larger operator who runs on adjoining BLM and Forest permits. All four permittees run ranches where cattle and livestock are the main business.

3.15.6 Environmental Consequences

3.15.6.1 Action Alternatives

All action alternatives are expected to have similar impacts to the range resource.

Direct Effects

The permittee may have to actively schedule moves between allotment pastures in order to keep livestock away from active timber falling operations, haul routes and prescribed burns.

Livestock may have increased stress with changed rotations. Although livestock generally tend to avoid areas where trees are being felled, they could be hit by logging traffic. Coordination with the permittees in advance and requiring timber operators to drive at reduced speeds within primary range in active allotments should reduce potential cow/vehicle collisions.

Although range improvements are required to be protected from the proposed activities, there is possibility of accidental damage. Any damage incurred would be repaired (Appendix D).

Indirect Effects

The permittee may need to defer grazing within some prescribed fire units until after seed set the year following the burn. The Forest Service Prescribed Burn should coordinate with the Forest Service Range Conservationist each spring to know which prescribe burn units are proposed to be prescribed burned that year. The Forest Service Range Conservationist would schedule those prescribe burn unit into the Annual Operating Instructions. The permittee may have to adjust cattle pasture rotations from previous years to accommodate the prescribed burns.

The allotment may need additional fencing if the vegetation treated under Freeman creates new unexpected travel routes for the cows. If additional fences are built, additional expenses will be incurred by the permittee.

Understory grass species may increase in species abundance and pounds per acre as a result of reduced conifer competition through thinning. The silvicultural practice of thinning trees and allowing a temporary successional increase in grass in the Range program is called creating 'transitory range'. No increases in permitted animal unit months (AUM) are proposed with this project. The indirect effect would be existing livestock use would be diffused over a larger area.

Cumulative Effects

Past Actions

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. For a list of past actions, see Appendix E of the Freeman DEIS.

Present Actions

Present actions include the Annual Operating Instructions from last year, 2005 and the upcoming Annual Operating Instructions for the coming grazing season in 2006.

Future Actions

Although forage may increase after Freeman removes competing conifer vegetation, there are currently no intentions to increase the AUMs. Any increase in forage is expected to distribute existing use throughout the allotments.

Cumulative Effects

Cumulative effects to the permitted livestock with disturbance, whether from Freeman , Grizz DFPZ/GS/ITS, Cut Off DFPZ Mt Ingalls DFPZ and the future maintenance of DFPZ and WUI in the area, increase in recreation and fuelwood gathering include stress that tend to make the cows more nervous, high strung and harder to gather in the fall.

The rotenone treatment may impact water sources for livestock. Alternative watering sites or sources may need to be provided in the Pike Project depending upon the label restrictions for livestock watering.

Herbicide treatments of noxious weeds should have no adverse effect on cattle by following the label. Herbicides are designed to act on plants, not animals. Noxious weed sites are few and low in acres infested. Herbicide treatment should be minimal.

Fisheries culvert replacement and Recreation boating area tree removal 23N10Y should have no adverse impact on the allotment.

The creation of 7 Great Grey Owl nest sites should have no adverse impact on the allotments because PACs have already been identified with their residual cover standard from the 2004 Sierra Nevada Forest Plan Amendment. No additional PACs are planned with the creation of nest sites.

3.15.6.2 Alternative 2 (No-action)

Direct Effects

Permitees would experience no short-term inconvenience from vegetation management activities. Livestock would not be stressed by project activities.

Indirect Effects

None anticipated.

3.16 Heritage Resource Effects

3.16.1 Introduction

The following assessment is summarized from the heritage resource compliance for the environmental analaysis of the Freeman Project, incorporated here by reference (USFS PNF BRD 2006e). Cultural objects, historic structures and buildings and archaeological sites are the material remains of our national heritage. Together they are known as heritage or cultural resources. The Plumas National Forest is responsible for and committed to, protecting and managing these nonrenewable resources for current and future generations to understand and enjoy.

3.16.2 Summary of Effects

3.16.2.1 Action Alternatives

The SOPs would be followed during implementation of any of the action alternatives. Archaeological site boundaries are flagged and sites would be avoided during project implementation, therefore there would be no effect on heritage resources.

3.16.2.2 Alternative 2 (No-action)

With no proposed activity, there would be no effect to heritage resources.

3.16.3 Scope of the Analysis

Geographic Analysis Area: The heritage resources geographic analysis area is the same as the Freeman Project area. This boundary was chosen because sites within the project area would be protected during the implementation of any of the action activities.

Timeframe of Analysis: The temporal boundary is determined by the life of the project. This boundary was chosen because sites within the project area would be protected during the implementation of any of the action activities.

3.16.4 Analysis Methodology

Three levels of analysis were completed to understand the major themes and extent of heritage resources within the Freeman Project area. First, research into the larger geographic history relevant to the project area was conducted to understand historic themes or events that have transpired in time and space. This information is presented in the following section, Affected Environment. Next, heritage resource field surveys were conducted to identify cultural properties. Information on these surveys will be presented. Then, finally the amount and types of archaeological sites within the project area are discussed.

The great majority of the project area had already been previously surveyed and the remaining area was surveyed for this project. A total of 13,990 acres were surveyed for thirty-one earlier projects. The remaining 977 acres of the Freeman Project area were surveyed during the field seasons of 2004 and 2005. The entire project area has been surveyed and all identified cultural resources have been recorded.

There are a total of one hundred known archaeological sites within the Freeman Project area, which includes nine new sites that were discovered during field surveys. Sixty of the sites are classified as prehistoric. These consist of campsites, food processing stations and tool production stations, primarily exhibiting flaked stone artifacts. Twenty-six of the sites are historic. These sites include historic habitation areas, a saw mill site, sheep camps, arborglyphs (carvings on aspen tress), ditches, Feather River Lumber Company railroad grades and the Beckwourth Emigrant Trail. There are also fourteen multicomponent sites. Multicomponent sites contain cultural material from both the prehistoric and historic time periods.

All known archaeological sites within the Freeman Project area of potential affect, were field visited and site boundaries were flagged. One observation made during fieldwork was the mortality of aspen trees. Historically Basque sheepherders carved names, dates and the region of their origin on aspen trees (Mallea-Olaetxe 2001). Historic carving dates range from the early 1900s to the mid 1950s. However, even later carvings have been observed. It is common for the carvings from the early 1900s to be illegible or simply gone from the archaeological record due to the average 100-year life span of aspen trees. It is also common to see trees that have carved dates from the 1940s where trees are dead or dying. Monitoring of these sites indicated that there was almost always at least one, often more, aspen trees with carvings that had died. The carvings were either no longer legible, the bark had fallen off, or part or the entire tree had fallen down. The loss of these precious heritage resources highlights the decline of health of aspen stands within the project area.

3.16.5 Affected Environment

Three levels of analysis were completed to understand the major themes and extent of heritage resources within the Freeman Project area. First, research into the larger geographic history relevant to the project area was conducted to understand historic themes or events that have transpired in time and space. Next, heritage resource field surveys were conducted to identify cultural properties. Information on these surveys will be presented. Then, finally, the amount and types of archaeological sites within the project area are discussed.

History of the Freeman project area

The cultural history of the Freeman Project area has implications to both the cultural and environmental existing condition of the Freeman project area. The following discussion is presented in three brief sections. First general information about the prehistoric period will be reviewed, then the ethnographic period is presented and finally the historical period is discussed.

Prehistoric Period

Very few intensive archaeological research projects have been completed on the Plumas National Forest. Due to this lack of data, archaeological information from nearby regions is relied upon therefore information on prehistory presented below considers a larger geographic area than the Freeman Project boundaries.

Based on evidence from the eastern Sierra Nevada, Elston (1986) proposed that human occupation of the region spanned from the Early Holocene (ca. 8,000 BC) to the present time. Prehistoric cultural complexes which have been documented for the northern Sierra Nevada mountains are the Tahoe Reach (8,000-6,000 BC), Spooner (5,000-2,000 BC), Martis (2,000 BC-AD 500), Kings Beach (AD 500- 1850) and Historic (after 1850) (Kowta 1988, Moratto 1984).

The Tahoe Reach Complex dates to the early Holocene when the environment was in a warming trend after the last ice age (Wallace 1978). The most notable artifacts of this time in this region are large Parman projectile points (Moratto 1984). Other diagnostic artifacts of this cultural complex include basalt bifaces, crescents and scrapers. Cultural material from this time period remains sparse, which may demonstrate a small human population (PAR Environmental Services 1996).

The Spooner cultural Complex is thought to mark the initial occupation of the high Sierras (PAR 1996, Moratto 1984). There was still a general warming and drying of the environment evident during periods when Lake Tahoe did not overflow. Characteristic artifacts of this cultural complex are large basalt projectile points, milling stones, manos and unshaped pestles. There are not many differences between the Spooner and Martis Complexes.

The Martis Complex is further broken down into the Early (2,000-1,500BC), Middle (1,500 - 500BC) and Late (500 BC-AD 500) Complexes. It is believed that the Martis Complex is “represented on both sides of the Sierran crest from south of Lake Tahoe northward to the south end of Honey Lake” (Kowta 1988). Projectile points, scraping and cutting tools, most commonly made of basalt, demonstrate the importance of hunting large and small game. Diagnostic projectile points include contracting stemmed, corner-notched, eared and large side notched points. Seed grinding tools, the milling stone and mano, are also present. Mortars and pestles, associated with acorn and larger seed grinding, show up later in the Martis complex. Areas revisited or occupied over a long period of time had a wide variety and quantity of artifacts, which included bedrock milling features and midden (dark colored culturally affected soil). Population size increases are evident in the size of permanent base camps and winter settlements (PAR 1996). Evidence of circular houses with sunken floors also appear in the archaeological record during this time.

The Kings Beach Complex is also further broken down into Early (AD 500- 1,200) and Late (AD 1,200—historic) Complexes (Kowta 1988). Smaller and lighter projectile points are more commonly made of chert, jasper and obsidian and demonstrate the introduction of the bow and arrow (Moratto 1984). Diagnostic projectile point types include small Desert side notched, Cottonwood triangular and Rosegate Series. Local faunal food sources include deer, mountain sheep, rabbits and ground squirrels. Hopper and bedrock mortars as well as the continued use of milling stones and manos demonstrate that seeds and other plant resources like piñon nuts and grass seeds are still utilized (PAR 1986). Other artifacts include pine nut beads, olivella shell beads, steatite pipes, bone tubes, cordage and basketry.

Prehistoric sites within the Freeman Project area primarily include diagnostic artifacts from the Middle to Late Archaic periods, or the Martis and Kings Beach cultural complexes. The majority of stone tools and flakes are basalt. Diagnostic projectile points from the Martis Complex include contracting stem and large side notched points. Plant processing is also evident by the milling stones and manos identified. Artifacts indicative of the Late Archaic period include smaller projectile points made of chert and obsidian as well as bedrock mortars. Desert side notched and Rosegate points were two types of projectile points identified. One archaeological site in particular has a large amount of bedrock mortars. However, overall bedrock mortars were not as common as milling stones and manos within the Freeman Project area. Based on field survey data available at the BRD, it appears that the majority of prehistoric archaeological sites present within the Freeman project area date to the Middle and Late Archaic.

Ethnographic Period

The Freeman Project area is located in a region described as a ‘contact zone’ between two geomorphic provinces and ethnographic areas, which are known as the Sierra and Western Great Basin (PAR 1996, Kroeber 1925). Because of similar traits, the sharing of ideas and the use of the same natural materials, the identification of historic cultural boundaries between Native American groups in this area is difficult. There are three tribes that may have historically utilized resources within the project area: the Mountain Maidu, Washoe and Northern Paiute (D’Azevdo 1986, Fowler & Liljeblad 1986, Riddell 1978). At the time of European contact, the land within the Freeman Project area was inhabited by the Mountain Maidu (Dixon 1905).

The Maidu have three distinctive linguistic and cultural groups that also coincide with geographical locations (Dixon 1905). These groups are the Mountain Maidu or Northeastern, the Konkow or Northwestern and the Nisenan or Southern (Riddell 1978). The Mountain Maidu lived in and around the Freeman Project area. This project location lies within the Northeastern cultural area which is characterized by an arid climate, with cold winters and hot summers and a chain of high elevation mountain valleys.

During the early 1900s the Mountain Maidu occupied Red Clover Valley and portions of northwestern Sierra Valley and also “held Mohawk Valley as a hunting-ground, the snowfall being too heavy there for a permanent residence” (Dixon 1905). Grizzly Valley was probably also occupied by the Maidu at this time due to it’s proximity to the above mentioned valleys.

The Maidu utilized various stone tools including knives, small and large projectile points, scrapers, pestles, mortars and milling stones (Dixon 1905). Other objects include stone pipes and charms. Obsidian, largely obtained through trade, basalt, chert and jasper were utilized. Nets were made primarily of milkweed and baskets were made from hazel, yellow pine roots, grasses, maiden hair fern and other local vegetation.

The Northeastern Maidu carried out a seasonal migration where they moved around to gather various resources (PAR 1986). However, there are also permanent villages which were "situated on the edges of various valley floors at slightly lower elevations during winter months where water, vegetation and game were abundant" (PAR 1986). Hunting was pursued during the spring, summer and fall. Game animals included deer, bear, elk, antelope, mountain sheep, rabbits and squirrels (Dixon 1905). Nets and traps were utilized to catch fish.

Many different varieties of berries and plants were gathered during the spring and summer (Dixon 1905). Manzanita berries were collected in abundance to make a cider. Other examples of preferred berries include wild currants, chokecherries, blackberries and gooseberries (PAR 1986). Other plant resources utilized are roots, bulbs, grass seed, clover, wild mint and mushrooms.

We know that historically both the Mountain Maidu and Washoe considered eagles to be sacred animals (D'Azevedo 1986, Riddell 1978). The Maidu never shot eagles because "it brought bad luck" (Riddell 1978). Also the Washoe never killed or ate eagles because they were believed "to have extraordinary supernatural attributes" (D'Azvedo 1986). In the past, Native American hunting affected the abundance of some wildlife species (Williams 2003). Due to cultural and spiritual motivations both of these Native American groups were, in a sense, protecting eagles. Today eagles and their habitat, with golden eagles as management indicator species and bald eagles on the threatened species list, continue to be protected. One purpose of the Freeman Project is to improve bald eagle habitat.

In the American West, natural and anthropogenic fire was a normal occurrence before the arrival of Euroamericans (Williams 2003). There were numerous reasons that Native Americans utilized fire. Fire was used as a tool to remove small trees, underbrush and diseased vegetation, which left open, healthy forests with large trees. The Freeman Project proposes to improve forest health by treating disease and insect infestations. One way of accomplishing this is by thinning California Wildlife Habitat Relationships (CWHR) Size Class 4 to accelerate the stands growth to CWHR Size Class 5. Removing disease and encouraging growth of large diameter trees would help to bring the natural environment of the project area closer to its historical setting.

Historical Period

The California Gold Rush was the initial catalyst for early Euro-American settlement in what would become central Plumas County. Many early gold seekers undoubtedly passed westward through the area in 1849 but, so far as is recorded, none settled that year (Farriss and Smith 1882). However, strikes along the middle and north forks of the Feather River in early 1850 resulted in the first settlements both along the river terraces and within the attractive and temperate locations of American and Indian Valleys. Many land claims and permanent settlement were well established the following year.

There is no specific record of any Euroamerican entry into Grizzly Valley until after Jim Beckwourth (of African-American heritage) first surveyed an overland trail through the northern Sierra Nevada in the summer of 1850 (Young 2004). From modern day Sparks, NV, his trail first extended northwest then east across Beckwourth Pass skirting the northern edge of Sierra Valley then followed Grizzly Creek northwest into Grizzly Valley. The trail continued northwest diagonally through the valley to Emigrant Creek where it made one of the most difficult crossings along its length over Grizzly Ridge. From here the trail continued down into American Valley and then westward to end at Bidwell’s Bar. The route saw extensive one-way traffic though Grizzly Valley throughout the 1850s including the movement of great numbers of cattle to the markets of California’s northern gold camps (Lawson 2005).

It was probably during this time that early settlers of central Plumas County became aware of the excellent forage surrounding Grizzly Valley. There was never any substantial mineral wealth in the immediate vicinity of Grizzly Valley sufficient to attract early prospectors. One reference indicates that an unsuccessful attempt at prospecting along Grizzly Creek (probably north of the valley) took place as early as July of 1851 (Farriss and Smith 1882). In later years the area northwest of Grizzly Valley saw considerable mining development culminating in the development of a major copper producer, Walker Mine, between ca. 1915 - 1940.

The Plumas County Map of 1874 shows no improvements within Grizzly Valley other than the road extending up Grizzly Creek into the valley. The arduous route over Grizzly Ridge had been abandoned by the end of the 1850s. Exactly when the first settlement around the valley took place is uncertain but the Government Land Office (GLO) Maps surveyed between ca. 1872 and 1880 show several locations at the northern end of valley. These include Lovejoy’s House, Cate and Heriot’s Barn, the Chase House and several others. This indicates they were likely in place by at least the mid to late 1870s. Interestingly, an “Old Log House” is depicted along what is now known as Old House Creek at the north end of the valley. If it was old when the GLO surveys were conducted, this gives a good clue that this house, at least, probably dates back to the 1860s. In addition, the Plumas County Tax Assessment Records (PCTAR) include an entry for George Freeman in 1875 for “Possessory Claim” for 320 acres and a ranch in the area of Freeman Creek (PCTAR 1875). All of these early locations, with the possible exception of the old log house, are associated with ranching, dairying and hay production.

Agricultural products were in high demand at this time due to the rise of the Comstock in Nevada beginning in the late 1860s. During the following decade many small dairies were established in the valleys of the northern Sierra Nevada to tap this lucrative market. Despite transportation challenges, many of these small operations found considerable profit until the mining boom ended in the mid-1880s. Facing a shrinking market and a downturn in the national economy beginning in the early 1890s, most of these small dairies did not survive into the new century. George Freeman sold out to George Mapes, a well-known cattleman in Sierra Valley as early as 1879 (Plumas County Deeds 1879). By the mid 1880s, the emphasis within Grizzly Valley appears to have been focused primarily on ranging beef cattle. The Plumas County Map of

1892 shows substantial private land holdings (claims) within and surrounding Grizzly Valley including Mapes, as well as Putnam Cate and Robert Herriot (both residents of Beckwith; today's Beckwourth) and Moses Lovejoy.

By this time, considerable placer mining was occurring along Grizzly Creek northwest of Grizzly Valley and traffic through the valley likely increased as a result. The discovery of copper at Walker Mine also brought increased traffic through the valley. By the mid 1920s Walker Mine had grown to include a full size town. Until 1920, when a nine-mile aerial tram was constructed extending west over Grizzly Ridge, ore was transported by wagon or truck through the valley to the railroad connection at Kerby's (later Gulling) near the confluence of Grizzly Creek and the Middle Fork of the Feather River. Even following the establishment of the tram, the route through Grizzly Valley was the primary auto road between the mine and Portola and traffic was substantial in the non-winter months.

In March of 1905, the Plumas Forest Reserve was established. Most, if not all, the land not yet claimed within and surrounding Grizzly Valley became part of what would, by 1908, be known as the Plumas National Forest. A guard cabin was erected in Three Mile Valley during the early years of forest administration. The forest also apparently briefly used Lovejoy's as a station as shown on the 1918 edition of the PNF map. In 1923, the PNF completed the connecting road between Crocker Guard Station and lower Grizzly Valley that may have made regular use of the Three Mile Station less important (Plumas National Bulletin 1923). The Three Mile Station was no longer shown on the forest maps by 1950.

When the Western Pacific Railroad was completed through Plumas County in 1909 many sawmills were developed along the new route. Among these was the Feather River Lumber Company (FRLC), formed in 1905 (Vaughan 1989). By 1910 the main sawmill and box factory had been established at Delleker, west of Portola. The FRLC engaged in extensive logging operations in the forested hills south of Grizzly Valley in the late 1910s and early 1920s on both private and PNF land. After about 1915 the company began using a narrow gauge railroad to bring logs to its mill.

Up until the late 1910s, no substantial logging operations had taken place in the Grizzly Valley. There was a sizable sawmill at Walker Mine by ca. 1916 but there is no record of logging operations in the direct vicinity of Grizzly Valley as there were sufficient timber stands closer to the mine. In 1920, investors from Klamath Falls, OR, established the McCollum and Christy sawmill on Cow Creek. This short-lived operation was plagued with legal and financial problems. Lumber was hauled down the Grizzly Creek Road on trucks to the rail connection at the Western Pacific. The sawmill was sold and by the end of 1924, it had been moved out of Grizzly valley altogether (The Timberman 1924).

In May of 1924, the FRLC was awarded a large government timber sale along Humbug Creek and the company pushed its railroad logging operation in the direction of Grizzly Valley (Vaughan 1989). A Timber Sale Cut Atlas on file at the Beckwourth Ranger District indicates that additional sales by the PNF were made within the current Freeman Project area shortly after the

Humbug sale and operations had begun within the current project area by the late 1920s. By the end of the decade, the company had penetrated the southwest end of Grizzly Valley and had constructed miles of temporary railroad spurs throughout the area. Several large logging camps operated at various periods. The company used caterpillar tractors and big wheels rather than steam donkeys due, in large part, to the comparatively gentle topography of much of the sale area. By the mid 1930s, tracked flatbeds were being pulled by the cats. There were slow downs in production as a result of the Great Depression in the early 1930s but logging continued into the northern part of Grizzly Valley during the mid- to late 1930s. The final Grizzly Valley logging camp was located in the Old House Creek area in the late-1930s. Railroad logging operations ended in 1940 and logging in the area was essentially completed by the FRLC by 1941 or 1942. By the early 1950s, the old mainline grade along the western end of the valley was converted into the main road, today's 24N10 Road. Timber harvest re-entry into the logged over areas of the FRLC was common between the 1950s and 1980s.

During the first half of the twentieth century, range activities continued. By 1920, however, R.T. Jenkins had acquired at least some of the lands formerly held by George Mapes. Jenkins established a camp and ran thousands of head from this time until at least the early 1960s. Sheepherders were often of Basque descent. These people had a tendency to carve various designs and messages on the many aspen trees located through the area. The oldest one recorded in the Grizzly Valley area dates to 1909 indicating that sheep had probably been introduced by that time. Cattle allotments also continued into the twentieth century but allotments were now managed by the PNF. Many of these allotments remain active to the present day, although the numbers of animals have been substantially reduced over the years. Currently, no sheep graze in Grizzly Valley but the overall pattern of seasonal range use in the area is one that has been continuously present for at least 130 years.

Recreation in the form of hunting and fishing was a common activity within Grizzly Valley throughout the late nineteenth and early twentieth century. When the Old House Creek logging camp of the FRLC was abandoned, many people from the Portola area simply moved into the old skid shacks and used them as summer recreation sites during the 1940s and 1950s (Donnenwirth 2005). In the late 1960s, recreation took on a new and expanded form with the construction of the Grizzly Dam and the formation of Lake Davis. Even as early as 1920, speculation was present regarding the use of lower Grizzly Valley as a reservoir (PNB 1920). In 1966 the project was begun and by 1968 the lower valley was flooded covering the old Beckwourth Emigrant Trail and numerous other cultural resource sites. The PNF proceeded immediately to establish camping areas and fishing access points. To this day, Lake Davis is one of the most popular recreation sites on the forest.

3.16.6 Environmental Consequences

3.16.6.1 Action Alternatives

Direct and Indirect Effects

Heritage resource site boundaries are flagged and SOPs would be followed during implementation of any of the action alternatives. All heritage resource sites would be avoided during project implementation therefore there would be no effect on heritage resources.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from any of the alternatives therefore there would be no cumulative effects.

3.16.6.2 Alternative 2 (No-action)

With no proposed activity, there would be no effect to heritage resources.

3.17 Legal Regulatory Compliance and Consultation

The Beckwourth Ranger District operates under a diverse array of local, stated and federal management guidance and policy as well as various executive orders.

Currently, the Beckwourth Ranger District is guided by the Plumas National Forest 1988 Land and Resource Management Plan (LRMP)as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD.

3.17.1 Principle Environmental Laws

3.17.1.1 National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) requires that federal agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14).

The Freeman Project EIS meets the CEQ regulations requiring public scoping and a thorough analysis of issues, alternative and effects. Refer to Section 2 of the EIS for further details.

3.17.1.2 National Forest Management Act

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The National Forest Management Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles and implement a resource management plan for each unit of the National Forest System (NFS). It is the primary statute governing the administration of National Forests.

Section 6 of the Forest and Rangeland Renewable Resources Planning Act of 1974, as re-designated by this Act, is amended by adding at the end thereof new subsections (c) through (m) as follows: "(c) The Secretary shall begin to incorporate the Standards and Guidelines required by this section in plans for units of the National Forest System as soon as practicable after enactment of this subsection and shall attempt to complete such incorporation for all such units by no later than September 30, 1985. The Secretary shall report to the Congress on the progress of such incorporation in the annual report required by section 8(c) of this Act. Until such time as a unit of the National Forest System is managed under plans developed in accordance with this Act, the management of such unit may continue under existing land and resource management plans.

The Plumas LRMP, HFQLG Forest Recovery Act and SNFPA all follow the guidelines regarding natural resource management and planning set forth in NFMA. By following the

Standards and Guidelines in these management documents that govern activities on the Beckwourth Ranger District, compliance with NFMA is met.

3.17.1.3 Endangered Species Act

Congress passed the Endangered Species Preservation Act in 1966. This law allowed listing of only native animal species as endangered and provided limited means for the protection of species so listed. The Departments of Interior, Agriculture and Defense were to seek to protect listed species and insofar as consistent with their primary purposes, preserve the habitats of such species. Section 7 of the Endangered Species Act (Act) [16 U.S.C. 1531 et seq.] outlines the procedures for Federal interagency cooperation to conserve Federally listed species and designated critical habitats.

Section 7(a)(1) directs the Secretary (Secretary of the Interior/Secretary of Commerce) to review other programs administered by them and utilize such programs to further the purposes of the Act. It also directs all other Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of species listed pursuant to the Act.

This section of the Act makes it clear that all Federal agencies should participate in the conservation and recovery of listed threatened and endangered species. Under this provision, Federal agencies often enter into partnerships and Memoranda of Understanding with the United States Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) for implementing and funding conservation agreements, management plans and recovery plans developed for listed species. Biologists for the Services should encourage the development of these types of partnerships and planning efforts to develop pro-active approaches to listed species management.

Wildlife and Fisheries

Several Threatened and Endangered (T&E) species identified in the list of T&E species provided by the USFWS (http://www.fws.gov/sacramento/es/spp_lists/NFActionPage.cfm)", updated February 14, 2006, have been eliminated. Due to the lack of species distribution and/or lack of designated critical habitat, only the bald eagle (Threatened status) is being actively managed for.

The Lake Davis Bald Eagle Habitat Management Plan (BEHMP) was finalized in mid-June 2004 with consultation from USFWS and the California Department of Fish and Game. It is the guiding document for managing bald eagle habitat. Consultation with USWFS regarding the Freeman Project area initiated in mid-April 2004 with discussion regarding cumulative effects of the Freeman Project on the bald eagle.

Botany

The latest USFWS species list for Plumas County, in which the project occurs, was accessed from the USFWS website on March 13, 2006 and incorporates the database update of March 1, 2006

(USDI, Fish and Wildlife Service, 2006). This list fulfills the requirements to provide a current species list pursuant to Section 7(c) of the Endangered Species Act, as amended.

Controlling special interest plants and populations greatly reduces the impact to botanical resources. Occurrences protected by flagging and avoiding as a control area will be flagged prior to implementation.

3.17.1.4 Clean Water Act

Section 208 of the Clean Water Act required the States to prepare non-point source pollution plans, which were to be certified by the State and approved by the Environmental Protection Agency (EPA). In response to this law and in coordination with the State of California Water Resources Control Board (SWRCB) and EPA, Region Five began developing Best Management Practices (BMPs) for water quality management planning on National Forest System lands within the State of California in 1975.

The Freeman Project meets the Clean Water Act by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Freeman Project meets this Act according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

3.17.1.5 Clean Air Act

The Clean Air Act provides the principal framework for national, state and local efforts to protect air quality. Under the Clean Air Act, the Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The 1990 Clean Air Act is the most recent version of a law first passed in 1970.

All burning is done in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District (NSAQMD). The smoke plan requires burning with wind directions that transport smoke away from communities and the amount of acres burned daily are limited. Burns are conducted during approved burn days, when atmospheric conditions favor smoke dispersion. Prescribed burning takes place in spring or fall after the first rains when fuels are relatively moist to reduce the potential for escape.

3.17.1.6 National Historic Preservation Act

Section 101 of the National Environmental Policy Act (NEPA) requires the federal government to preserve important historic, cultural and natural aspects of our national heritage. To accomplish this, federal agencies utilize the Section 106 process of the National Historic Preservation Act (NHPA). This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8. NEPA includes reference to "…important historic, cultural and natural aspects of our national heritage". Locally, the Plumas National Forest uses a programmatic agreement (PA) between Region 5 of the US Forest Service, the California State Historic Preservation Officer and the Advisory Council on Historic Preservation to implement the Section 106 process.

The Freeman Project EIS meets NHPA by protecting heritage and cultural resources through surveying, tribal and historical preservation society consultation and protecting sites in the Freeman Project area. All known archaeological sites within the Freeman Project area of potential affect, were field visited and site boundaries were flagged. As outlined in the Programmatic Agreement, protection measures will be implemented, as appropriate, for all heritage resources located within the project area. The application of the protection measures would result in the Freeman Project having "no effect" on heritage resources and the Forest would have taken into account the effect of the project on heritage resource sites in compliance with the PA and Section 106 of the NHPA.

3.17.2 Executive Orders

3.17.2.1 Consultation and coordination with Indian Tribal governments, Executive Order 13175 of November 6, 2000

The following tribes were consulted during the NEPA scoping phase of the Freeman Project on August 29, 2005:

- Washoe Tribe of California and Nevada
- Susanville Indian Rancheria
- Greenville Indian Rancheria

Only the Susanville Indian Rancheria responded to the scoping letter. The Susanville Indian Rancheria scoping response letter was received on September 18, 2005.

3.17.2.2 Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Through scoping and consulting with local Native American tribes, it was determined by District Heritage Specialists that there were no Indian sacred sites in the Freeman Project area.

3.17.2.3 Invasive species, Executive 13112 of February 3, 1999

Executive Order 13112 created the Invasive Species Council (ISC) in order to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause. Federal agencies are required to:

- identify actions that may affect the status of invasive species
- use relevant programs and authorities to prevent the introduction, control and monitoring of invasive species
- provide for native species restoration as well as their habitats
- promote public information
- not condone or carry out actions that may spread invasive species
- consult with the ISC and other stakeholders as appropriate

The Freeman Project meets the Executive Order by following the noxious weedsmanagement Standards and Guidelines in Appendix A of the ROD for SNFPA. The SNFPA guidelines direct proactive management of noxious weeds that meet with the Executive Order. District botanists carried out the intent of the Executive Order and the noxious weeds Standards and Guides by:

- consulting with a ISC representative
- identifying and controlling weed infestation areas
- preventing the spread of noxious weeds through SOPs and site specific mitigation
- educating the public regarding the presence and spread of noxious weeds

3.17.2.4 Floodplain management, Executive Order 11988 of May 24, 1977 and Protection of Wetlands, Executive Order 11990 of May 24, 1977

Executive Orders 11988 and 11990 require Federal agencies to avoid, to the extent possible, short- and long-term effects resulting from the occupancy and modification of flood plains and the modification or destruction of wetlands. These executive orders are intended to preserve the natural and beneficial values served by floodplains and wetlands.

The Freeman Project meets these executive orders by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Freeman Project meets these executive orders according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

3.17.2.5 Environmental Justice, Executive Order 12898 of February 11, 1994

Executive Order 12898 requires that Federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies and activities on minority and low-income populations.

Although low-income and minority populations are within the vicinity of the Freeman Project, activities associated with the Project would not discriminate against them. Proposed activities would not adversely affect community, social, economic and human health and safety factors. Public scoping was conducted in accordance with NEPA regulations to identify any potential issues or hazards associated with the Freeman Project.

3.17.2.6 Use of off-road vehicles, Executive Order 11644 and 11989, amended May 25, 1977

It is the purpose of these orders to establish policies and provide for procedures that will ensure that the use of off-highway vehicles (OHV) on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands and to minimize conflicts among the various uses of those lands.

On July 15, 2004, the Forest Service published proposed travel management regulations in the Federal Register. The final rule provides a national framework for local units to use in designating a sustainable system of roads, trails and areas for motor vehicle use. The rule's goal is to secure a wide range of recreation opportunities while ensuring the best possible care of the land.

Currently, all roads proposed to be closed in the Freeman Project are coordinated with ongoing planning for designation of off-road highway vehicle routes (Appendix B, Table B.4). Roads being proposed for closure and decommission are guided by the forestwide OHV analysis process and the Riparian Management Objectives, which set forth goals for water quality and soil compaction.

3.17.3 Special Area Designation

3.17.3.1 Lake Davis Recreation Area

The area surrounding Lake Davis is a Recreation Area. The Recreation Area offers a wide variety of summer outdoor experiences to the public. Vehicle activity is restricted to established roads to minimize impacts on recreation activities.

3.17.3.2 California State Game Refuge

The California Department of Fish and Game (CDFG) currently manages a State Game Refuge of which portions are within the Freeman Project area. CDFG restricts any type of hunting or discharge of a firearm within a Game Refuge.

3.17.3.3 Non-applicable Areas

The following special interest areas are not found within the Freeman Project area:

- Research Natural Areas
- Inventoried roadless areas
- Wilderness areas
- Wild/scenic rivers

Chapter 4 Preparers and Contributors

4.1 List of Preparers and Contributors

Wildlife Resources

Russell Nickerson

Russell holds a B.S. degree in Wildlife Biology from the University of Montana, Missoula. He has worked for the Pacific Southwest Research Station-Redwood Sciences Lab and on other field research projects. He's been the Assistant District Wildlife Biologist on the Beckwourth Ranger District, Plumas National Forest since 2001.

Heritage Resources

Dan Elliott

Dan has over 30 years experience as a professional archaeologist. He has a B.A. and M.A. degree in Anthropology with an emphasis in historic archaeology from California State University, Chico. Dan specializes in railroad logging systems, historic mining and nineteenth century material culture studies. He is a member of the Society for California Archaeology and the Society for Historic Archaeology. He has been employed by the Forest Service as an archaeologist since 1986 and has been on the Plumas National Forest since 1996. He is currently the Beckwourth District Archaeologist.

Mary Kliejunas

Mary has a B.A. degree in Anthropology and a M.A. in Social Science from California State University, Humboldt. She has five years experience working in cultural resources for the Forest Service. She is currently the Beckwourth Assistant District Archaeologist.

Transportation Engineer

Pete Hochrein

Pete holds a B.S. degree in Forest Resource Management from the University of California, Berekeley and a Master of Forestry degree in Forest Engineering from Oregon State University. He has worked for the Forest Service for 26 years and on the Plumas National Forest for the last 16 years as a Transportation/Logging Systems Group Leader, Engineering Projects Group Leader and is currently the Forest Transportation Planner.

Silviculture

Patti Millet

Patti holds a B.S. in Forestry from the University of Massachusetts and a M.F.S. in Silviculture from the Yale School of Forestry and Environmental Studies. She has worked for the federal government as a forester 19 years, the past 14 as the district silvilculturist on the Beckwourth

Ranger District, Plumas National Forest. She is responsible for the silviculture and implementation of vegetation management projects.

Fuels

Alec Lane

Alec graduated from Technical Fire Management in 2003. He has worked as a wildland firefighter with the Forest Service since 1979 on engines and handcrews on the Inyo and Los Padres National Forests. He came to the Plumas National Forest in 1998 as an Engine Captain and became the Beckwourth Ranger District Fuels Officer in 2002. Alec also serves as a Division Supervisor on a Type 2 Incident Management Team.

Botanical Resources

Mike Friend

Mike has a B.S. in Environmental Science with a minor in Botany from Oregon State University, Corvallis. He has worked as a botanist for the Army Corps of Engineers in Oregon, the Shasta-Trinity National Forest and currently at the Beckwourth Ranger District on the Plumas National Forest.

Terry Miller

Terry received a B.A. in Plant Biology from Southern Illinois University, Carbondale. He also has a received a M.S. from the University of Idaho, Moscow. Terry worked for the Fishlake National Forest prior to coming to the Plumas National Forest where he has worked as the Beckwourth Ranger District Botanist since 2003.

Hydrology

Barbara Drake

Barbara has a B.S. degree in Earth Science with an emphasis in environmental science from California State University, Chico. She has ten years experience working with the Forest Service. She has been a Hydrologist on the Plumas National Forest since 2000. She has one year experience as watershed program manager for the Plumas National Forest. She currently serves on three watershed technical advisory committees

Planning

Sabrina Stadler

Sabrina holds a B.S. in Wildlife Managment from Humboldt State University emphasizing Botany. She also has a M.S. in Natural Resources Planning and Interpretation. Sabrina is the ID Team Project Leader for the Freeman Project EIS. As Senior NEPA Planner she brings seventeen years of experience in natural resource management. She has experience with both writing and editing scientific technical documents, involving an interdisciplinary approach, such as ecological classification field guides, watershed planning and other scientific publications. She has a background in geographic information systems, botany, wildlife, fisheries, hydrology and ecology.

Maurice Huynh

Maurice graduated from the University of California, Berkeley with a B.S. in Forestry and from Northern Arizona University, Flagstaff, with a Master of Forestry. He has worked for various private timber and forestry consulting companies prior to his career with the Forest Service. Currently, he is the Assistant District NEPA Planner on the Beckwourth Ranger District, Plumas National Forest.

Recreation

Judy Schaber

Judy has an AA in Humanities/Social Science from the County College of Morris, an AS in Forestry from Feather River College and a BS in Environmental Resource Sciences from the University of Nevada, Reno. She has 21 years of experience with the Forest Service, working in Timber, Silviculture and Recreation. She has worked at the Plumas District level and at the Supervisors Office. Judy is currently working on the Beckwourth Ranger District in Recreation.

Chapter 5 Environmental Impact Statement Distribution List

5.1 Distribution of the Draft Environmental Statement

5.1.1 Government Agencies

5.1.1.1 Federal Agencies

- Director, Planning and Review Advisory

  Council on Historic Preservation
- Deputy Director

  USDA APHIS PPD/EAD
- Natural Resources Conservation Service

  National Environmental Coordinator
- USDA, National Agricultural Library

  Head, Acquisitions & Serials Branch
- National Marine Fisheries Service

  Habitat Conservationists Division
- U.S. Army Engineer Division, South Pacific

  CESPD-CMP
- Environmental Protection Agency Region 9

  EIS Review Coordinator
- Environmental Protection Agency

  Office of Federal Activities
- Director, Office of Environmental Policy and Compliance

  U.S. Department of the Interior
- U.S. Coast Guard (USCG)

  Environmental Impact Branch Marine Environmental and Protection Division
- Western-Pacific Region

  Regional Administrator

  Federal Aviation Administration
- U.S. Department of Energy

  Director, Office of NEPA Policy and Compliance

5.1.1.2 State Agencies

- California Department of Fish and Game

  Portola Branch

  Sacramento Headquarters

- California Regional Water Quality Control Board
- Northern Sierra Air Quality Management

5.1.1.3 Local Agencies

- City of Portola
- Plumas County Board of Supervisors
- Plumas County Department of Public Works

5.1.2 Organizations

- Californians for Alternatives to Toxics
- Center for Biological Diversity
- Collins Pine
- Counties' QLG Forester
- Earthjustice
- Five Dot Land & Cattle Co.
- John Muir Project
- Northern Sierra Natural Resource Coalition
- Pacific Legal Foundation
- Plumas Corp.
- Plumas Fire Safe Council
- Plumas Forest Project
- Quincy Library Group
- Roberti Ranch, Inc.
- Sierra Nevada Forest Protection Campaign
- Oregon-California Trails Association

5.1.3 Tribes

- Auburn Rancheria
- Berry Creek Rancheria Tyme Maidu
- Big Meadows Lodge Tribe
- Enterprise Rancheria
- Greenville Rancheria
- Washoe
- Susanville

5.1.4 Individuals

- Jay Lininger
- Leigh Ann Kern
- Linda Blum
- Tom Downing
- Jim MacIntyre

Appendix A References

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Appendix B Unit Description and Proposed Transportation Activities

Table B.1. A summary of the Freeman Project Proposed Action illustrating the number of group selection acres, silvicultural treatments and the zone, Eastside or Westside vegetation type and special prescription that each unit falls into.

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
001	DFPZ	Mechanical Thin	2	W		21
002	DFPZ	Masticate	0	W		38
003	DFPZ	Mechanical Thin	2	W		20
004	Area Thin	Mechanical Thin	10	W		145
005	Area Thin	Mechanical-Aspen	0	W		8
006	DFPZ	Grapple Pile	0	W	Eagle	16
007	DFPZ	Mechanical-Aspen	0	W		58
008	DFPZ	Mechanical Thin	3	W		34
009	DFPZ	Mechanical Thin	2	W		26
010	Area Thin	Mechanical Thin	3	W		28
011	DFPZ	Masticate	0	W		25
012	Area Thin	Mechanical-Aspen	0	W		1
013	Area Thin	Mechanical Thin	0	W		60
014	Area Thin	Mechanical-Aspen	0	W		10
015	Area Thin	Aspen PAC	0	W	Goshawk	6
016	Area Thin	Aspen PAC	0	W	Goshawk	10
017	Area Thin	Mechanical-Aspen	0	W		4
019	Area Thin	Mechanical-Aspen	0	W		2
020	Area Thin	Mechanical Thin	2	W		43
021	Area Thin	Mechanical-Aspen	0	W		10
023	Area Thin	Mechanical-Aspen	0	W		21
024	DFPZ	Mechanical Thin	2	E		28
025	DFPZ	Mechanical Thin	3	E	Eagle-25	97
026	DFPZ	Mechanical Thin	0	E		7
027	DFPZ	Mechanical Thin	0	E		39
028	DFPZ	Underburn	0	E	Eagle-14	18
029	DFPZ	Mechanical Thin	8	E	Eagle-24	113
030	Area Thin	Mechanical Thin	0	W		26
031	Area Thin	Masticate	0	W		238
033	DFPZ	Mechanical Thin	0	E	Eagle-50	80
034	Area Thin	Mechanical-Aspen	0	W		8
035	Area Thin	Mechanical-Aspen	0	W		14
036	DFPZ	Grapple Pile	0	W		24
037	DFPZ	Mechanical-Aspen	0	W		11
038	DFPZ	Mechanical-Aspen	0	W		2
039	DFPZ	Mechanical Thin	7	W		85
040	DFPZ	Mechanical Thin	2	W	Eagle	67
041	DFPZ	Mechanical Thin	0	W	Eagle	76
042	DFPZ	Mechanical Thin	0	E	Eagle	76
043	Area Thin	Grapple Pile	0	E	Eagle	115

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
044	Area Thin	Mechanical Thin	0	E	Eagle	24
046	DFPZ	Mechanical Thin	4	E	Eagle	126
047	DFPZ	Mechanical-Aspen	0	W	Eagle	4
048	Area Thin	Mechanical Thin	12	W	Eagle-34	109
049	DFPZ	Mechanical-Aspen	0	W	Eagle	7
050	WUI	Mechanical-Aspen	0	W	Eagle	10
051	DFPZ	Mechanical-Aspen	0	W	Eagle	40
052	DFPZ	Mechanical Thin	4	W	Eagle	59
053	Area Thin	Mechanical Thin	3	E	Eagle	92
054	DFPZ	Masticate	0	W	Eagle	34
055	DFPZ	Grapple Pile	0	W	Eagle	12
056	DFPZ	Mechanical-Aspen	0	W	Eagle	30
057	Area Thin	Mechanical Thin	5	E	Eagle	89
058	DFPZ	Mechanical-Aspen	0	W	Eagle	6
059	DFPZ	Mechanical-Aspen	0	W	Eagle	1
060	DFPZ/WUI	Mechanical Thin	0	E	Eagle	8
061	DFPZ/WUI	Mechanical-Aspen	0	W	Eagle	3
062	WUI	Mechanical Thin	0	E	Eagle	11
063	DFPZ/WUI	Eagle Selection	0	W	Eagle	71
064	DFPZ/WUI	Mechanical Thin	0	W	Eagle	4
065	DFPZ/WUI	Grapple Pile	0	W	Eagle	40
066	Area Thin	Masticate	0	W	Eagle-1	58
067	DFPZ/WUI	Mechanical-Aspen	0	W	Eagle	18
069	DFPZ/WUI	Hand Thin	0	E	Eagle-17	20
072	WUI	Mechanical Thin	2	E		37
073	DFPZ/WUI	Mechanical Thin	0	E		21
074	WUI	Mechanical-Aspen	0	W		11
075	WUI	Groups Only	13	W		183
076	DFPZ/WUI	Mechanical Thin	3	E		61
077	DFPZ/WUI	Mechanical Thin	1	E		25
078	DFPZ/WUI	Mechanical-Aspen	0	W		4
079	WUI	Mechanical-Aspen	0	W		6
080	WUI	Grapple Pile	0	W		88
081	WUI	Mechanical-Aspen	0	W		19
082	WUI	Mechanical Thin	1	W		12
083	Area Thin	Mechanical Thin	0	E	Eagle	24
084	Area Thin	Mechanical-Aspen	0	W		7
085	Area Thin	Masticate	0	W		35
086	Area Thin	Mechanical Thin	10	W		171
087	Area Thin	Helicopter ITS	10	W		137
088	Area Thin	Mechanical Thin	6	W		81
089	Area Thin	Mechanical-Aspen	0	W		84
090	Area Thin	Mechanical-Aspen	0	W		74
091	Area Thin	Mechanical Thin	7	W	Eagle-4	73
092	Area Thin	Grapple Pile	0	W	Eagle-3	25

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
093	Area Thin	Helicopter ITS	4	W		49
094	Area Thin	Mechanical Thin	0	W		45
095	Area Thin	Grapple Pile	0	W		141
096	Area Thin	Mechanical Thin	2	W		20
097	Area Thin	Mechanical Thin	6	W		109
098	Area Thin	Aspen PAC	0	W	Goshawk	2
099	Area Thin	Mechanical Thin	0	W		27
100	DFPZ	Grapple Pile	0	W		28
102	DFPZ	Grapple Pile	0	W		71
103	Area Thin	Mechanical Thin	2	W		48
105	DFPZ	Mechanical Thin	9	W		98
106	DFPZ	Hand Thin	0	W		2
107	DFPZ	Grapple Pile	0	W		190
108	DFPZ	Mechanical Thin	5	W		61
109	DFPZ	Grapple Pile	0	W		7
110	DFPZ	Grapple Pile	0	W		34
111	DFPZ	Mechanical Thin	3	W		59
112	DFPZ	Hand Thin	0	W		11
113	DFPZ	Mechanical Thin	3	W		49
114	DFPZ	Grapple Pile	0	W		13
115	DFPZ	Grapple Pile	0	W		55
116	Area Thin	Mechanical Thin	1	W		21
117	DFPZ	Masticate	0	W		53
118	DFPZ	Mechanical Thin	0	W		11
119	Area Thin	Mechanical Thin	1	E	Eagle	47
120	Area Thin	Aspen PAC	0	W	Goshawk	7
121	Area Thin	Handthin - Aspen	0	W		3
122	DFPZ	Hand Thin	0	W	Eagle	10
123	DFPZ	Underburn	0	W	Eagle	22
124	DFPZ	Mechanical-Aspen	0	W	Eagle	15
126	WUI	Mechanical Thin	0	W		9
127	DFPZ	Hand Thin	0	W		12
130	Area Thin	Mechanical Thin	0	E	Eagle	58
131	Area Thin	Mechanical Thin	4	W		63
132	Area Thin	Mechanical Thin	2	E	Eagle	36
133	DFPZ	Mechanical Thin	1	E		15
134	Area Thin	Mechanical Thin	0	E	Eagle	42
135	DFPZ	Mechanical-Aspen	0	W	Eagle-1	4
136	WUI	Mechanical Thin	0	E	Eagle	18
137	Area Thin	Mechanical-Aspen	0	W		11
138	DFPZ/WUI	Mechanical Thin	0	E		23
139	Area Thin	Mechanical Thin	4	W		47
141	Area Thin	Grapple Pile	0	W		33
142	Area Thin	Masticate	0	W		29
143	Area Thin	Grapple Pile	0	E	Eagle	16

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
144	Area Thin	Masticate	0	W	Eagle	24
146	DFPZ/WUI	Grapple Pile	0	E		26
147	DFPZ/WUI	Mechanical-Aspen	0	E		85
148	WUI	Mechanical Thin	0	E		23
149	WUI	Grapple Pile	0	E		36
150	DFPZ/WUI	Aspen-Grapple	0	E		5
151	WUI	Mechanical-Aspen	0	E		21
152	DFPZ/WUI	Aspen-Grapple	0	E		1
153	DFPZ/WUI	Mechanical Thin	0	E		24
154	DFPZ/WUI	Grapple Pile	0	E		35
156	DFPZ	Mechanical Thin	0	W		8

Table B.2. A summary of the Freeman Project Alternative 3 illustrating the number of group selection acres, silvicultural treatments and the zone, Eastside or Westside vegetation type and special prescription that each unit falls into.

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
001	DFPZ	Mechanical Thin	2	W		23
002	DFPZ	Masticate	0	W		37
003	DFPZ	Mechanical Thin	2	W		37
004	Area Thin	Mechanical Thin	10	W		146
005	Area Thin	Mechanical-Aspen	0	W		2
006	DFPZ	Grapple Pile	0	W	Eagle	17
007	DFPZ	Mechanical-Aspen	0	W		27
008	DFPZ	Mechanical Thin	3	W		39
009	DFPZ	Mechanical Thin	2	W		27
010	Area Thin	Mechanical Thin	3	W		28
011	DFPZ	Masticate	0	W		25
012	Area Thin	Mechanical-Aspen	0	W		0
013	Area Thin	Mechanical Thin	0	W		65
014	Area Thin	Mechanical-Aspen	0	W		4
015	Area Thin	Aspen PAC	0	W	Goshawk	3
016	Area Thin	Aspen PAC	0	W	Goshawk	5
017	Area Thin	Mechanical-Aspen	0	W		1
019	Area Thin	Mechanical-Aspen	0	W		0
020	Area Thin	Mechanical Thin	2	W		42
021	Area Thin	Mechanical-Aspen	0	W		1
023	Area Thin	Mechanical-Aspen	0	W		11
024	DFPZ	Mechanical Thin	2	E		32
025	DFPZ	Mechanical Thin	3	E	Eagle-25	97
026	DFPZ	Mechanical Thin	0	E		7
027	DFPZ	Mechanical Thin	0	E		39
028	DFPZ	Underburn	0	E	Eagle-14	18
029	DFPZ	Mechanical Thin	8	E	Eagle-24	113
030	Area Thin	Mechanical Thin	0	W		26
031	Area Thin	Masticate	0	W		241
033	DFPZ	Mechanical Thin	0	E	Eagle-50	80
034	Area Thin	Mechanical-Aspen	0	W		3
036	DFPZ	Grapple Pile	0	W		24
037	DFPZ	Mechanical-Aspen	0	W		2
039	DFPZ	Mechanical Thin	7	W		94
040	DFPZ	Mechanical Thin	2	W	Eagle	76
041	DFPZ	Mechanical Thin	0	W	Eagle	87
042	DFPZ	Mechanical Thin	0	E	Eagle	76
043	Area Thin	Grapple Pile	0	E	Eagle	115
044	Area Thin	Mechanical Thin	0	E	Eagle	24
046	DFPZ	Mechanical Thin	4	W	Eagle	142

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
047	DFPZ	Mechanical-Aspen	0	W	Eagle	1
048	Area Thin	Mechanical Thin	12	W	Eagle-34	109
049	DFPZ	Mechanical-Aspen	0	W	Eagle	2
050	WUI	Mechanical-Aspen	0	W	Eagle	3
051	DFPZ	Mechanical-Aspen	0	W	Eagle	17
052	DFPZ	Mechanical Thin	4	W	Eagle	68
053	Area Thin	Mechanical Thin	3	E	Eagle	92
054	DFPZ	Masticate	0	W	Eagle	34
055	DFPZ	Grapple Pile	0	W	Eagle	12
056	DFPZ	Mechanical-Aspen	0	W	Eagle	19
057	Area Thin	Mechanical Thin	5	E	Eagle	89
058	DFPZ	Mechanical-Aspen	0	W	Eagle	2
060	DFPZ/WUI	Mechanical Thin	0	E	Eagle	9
062	WUI	Mechanical Thin	0	E	Eagle	17
063	DFPZ/WUI	Eagle Selection	0	W	Eagle	80
064	DFPZ/WUI	Mechanical Thin	0	W	Eagle	4
065	DFPZ/WUI	Grapple Pile	0	W	Eagle	40
066	Area Thin	Masticate	0	W	Eagle-1	58
067	DFPZ/WUI	Mechanical-Aspen	0	W	Eagle	13
069	DFPZ/WUI	Hand Thin	0	E	Eagle-17	20
072	WUI	Mechanical Thin	2	E		37
073	DFPZ/WUI	Mechanical Thin	0	E		22
075	WUI	Groups Only	13	W		191
076	DFPZ/WUI	Mechanical Thin	3	E		60
077	DFPZ/WUI	Mechanical Thin	1	E		24
078	DFPZ/WUI	Mechanical-Aspen	0	W		1
080	WUI	Grapple Pile	0	W		91
081	WUI	Mechanical-Aspen	0			4
082	WUI	Mechanical Thin	1	W		14
083	Area Thin	Mechanical Thin	0	E	Eagle	24
085	Area Thin	Masticate	0	W		35
086	Area Thin	Mechanical Thin	10	W		171
087	Area Thin	Helicopter ITS	10	W		137
088	Area Thin	Mechanical Thin	6	W		86
089	Area Thin	Mechanical-Aspen	0	W		32
090	Area Thin	Mechanical-Aspen	0	W		12
091	Area Thin	Mechanical Thin	7	W	Eagle-4	72
092	Area Thin	Grapple Pile	0	W	Eagle-3	25
093	Area Thin	Helicopter ITS	4	W		49
094	Area Thin	Mechanical Thin	0	W		45
095	Area Thin	Grapple Pile	0			158
096	Area Thin	Mechanical Thin	2	W		20
097	Area Thin	Mechanical Thin	6	W		111
098	Area Thin	Aspen PAC	0	W	Goshawk	1
099	Area Thin	Mechanical Thin	0	W		27

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
100	DFPZ	Grapple Pile	0	W		28
102	DFPZ	Grapple Pile	0			71
103	Area Thin	Mechanical Thin	2	W		48
105	DFPZ	Mechanical Thin	9	W		98
106	DFPZ	Hand Thin	0	W		2
107	DFPZ	Grapple Pile	0	W		190
108	DFPZ	Mechanical Thin	5			61
109	DFPZ	Grapple Pile	0	W		7
110	DFPZ	Grapple Pile	0	W		34
111	DFPZ	Mechanical Thin	3	W		59
112	DFPZ	Hand Thin	0			11
113	DFPZ	Mechanical Thin	3	W		49
114	DFPZ	Grapple Pile	0			13
115	DFPZ	Grapple Pile	0	W		55
116	Area Thin	Mechanical Thin	1	W		24
117	DFPZ	Masticate	0	W		53
118	DFPZ	Mechanical Thin	0	W		11
119	Area Thin	Mechanical Thin	1	E	Eagle	46
120	Area Thin	Aspen PAC	0	W	Goshawk	2
122	DFPZ	Hand Thin	0	W	Eagle	10
123	DFPZ	Underburn	0	W	Eagle	22
124	DFPZ	Mechanical-Aspen	0	W	Eagle	6
126	WUI	Mechanical Thin	0	W		11
127	DFPZ	Hand Thin	0	W		12
130	Area Thin	Mechanical Thin	0	E	Eagle	58
131	Area Thin	Mechanical Thin	4	W		68
132	Area Thin	Mechanical Thin	2	E	Eagle	36
133	DFPZ	Mechanical Thin	1	E		15
134	Area Thin	Mechanical Thin	0	E	Eagle	42
135	DFPZ	Mechanical-Aspen	0	W	Eagle	1
136	WUI	Mechanical Thin	0	E	Eagle	18
137	Area Thin	Mechanical-Aspen	0	W		6
138	DFPZ/WUI	Mechanical Thin	0	E		23
139	Area Thin	Mechanical Thin	4	W		44
141	Area Thin	Grapple Pile	0	W		36
142	Area Thin	Masticate	0	W		30
143	Area Thin	Grapple Pile	0	E	Eagle	16
144	Area Thin	Masticate	0	W	Eagle	24
146	DFPZ/WUI	Grapple Pile	0	E		26
147	DFPZ/WUI	Mechanical-Aspen	0	E		41
148	WUI	Mechanical Thin	0	E		24
149	WUI	Grapple Pile	0	E		40
151	WUI	Mechanical-Aspen	0	E		10
153	DFPZ/WUI	Mechanical Thin	0	E		58
154	DFPZ/WUI	Grapple Pile	0	E		42

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
156	DFPZ	Mechanical Thin	0	W		8

Table B.3. A summary of the Freeman Project Alternative 4 illustrating the number of group selection acres, silvicultural treatments and the zone, Eastside or Westside vegetation type and special prescription that each unit falls into.

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
001	DFPZ	Mechanical Thin	2	W		36
002	DFPZ	Masticate	0	W		24
003	DFPZ	Mechanical Thin	2	W		37
004	Area Thin	Mechanical Thin	10	W		146
005	Area Thin	Mechanical-Aspen	0	W		2
006	DFPZ	Grapple Pile	0	W	Eagle	15
007	DFPZ	Mechanical-Aspen	0	W		27
008	DFPZ	Mechanical Thin	3	W		39
009	DFPZ	Mechanical Thin	2	W		30
010	Area Thin	Mechanical Thin	3	W		83
011	DFPZ	Masticate	0	W		22
012	Area Thin	Mechanical-Aspen	0	W		0
013	Area Thin	Mechanical Thin	0	W		65
014	Area Thin	Mechanical-Aspen	0	W		4
015	Area Thin	Aspen PAC	0	W	Goshawk	3
016	Area Thin	Aspen PAC	0	W	Goshawk	5
017	Area Thin	Mechanical-Aspen	0	W		1
019	Area Thin	Mechanical-Aspen	0	W		0
020	Area Thin	Mechanical Thin	2	W		42
021	Area Thin	Mechanical-Aspen	0	W		1
023	Area Thin	Mechanical-Aspen	0	W		11
024	DFPZ	Mechanical Thin	2	E		32
025	DFPZ	Mechanical Thin	3	E	Eagle-25	97
026	DFPZ	Mechanical Thin	0	E		7
027	DFPZ	Mechanical Thin	0	E		39
028	DFPZ	Underburn	0	E	Eagle-14	18
029	DFPZ	Mechanical Thin	8	E	Eagle-24	113
030	Area Thin	Mechanical Thin	0	W		26
031	Area Thin	Masticate	0	W		98
033	DFPZ	Mechanical Thin	0	E	Eagle-50	80
034	Area Thin	Mechanical-Aspen	0	W		3
036	DFPZ	Grapple Pile	0	W		24
037	DFPZ	Mechanical-Aspen	0	W		2
039	DFPZ	Mechanical Thin	7	W		94
040	DFPZ	Mechanical Thin	2	W	Eagle	77
041	DFPZ	Mechanical Thin	0	W	Eagle	87
042	DFPZ	Mechanical Thin	0	E	Eagle	143
043	Area Thin	Grapple Pile	0	E	Eagle	48
044	Area Thin	Mechanical Thin	0	E	Eagle	24
046	DFPZ	Mechanical Thin	4	W	Eagle	143

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
047	DFPZ	Mechanical-Aspen	0	W	Eagle	1
048	Area Thin	Mechanical Thin	12	W	Eagle-34	268
049	DFPZ	Mechanical-Aspen	0	W	Eagle	2
050	WUI	Mechanical-Aspen	0	W	Eagle	3
051	DFPZ	Mechanical-Aspen	0	W	Eagle	17
052	DFPZ	Mechanical Thin	4	W	Eagle	70
053	Area Thin	Mechanical Thin	3	E	Eagle	92
054	DFPZ	Masticate	0	W	Eagle	34
055	DFPZ	Grapple Pile	0	W	Eagle	9
056	DFPZ	Mechanical-Aspen	0	W	Eagle	19
057	Area Thin	Mechanical Thin	5	E	Eagle	89
058	DFPZ	Mechanical-Aspen	0	W	Eagle	2
060	DFPZ/WUI	Mechanical Thin	0	E	Eagle	9
062	WUI	Mechanical Thin	0	E	Eagle	17
063	DFPZ/WUI	Eagle Selection	0	W	Eagle	124
066	Area Thin	Masticate	0	W	Eagle-1	58
067	DFPZ/WUI	Mechanical-Aspen	0	W	Eagle	13
069	DFPZ/WUI	Hand Thin	0	E	Eagle-17	20
072	WUI	Mechanical Thin	2	E		37
073	DFPZ/WUI	Mechanical Thin	0	E		22
075	WUI	Groups Only	13	W		191
076	DFPZ/WUI	Mechanical Thin	3	E		60
077	DFPZ/WUI	Mechanical Thin	0	E		24
078	DFPZ/WUI	Mechanical-Aspen	0	W		1
081	WUI	Mechanical-Aspen	0			4
082	WUI	Mechanical Thin	1	W		14
083	Area Thin	Mechanical Thin	0	E	Eagle	24
085	Area Thin	Masticate	0	W		35
086	Area Thin	Mechanical Thin	10	W		171
087	Area Thin	Helicopter ITS	10	W		137
088	Area Thin	Mechanical Thin	6	W		86
089	Area Thin	Mechanical-Aspen	0	W		32
090	Area Thin	Mechanical-Aspen	0	W		12
091	Area Thin	Mechanical Thin	7	W	Eagle-4	72
092	Area Thin	Grapple Pile	0	W	Eagle-3	25
093	Area Thin	Helicopter ITS	4	W		49
094	Area Thin	Mechanical Thin	0	W		45
096	Area Thin	Mechanical Thin	2	W		20
097	Area Thin	Mechanical Thin	6	W		111
098	Area Thin	Aspen PAC	0	W	Goshawk	1
099	Area Thin	Mechanical Thin	0	W		27
100	DFPZ	Mechanical Thin	0	W		28
102	DFPZ	Grapple Pile	0	W		51
103	Area Thin	Mechanical Thin	2	W		48
105	DFPZ	Mechanical Thin	9	W		98

Unit #	Zone	Treatment	Group Selection (Acres)	Eastside or Westside	Special Prescription (Acres)	Acres
106	DFPZ	Hand Thin	0	W		2
107	DFPZ	Mechanical Thin	0	W		186
108	DFPZ	Mechanical Thin	5	W		77
109	DFPZ	Masticate	0	W		8
110	DFPZ	Masticate	0	W		13
111	DFPZ	Mechanical Thin	3	W		103
113	DFPZ	Mechanical Thin	3	W		49
115	DFPZ	Grapple Pile	0	W		55
116	Area Thin	Mechanical Thin	1	W		24
117	DFPZ	Masticate	0	W		32
118	DFPZ	Mechanical Thin	0	W		30
119	Area Thin	Mechanical Thin	1	E	Eagle	46
120	Area Thin	Aspen PAC	0	W	Goshawk	2
122	DFPZ	Hand Thin	0	W	Eagle	10
124	DFPZ	Mechanical-Aspen	0	W	Eagle	6
126	WUI	Mechanical Thin	0	W		101
127	DFPZ	Hand Thin	0	W		12
130	Area Thin	Mechanical Thin	0	E	Eagle	58
131	Area Thin	Mechanical Thin	4	W		68
132	Area Thin	Mechanical Thin	2	E	Eagle	36
133	DFPZ	Mechanical Thin	1	E		15
134	Area Thin	Mechanical Thin	0	E	Eagle	46
135	DFPZ	Mechanical-Aspen	0	W	Eagle	1
136	WUI	Mechanical Thin	0	E	Eagle	18
137	Area Thin	Mechanical-Aspen	0	W		6
138	DFPZ/WUI	Mechanical Thin	0	E		23
139	Area Thin	Mechanical Thin	4	W		80
142	Area Thin	Masticate	0	W		30
143	Area Thin	Mechanical Thin	0	E	Eagle	16
144	Area Thin	Masticate	0	W	Eagle	24
146	DFPZ/WUI	Masticate	0	E		30
147	DFPZ/WUI	Mechanical-Aspen	0	E		41
148	WUI	Mechanical Thin	0	E		24
149	WUI	Masticate	0	E		40
151	WUI	Mechanical-Aspen	0	E		10
153	DFPZ/WUI	Mechanical Thin	0	E		43
154	DFPZ/WUI	Grapple Pile	0	E		53
156	DFPZ	Mechanical Thin	0	W		8
157	DFPZ	Mechanical Thin	0	W	Eagle	25

Table B.4. Displaying the road number, type and length of each road scheduled for work under the Freeman Project or a previous decision.

Road #	Type	Length	Reason (*criteria number)
23N16Y	Close	0.2	3
24N42XA	Close	0.3	1
24N84X	Close	0.4	1
24N07B	Decommission	0.3	1
24N07C	Decommission	0.3	1
24N10D	Decommission	0.6	1
24N12B	Decommission	0.5	1
24N55	Decommission/Relocate	0.2	3
24N57C	Decommission	0.2	1
24N57D	Decommission	0.2	1
24N57E	Decommission	<0.1	1
24N57F	Decommission	0.1	1
24N61A	Decommission	0.2	1
24N71Y	Decommission	0.8	2 (R13)
24N74Y	Decommission	0.2	3
24N89YA	Decommission	0.2	1
24N89YB1	Decommission	0.3	1
24N89YB2	Decommission	0.6	1
Non-System	Decommission	1.9	TOC
24N12	Decomm-Prev.Decision	1.0	3
24N85YA	Decomm-Prev.Decision	0.8	3
24N43X	Decomm-Res. Damage	1.4	3
23N16Y	Single Track	0.2	3
23N22Y	Reconstruct	2.8	N/A
23N88	Reconstruct	1.5	N/A
24N07	Reconstruct	3.2	N/A
24N07A	Reconstruct	0.4	N/A
24N10B1	Reconstruct	0.4	N/A
24N10C	Reconstruct	1.8	N/A
24N11X	Reconstruct	1.2	N/A
24N42X	Reconstruct	0.3	N/A
24N55	Reconstruct	0.9	N/A
24N57	Reconstruct	1.6	N/A
24N61	Reconstruct	1.2	N/A
24N70Y	Reconstruct	0.5	N/A
24N84X	Reconstruct	0.1	N/A
23N22Y	Reconstruct	2.8	N/A
23N88	Reconstruct	1.5	N/A

OHV Route Designation Process road closure criteria (must fit at least one or more below):

1. Dead end spurs or routes that show no evidence of OHV use, which are also contributing to resource damage.
2. User created routes in areas that are already closed by existing Forest Orders.
3. Routes are creating egregious resource damage, to the extent that a delay in their closure would result in unacceptable and irretrievable impacts to the resource.

N/A road is not going to be closed or decommissioned.
TOC-Non-system roads closed to allow the Proposed Action to be implemented without undo watershed damage.

Appendix C Standards and Guidelines

Table C.1. Standards and Guidelines Applicable to All Activities occurring in the HFQLG Pilot project area (Table 2 of the SNFPA ROD).

HFQLG Land Allocation	Standards and Guidelines
Offbase and deferred areas	The following HFQLG resource management activities are prohibited: DFPZ construction, group selection, individual tree selection, all road building, all timber harvesting activities and any riparian management that involves road construction or timber harvesting.
Late successional old growth (LSOG) rank 4 and 5	Group selection and individual tree selection are not allowed in LSOG 4 and 5 stands. DFPZ construction is allowed in LSOG 4 and 5 stands. Design DFPZs to avoid old forest stands (CWHR classes 5M, 5D, 6) within this allocation.
California spotted owl PACs	The following resource management activities - DFPZs, group selection, individual tree selection and riparian restoration projects and other timber harvesting - are not allowed within spotted owl PACs.
California spotted owl habitat areas (SOHAs)	The following resource management activities - DFPZs, group selection, individual tree selection and riparian restoration projects and other timber harvesting - are not allowed within spotted owl SOHAs.
National forest lands outside of the above allocations and available for vegetation and fuels management activities specified in the HFQLG Act	**DFPZs**
	Eastside pine types and all other CWHR 4M and 4D classes: • Design projects to retain at least 30% of existing basal area, generally comprised of the largest trees. · • Design projects to retain all live trees ≥30 inches dbh; exceptions allowed for operability. Minimize impacts to ≥30-inch trees as much as practicable. · • For CHWR 4M and 4D classes that are not eastside pine types, retain, where available, 5% of total post-treatment canopy cover in lower layers comprised of trees 6 - 24-inches dbh. · • No other canopy cover requirements apply.
	• CWHR 5M, 5D and 6 classes except those referenced above: • Design projects to retain a minimum of 40% canopy cover. • Design projects to avoid reducing pre-treatment canopy cover by more than 30%. · • Design projects to retain at least 40% of existing basal area, generally comprised of the largest trees. · • Design projects to retain, where available, 5% of total post-treatment canopy cover in lower layers comprised of trees 6-24 inches dbh. · • Design projects to retain all live trees ≥30 inches dbh; exceptions allowed for operability. Minimize impacts to ≥30-inch trees as much as practicable.
	• All other CWHR class stands: · • Retain all live trees ≥30 inches dbh, except to allow for operations. Minimize operations impacts to ≥30-inch trees as much as practicable.

	Group Selection
	• Design projects to retain all live trees ≥30” dbh, except allowed for operability. Minimize impacts to ≥30-inch trees as much as practicable. • •
	Area thinning (individual tree selection)
	• All eastside pine types: · • Design projects to retain at least 30% of existing basal area, generally comprised of the largest trees · • Design projects to retain all live trees ≥30 inches dbh; exceptions allowed for operability. Minimize impacts to ≥30-inch trees as much as practicable. · • Canopy cover change is not restricted.
	• CWHR classes 4D, 4M, 5D, 5M and 6 (except eastside pine type): · • Where vegetative conditions permit, design projects to retain ≥50% canopy cover after treatment averaged within the treatment unit, except where site-specific project objectives cannot be met. Where 50 percent canopy cover retention cannot be met as described above, design projects to retain a minimum of 40% canopy cover averaged within the treatment unit. · • Design projects to avoid reducing canopy cover by more than 30% from pre-treatment levels. · • Design projects to retain at least 40% of the existing basal area, generally comprised of the largest trees. · • Design projects to retain, where available, 5% of total post-treatment canopy cover in lower layers comprised of trees 6-24 inches dbh. · • Design projects to retain all live trees ≥30 inches dbh; exceptions allowed for operability. Minimize impacts to ≥30-inch trees as much as practicable.
	Down wood and snags
	• Determine retention levels of down woody material on an individual project basis. Within westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large down wood per acre. Within eastside vegetation types, generally retain an average of three large down logs per acre. Emphasize retention of wood that is in the earliest stages of decay. Consider the effects of follow-up prescribed fire in achieving desired retention levels of down wood. • Determine snag retention levels on an individual project basis. Design projects to sustain across a landscape a generally continuous supply of snags and live decadent trees suitable for cavity nesting wildlife. Retain some mid and large diameter live trees that are currently in decline, have substantial wood defect, or have desirable characteristics (teakettle branches, large diameter broken top, large cavities in the bole) to serve as future replacement snags and to provide nesting structure. When determining snag retention levels, consider land allocation, desired condition, landscape position and site conditions (such as riparian areas and ridge tops), avoiding uniform distribution across large areas

	• During project-level planning, consider the following guidelines for large-snag retention: • In westside mixed conifer and ponderosa pine types, four of the largest snags per acre. In the red fir forest type, six of the largest snags per acre. • In eastside pine and eastside mixed conifer forest types, three of the largest snags per acre. • In westside hardwood ecosystems, four of the largest snags per acre (hardwood or conifer). • Where standing live hardwood trees lack dead branches, six of the largest snags per acre to supplement wildlife needs for dead material. ·Use snags larger than 15 inches dbh to meet this guideline. Snags should be clumped and distributed irregularly across the treatment units. Consider leaving fewer snags strategically located in treatment areas within the WUI and DFPZs. While some snags will be lost due to hazard removal or use of prescribed fire, consider these potential losses during project planning to achieve desired snag retention levels.
	Spotted owl surveys
	• Prior to undertaking vegetation treatments in spotted owl habitat having unknown occupancy, conduct surveys in compliance with the Pacific Southwest Region survey direction and protocols and designate PACs where appropriate according to survey results.

Appendix D Standard Operating Procedures

Fire/Air Quality

For all prescribed burning, comply with air quality permits issued by the Northern Sierra Air Quality Management District. A prescribed burn plan, including a mandatory smoke management plan (SMP), would be required prior to any prescribed fire. The SMP is reviewed and approved by the local air quality management District office.

Conduct prescribed burning in a manner that avoids excessive buildup of smoke in any particular airshed.

Other than in visual corridors, no more than 10% mortality following the underburn and no areas of mortality greater than 2 acre.

Watershed

Protect water quality through the use of BMPs, which are employed by the Forest Service and the State of California to prevent water quality degradation and to meet state water quality objectives relating to non-point sources of pollution. In addition, use site-specific mitigation measures that relate directly to these BMPs to minimize erosion and resultant sedimentation.

Apply the Standards and Guidelines identified in the SAT Guidelines (as adopted under the HFQLG EIS) relating to timber sale activities in all RHCAs. Activities in RHCAs will improve or maintain the structure and function of the RHCA and fish and wildlife habitat.

Streamside Areas

For intermittent and ephemeral streams showing scour and deposition and wetlands less than one acre in size, use RHCA widths of a minimum of 100 feet in width (horizontal distance) or the height of one site potential tree, whichever is greater. For perennial fish-bearing streams, use RHCA widths of 300 feet horizontal distance as measured from both sides of the stream channel, or to the top of the inner gorge, or the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, whichever is greatest. Extend RHCAs around wetlands greater than one acre and perennial non fish-bearing streams to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of moderately and highly unstable areas, or a 150’ horizontal distance, whichever is greatest.

Employ streamside management zone (SMZ) widths are 50’ for those stream segments that do not display scour and deposition and are not classified as RHCAs.

Exclude equipment from RHCA, except at equipment crossings and within hardwood treatment areas (See Hardwoods), unless specifically allowed for in the environmental document. Minimize the number of crossings. Crossings will be back-bladed after use, as necessary, to restore the natural relief and reduce erosion.

Remove any slash generated by project activities from stream courses as soon as practicable, not exceeding 48 hours.

Do not locate landings within RHCAs. Mulch and then subsoil landings and other disturbances within 200 feet of stream channels.

Remove no trees adjacent to channels that provide bank stability and/or contribute to channel integrity (except for hazard trees).

Drainages disrupted by existing and activity related landings, skid trails and temporary roads would be restored to their natural contour. This would occur during subsoiling operations.

Do not locate skid trails parallel to the bottom of swales. Treat swales as stream courses, crossing at right angles and skidding away from these features.

While underburning, do not ignite fire within 50’ of stream channels or riparian vegetation, whichever is greatest. Allow backing fire to creep into RHCAs if fuels naturally carry this fire. Retain at least 90% of large woody debris in channels and leave 50-75% of the ground unburned within the interior 50’ of RHCAs. Within these core areas, ensure that burned areas appear intermittent, not concentrated. Maintain a minimum of 75% ground cover over RHCA’s and SMZs. Locate burn piles from or above the “green line” or at least 25’ away from channels having evident scour and deposition, whichever is greater. Burn piles prior to under burning.

Retain 5 tons/acre of fuels less than 15” in diameter and 10-15 tons/acre of the largest down logs greater than 15” in diameter, where available.

Aspen

Aspen Stands with defined Stream Channels

No equipment within 25 feet of any stream course. Machinery can work adjacent and reach into the exclusion zone with the extendable boom. Skid trails will be perpendicular to the stream course within 50 feet of the stream and spacing of skids will be no closer than 120 feet. No trees will be removed that are providing stability to the streambank.

Along perennial fish-bearing streams where Aspen are not of sufficient size to provide shade to the stream channel conifers will be left to provide shade.

Aspen Stands with no definable stream channel

Aspen stands within wet areas where no definable stream channels are present will be harvested in dry periods when the upper eight inches of the soil is essentially dry or the ground is frozen to a depth of five inches or snow depth is at least 18 inches or is compacted by equipment to eight inches. For this measure soil is defined as “dry” when no portion can be molded by hand compression and hold that shape when the hand is tapped.

Soil Protection Measures

To control the surface erosion, the LRMP requires a minimum of 40% ground cover on soils with a low erosion hazard rating. The minimum ground cover increases to 50%, 60% and 70% for soils with an erosion hazard rating of moderate, high and very high, respectively. If ground cover standards are not met, implementation of mitigation methods such as leaving chips on site would ensure standards would still be met.

Conduct ground based harvest operations only when the upper 8” of the soil is essentially dry, or the ground is frozen to a depth of 5”, or snow depth is at least 18” or is compacted by equipment to 8”. For this measure, soil is defined as “dry” when no portion of the top 8” can be molded by hand compression and hold that shape when the hand is tapped. Allow cut-to-length harvesters and forwarders to operate on moist soil, when the depth of the organic mat is greater than 18”.

Restrict skidding equipment to designated skid trails, unless, through consultation with the District’s physical scientist, it is determined that departure from skid trails would not likely impair the soil. Generally use a range of skid trail spacing, 80-120’ center to center, when trails are parallel and generally perpendicular to the stream. Reusing existing skid trails, with spacing closer than prescribed, is acceptable.

Areas with compacted soil will be subsoiled using a subsoiling/slash placement implement mounted on an excavator and displaced soil will be leveled and slash scattered.

Where specified by the District’s physical scientist, subsoil skid trails, landings and non-system roads within the project area through the full depth of compaction to restore soil porosity. Post-harvest compaction monitoring would be completed and subsoiling of both project skid trails and landings, as well as legacy trails and landings, would be subsoiled to achieve FS Region 5 soil compaction standards. In addition, all temporary roads and those non-system roads to be decommissioned would be subsoiled. Selected landings and terminating skid trails would be subsoiled with a winged subsoiler or other equipment capable of lifting and fracturing compacted soil without mixing the soil horizons to a depth of at least 24”. Constructed skid trails would be subsoiled to a minimum depth of 24“, water-barred and blocked. All primary skid trails, experiencing three or more passes with equipment, would be subsoiled with a winged subsoiler to a minimum depth of 20”. Post-harvest compaction monitoring would be completed, both project skid trails and landings, as well as legacy trails and landings, would be subsoiled to achieve FS Region 5 soil compaction standards. The subsoiler would be lifted where substantial root and bole damage to larger trees would occur from subsoiling. Skids with slope over 25% may not be subsoiled, but would be frequently waterbarred. Areas within 50’ of ephemeral draws, swales, connected drainages and meadow edges would not be subsoiled. Subsoiling would not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots.

Block vehicle access to temporary roads and install water-bars prior to subsoiling them.

Allow low ground pressure (under 8.0 psi) equipment to travel off of designated skid trails to bring logs to trails. Allow low ground pressure (under 8.0 psi) excavators to work on slopes up to 45% to pile excess fuels.

Silviculture

Pine stumps > 14” will be treated with a borate compound for the control of Annosus root disease. Generally, retain sugar pine and hardwoods in thinned units, with exceptions allowed for safety and operability. Protect trees identified or trees being tested as genetically superior or resistant to blister rust or dwarf mistletoe.

Landings

Landings will generally not be within 100 feet of the stream course. If a landing is situated closer than 100 feet it will be tilled, seeded, mulched after use and available slash will be spread out across landing to improve infiltration and minimize erosion. Reference: BMP 1-12. No landing will be situated closer than 60 feet from the stream course.

Noxious Weed Management

Flame and/or handpull known noxious weed populations as necessary. Flag and avoid noxious weed populations during implementation.

Require off-road equipment and vehicles used for project implementation coming from weed-infested areas or areas of unknown weed status to be cleaned of all attached mud, dirt, or plant parts. Generally, this would be done at a vehicle wash station or steam cleaning facility before the equipment and vehicles enter the project area. Include applicable contract provision in all contracts for equipment cleaning.

Assure that all gravel, fill, or other imported materials are weed-free. Use on-site sand, gravel, rock, or organic matter rather than importing material where possible. Evaluate road locations for weed risk factors.

For all project-related revegetation, use weed-free equipment, mulches and seed sources. Avoid seeding in areas where revegetation would occur naturally unless noxious weeds are a concern. Save topsoil from disturbed sites and replace it onsite unless contaminated with noxious weeds.

Botany

Protect known sensitive and special interest species according to PNF’s current interim management prescriptions for specific species.

If additional TES Plant species are found during the life of the project, conduct an assessment and apply appropriate management prescriptions.

Wildlife

Unless determined to be unnecessary following pre-implementation surveys, limited operating periods (LOPs) to protect key wildlife species listed in the HFQLG FEIS (page 2-8, table 2.3), 2004 SNFPA ROD (pages 54-62) and the Biological Evaluation/Biological Assessment would apply.

Where subsequent surveys identify occupied threatened, endangered, or sensitive species habitat, establish PACs, den site buffers, or other protections as described in the SNFPA and HFQLG EISs. Include protections for any additional sensitive species identified in the BE/BA.

In areas of known populations of TES amphibians, apply direction from the HFQLG FEIS/ROD and the SNFPA ROD. Apply additional protection measures as follows: do not burn slash piles within RHCAs during the LOP and when burned, assure that 1) no fuel is dumped on the pile and fusees or a single propane torch is used to light the pile and 2) light piles from a single location rather than multiple locations, allowing sheltering amphibians to escape.

Heritage Resources

The proposed project has the potential to affect heritage resources. As outlined in the Programmatic Agreement (PA), the following protection measures will be implemented, as appropriate, for all heritage resources located within the project area. The application of the following protection measures would result in the Freeman Project having “no effect” on heritage resources and the Forest would have taken into account the effect of the project on heritage resource sites in compliance with the PA and Section 106 of the NHPA.

If any unrecorded heritage resources (artifacts, features, or sites) are encountered as a result of project operations, all activities in the vicinity of such finds will immediately cease pending an examination by the District Archaeologist.

- At a minimum, heritage resource sites shall be excluded from areas where activities associated with the project will occur.
    1. All proposed activities, facilities, improvements and disturbances shall avoid heritage resource sites. Avoidance means that no activities associated with the project that may affect heritage resource sites shall occur within a site’s boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid heritage resource sites.
    2. All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
    3. Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property’s eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.

4. When any changes in proposed activities are necessary to avoid heritage resource sites, e.g., project modifications, these changes shall be completed prior to initiating any activities.
5. Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.
6. Upon approval of the Forest or District Archaeologist, low intensity underburning may be allowed over selected prehistoric sites as long as fuel loads are relatively light.
7. Upon approval of the Forest or District Archaeologist, existing breaches within linear sites may be designated on the ground and reused for project activities.
8. On a case by case basis linear sites may be breached to access treatment units with the approval of the Forest or District Archaeologist. These breaches must be kept to a minimum. Also the linear feature (road, ditch, or railroad grade) needs to be recontoured to look like it did before the breach was created.
9. Roads and trails that currently overlie historic linear sites may continue to be used as transportation routes without notification. However, if there are activities that will change the morphology of the existing road or trail (that is overlaying a historic linear site), these activities need to be reviewed by the Forest or District Archaeologist.
10. Roads proposed to be decommissioned that extend through archaeological sites will need to be blocked instead of sub-soiled.

Visual Quality Management (Immediate Foreground of Visual Corridors)

To the extent feasible, locate landings and primary skidtrails away from the immediate foreground of Sensitivity Level I and II travel corridors. Limit size of landings so that they are not visually evident from the sensitive travel routes following completion of treatment activities.

Minimize stump heights in both mechanical and handthinning units adjacent to sensitive travel corridors, typically resulting in stumps 6” or less in height within 300’ of the travel corridor.

During tree marking, open and enhance views of residual old growth trees near the visual corridor where possible.

Target consumption of burn piles of 95% or greater.

Target underburn mortality levels of 5% or less.

Transportation

Design all stream crossings to accommodate a 100-year flood and provide fish passage as necessary. Decommission temporary roads after use.

Design and obliterate temporary stream crossings to protect water quality and adjacent riparian vegetation (see “Streamside Areas” section for additional procedures for protecting riparian vegetation).

Stabilize and strategically place water bars on temporary roads where drainage control issues are evident or expected. After use, barricade roads to discourage vehicle traffic, using available natural materials such as rocks, logs, root wads and earth, to appear somewhat natural, have low installation costs and require little to no maintenance.

Maximum draw-down volumes will be estimated prior to use of the draft site. Minimum pool levels will be maintained during drafting using measurements such as staff gauges, stadia rods, tape measures, etc.

Abate dust from logging traffic with water from water drafting sites that are selected based on stream flow and suitability of access. Construct water-drafting sites so that oil, diesel fuel, or other spilled pollutants would not enter the stream. Back down ramps will be constructed and or maintained to ensure the stream bank stability is maintained and sedimentation is minimized. Rocking, chipping, mulching, or other effective methods are acceptable in achieving this objective.

When water is scarce, alternative sources such as chlorite, sulfonate or other dust abatement materials would be used.

Implementation

Within the project contract area, allow minor adjustments in boundaries of units if compatible with Forest Plan direction, the desired conditions and anticipated environmental effects disclosed by the project’s NEPA document.

Range

Range improvements will be protected from damage caused by the project. Forest Representatives will administer contracts and burn plans. Contracts and burn plans will display where range improvements are located and include provisions to rebuild to standard any range improvements which are damaged by the contractor. Range improvements for each allotment are listed in Part 3 of the permittees Term Grazing Permit.

The Forest Service Contract Administrator and the Forest Service Prescribed Burn Manager should coordinate with the Forest Service Range Conservationist early each spring to discuss the portions of the project that will be implemented that year. The Forest Service Range Conservationist should discuss those project activities in the Annual Operating Instructions meeting with the permittee prior to the District Ranger’s approval of that years Annual Operating Instructions.

Appendix E Cumulative Effects

Introduction

Cumulative effects are the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably future actions regardless of what agency or private entity undertakes such other actions. Cumulative impacts can result from individually minor events that cause significant impact over time (40CFR1508.7). A list of past actions and events within the project area allow resource specialists to conduct the requisite "hard look" analysis of cumulative impacts within the Freeman Project.

Project Boundary

These are past projects (from 1980-2006) or portions thereof, within the Freeman Project boundary (Table E.1 and E.2).

Green Sales

Green sales prescriptions included:

CC - clear cut strip and/or group select harvest

shelterwood - strip and/or group select harvest

overstory removal - oldest age class removed, individual tree removal

thinning - thinning from below and maintaining within 20% of existing canopy

aspen enhancement - removing conifers within aspen stand

sanitation - harvest trees with expected mortality within 10 years

Table E.1. Past green project sales from 1980-2006

Project Name (Year)	Volume Harvested (MMBF*)	Prescription
Freeman T.S. (1980-1983)	20 MMBF	CC, shelterwood, overstory removal
Slave T.S. (1982-1983)	1.5 MMBF	CC
Spot T.S. (1982-1983)	0.8 MMBF	CC-
Smith T.S. (1983-1985)	1.2 MMBF	CC-
Threemile T.S. (1987-1989)	6 MMBF	CC, shelterwood, overstory removal
Westside T.S. (1988-1990)	8 MMBF	CC, shelterwood, overstory removal
Summit T.S. (1988-1990)	10 MMBF	CC, shelterwood, overstory removal
HumBug DFPZ (2004)	0.2 MMBF	thinning, aspen enhancement

*MMBF-defined as 1 million board feet

Salvage Sales

Salvage sales included insect kill salvage, roadside hazard sales and combined insect salvage and timber sales. Salvage prescriptions included:

salvage ITM—salvage marking prescription; individual tree and small groups

sanitation ITM—salvage marking prescription (mortality within 5 years)

SSTS—salvage sale and timber sale combined

Table E.2. Past salvage sales from 1980-2006

Project Name (Year)	Volume Harvested (MMBF*)	Prescription
HumBug Insect Salvage (1990-1991)	5	salvage ITM (SSTS)
OverEasy (1990)	3	salvage ITM (SSTS)
ThreeMile Gap Insect Salavge (1990-1991)	7	salvage ITM (SSTS)
Summit Insect (1990-1994)	10	salvage ITM (SSTS)
ThreeMile Rock Insect Salvage (1993-94)	2	salvage ITM
Westside Insect Salvage (1993-1995)	8	salvage ITM
Deek Roadside Hazard Salvage (2004)	1	sanitation ITM
Smitty Roadside Hazard Salvage (2005)	1	sanitation ITM

*MMBF-defined as 1 million board feet

Miscellaneous Projects

These other projects and activities ranged from grazing permittees to public fuelwood sales. The projects included:

Grazing Allotments Humbug, Grizzly Valley, Grizzly Community and Lake Davis

Knutson-Vanderberg (KV) Cultural Projects (1980-2006) Site prep, planting and pre-commercial thinning associated with follow-up silvicultural treatments, post-harvest from timber sale and salvage sale projects.

Small Sale Fuelwood and Sawtimber Projects—**Meadow Enhancement (1980-1990)** Adjacent to FS Road 24N10, the west side of Lake Davis. These projects were designed to remove conifers competition within and encroaching upon meadow ecosystems surrounding Lake Davis.

Public Fuelwood (2001) Permits in Camp 5 Area totaling approximately 400 acres.

Little Summit Lake Post and Pole (1980-2000)

Recreation Facilities Maintenance and Improvements (1980-2006) The facilities included all fisherman road access to the westside of Lake Davis. Included were road definition and location reconstruction, rock surfacing, chip seal and asphalt surfacing, facilities development, road closures, road decommission and relocations.

Public Fuel Wood Permits (1980-2006) The area inside of FS Road 24N10 was restricted from woodcutting unless by special permit or policy, as was permitted for the Camp Five Area. The entire area within the closure was opened for three short time periods under special permit to eradicate the mortality; twice during the late 1980's and early 1990's. It was not feasible to achieve these goals via small commercial timber sales.

Pike Eradication (1997) Rotenone, a commercial fish piscicide, was applied to Lake Davis to eradicate the pike within the lake. The pike were an illegally planted fish species which was decimating the lake trout population as well as posing a risk to trout in the Feather River.

Watershed Restoration Projects Freeman and Cow Creeks (1980-2000) KV Projects included bank stabilization, exclosures to livestock grazing, planting of willows, small fuelwood projects and salvage sales to enhance meadow development, reseeding of disturbed areas and road closure and obliteration of woodcutter access roads into and within sensitive riparian sites.

Present and Future Foreseeable Activities

- Humbug DFPZ timbersale operations
- Long Valley KV
- hazard tree removal project.
- Public woodcutting
- Future Grizz DFPZ Proposed Action
- Treatment to eradicate the Pike from Lake Davis
- Westside Lake Davis Watershed restoration Project
- Grazing would be expected to continue on private and National Forest lands at current levels. Approximately 40 percent of the Humbug Allotment is within the Freemen Creek Watershed. Ninety-five cow-calf pairs are authorized for June to August. One hundred percent of Grizzly Valley is within the Freemen Creek Watershed. Five hundred and five cow-calf pairs are authorized for June to September. Approximately 50 percent of the Grizzly Valley Community Allotment is within the Freemen Creek Watershed. One hundred fifty seven pairs are authorized for June to September. One hundred and twenty pairs are authorized for June to September. The Lake Davis Allotment is within the Freemen Creek Watershed and it is currently vacant.
- Recreational use is expected to continue at current rate.

Extended Boundary

These are past projects (from 1980-2006) or portions thereof extend past the Freeman Project boundary (Table E.4 and Table E.5). Certain resources such as botany and wildlife look beyond the project boundary when doing their cumulative effects analysis.

Green sales

Green sales prescriptions included:

CC - clear cut strip and/or group select harvest

shelterwood - strip and/or group select harvest overstory removal - oldest age class removed, individual tree removal

thinning - thinning from below and maintaining within 20% of existing canopy

aspen enhancement - removing conifers within aspen stand

sanitation - harvest trees with expected mortality within 10 years

Table E.3. Past green project sales in the extended project boundary from 1980-2006

Project Name (Year)	Volume Harvested (MMBF*)	Prescription
Walker Timber Sale (1980-81)	8	*CC, shelterwood, overstory removal*
Midway T.S. (1982-83)	1.9	*CC, sanitation shelterwood*
Long Valley T.S (1981-1987)	8	*sanitation shelterwood,*
Opportunity T.S. (1983-85)	3	*thinning*
Refuge T.S. (1982-85)	8	*CC, shelterwood overstory removal*
Davis T.S. (1987)	5	*CC, shelterwood sanitation*
Emigrant T.S. (1995)	3	*CC, shelterwood, sanitation*
Chance T.S (1996)	3	*thinning*
Cate Place MP Thin (1997)	3	*thinning*
Blakeless MP Thin (1998)	2	*thinning*
Willow Timber Sale (1998)	4	*thinning*
Humbug DFPZ (2003)	3	*thinning*

*MMBF-defined as 1 million board feet

Salvage sales

Salvage sales included insect kill salvage, roadside hazard sales and combined insect salvage and timber sales (Table E.4). Salvage prescriptions included:

salvage ITM—salvage marking prescription; individual tree and small groups

sanitation ITM—salvage marking prescription (mortality within 5 years)

SSTS—salvage sale and timber sale combined

Table E.4. Past salvage sales in the extended project boundary from 1980-2006

Project Name (Year)	Volume Harvested (MMBF*)	Prescription
Walker Salvage (1982)	2	*Salvage ITM, Sanitation ITM*
Summit Salvage (1983)	4	*Sanitation ITM, Shelterwood*
Summit Cull Decks (1984)	0.4	*Cull Log Decks*
Walker Cull Decks (1984)	0.7	*Cull Log Decks*
Blakeless Insect Salvage (1989)	2	*Salvage ITM*
Nye Insect Salvage SSTS (1989)	2	*Salvage ITM*
Cinderella Insect Salvage (1990)	2.5	*Salvage ITM*
Alice Insect Salvage (SSTS) (1990)	2	*Salvage* ITM
Bozo Insect Salvage (SSTS) (1990)	2	*Salvage ITM*
Nye Two Insect Salvage SSTS (1991)	1	*Salvage ITM*
Bozo Two Insect Salvage SSTS (1991)	2	*Salvage ITM*
Cinderella Two Insect Salvage SSTS (1993)	Unknown	*Salvage ITM*
Bozo III Insect Salvage (1994)	1	*Salvage ITM*
Davis Insect Salvage Helicopter (1996-97)	2.9	*Salvage ITM*

*MMBF-defined as 1 million board feet

Misc.

Knutson-Vanderberg (KV) Cultural Projects (1980-2006)

Site prep, planting and pre-commercial thinning associated with follow-up silvicultural treatments, post-harvest from timber sale and salvage sale projects.

Small Sales - Fuelwood, cull deck, green sawlog and salvage projects (1985-1990)

The District Small Sale Program consisted of 3-6 MMBF during 1985-1990. These projects are too numerous to mention by project name. Many were associated with large green projects and smaller areas of insect infestation. After 1990, this Program became focused District Wide, within this Wildlife Extent Boundary.

Present and Future Foreseeable Activities

- Humbug DFPZ timbersale operations
- Long Valley KV
- hazard tree removal project.
- Public woodcutting
- Future Grizz DFPZ Proposed Action
- Treatment to eradicate the Pike from Lake Davis
- Westside Lake Davis Watershed restoration Project
- Grazing would be expected to continue on private and National Forest lands at current levels. Approximately 40 percent of the Humbug Allotment is within the Freemen Creek Watershed. Ninety-five cow-calf pairs are authorized for June to August. One hundred percent of Grizzly Valley is within the Freemen Creek Watershed. Five hundred and five cow-calf pairs are authorized for June to September. Approximately 50 percent of the Grizzly Valley Community Allotment is within the Freemen Creek Watershed. One hundred fifty seven pairs are authorized for June to September. One hundred and twenty pairs are authorized for June to September. The Lake Davis Allotment is within the Freemen Creek Watershed and it is currently vacant.
- Recreational use is expected to continue at current rate.

Appendix F Freeman Monitoring

Introduction

Monitoring activities on the Freeman Project will be a useful tool to land management. Information from monitoring will then guide future activities and/or adjust current management practices. The following efforts will take place on areas deemed to be of particular concern during project development.

Overall goals of monitoring activities will be:

- Provide information useful to mangers applying the principles of adaptive management.
- Assist the public in gauging the success of implementing the resource management activities as designed.
- Assess the effectiveness of the resource management activities in achieving resource objectives.

Programmatic HFQLG monitoring will occur concurrently(USFS HFQLG EIS 1999), testing the effectiveness of the entire HFQLG Pilot Project, of which Freeman is only one project. Since main HFQLG monitoring sites are determined randomly, it is not known yet how many of these sites will be included in the Freeman Project area. Direction for HFQLG Pilot Project monitoring is derived from the HFQLG FEIS, Chapter 6 and the Record of decision (ROD). This monitoring plan is comprised of three parts:

- Part I is the process developed to track viability concerns expressed in the HGQLG ROD.
- Part II (Implementation Monitoring) has three levels of assessment, Ranger District project evaluations, topic specific questions and interagency project reviews.
- Part III (Effectiveness Monitoring) assesses the degree to which implemented resource management activities meet resource objectives.

The following described monitoring activities will address the Purpose and Needs of the Freeman Project. In order to do so, post implementation assessment will be project specific.

Monitoring for Watershed Effects

Implementation and effectiveness monitoring for cumulative watershed effects are currently accomplished through the Best Management Practice Effectiveness Evaluation Process (BMPEEP), developed for Region 5. In this process individual BMPs are evaluated on-site where management practices are installed.

Sampling Design

Sites to be evaluated are identified by random or non-random sampling selection procedures. The random selection process for monitored sites involves looking at projects within the Beckwourth Ranger District. Within the selected project, randomly selected units that meet certain issues deemed appropriate by the hydrologist are then designated for monitoring. If the unit does not require monitoring, another is chosen within the project area. Randomly identified sites are very important for drawing statistical conclusions on the implementation and effectiveness of BMPs.

Non-random selected sites are clearly identified and kept separate from the randomly selected sites by the Forest Hydrologist during data storage and analysis.

Non-random selected sites are identified in various ways:

- Identified as part of a monitoring plan prescribed in an EA, EIS or LRMP.
- Identified as part of a Settlement or Negotiated Agreement.
- Part of a routine site visit.
- Sites that are of particular interest to site administrators, specialist and/or management due to their sensitivity, uniqueness and so forth.
- Selected for a particular reason specific to local needs.
- Units 1, 9, 48, 74, 57 and 78 will be monitored. These units will be subsoiled and receive implementation monitoring post treatment.

California Regional Water Quality Silvicultural Waiver Monitoring

As of January 30, 2003, the State of California Regional Water Quality Board, Central Valley Region, adopted a resolution granting the Forest Service a water quality waiver. In lieu of submitting a report of waste discharge and obtaining waste discharge requirements of timber harvest activities, the Forest Service will, along with other requirements, monitor as required:

BMP implementation and effectiveness monitoring at programmatic level

Project-specific monitoring (Attachment A, CA State Board Water Quality Waiver)

RHCA Monitoring

RHCA monitoring will observe and track sediment transport into streams. Monitoring methods will be similar to BMP Procedure TO1. Two random sample plots per unit would be chosen. Plots would only be placed in the treated portion of the RHCA. There would be a least one sample per 25’, 50’ and 100’ buffer width.

Aspen Unit Treatment Monitoring

Treated aspen units will be monitored for sediment transfer to streams. Like the RHCA monitoring, methods will be similar to BMP Procedure TO1. Sampling plots will be chosen at random.

Effectiveness and Implementation Monitoring for Botanical Resources

Implementation Monitoring

Implementation monitoring will begin in the year following project implementation. The objective will be to answer the following two questions from the HFQLG Monitoring Plan (1999):

- Were TES plants surveyed and protected?
- Were noxious weed introductions prevented and existing infestations suppressed?

Effectiveness Monitoring

Effectiveness monitoring will begin three years after project implementation. The objective will be to answer the following four questions from the HFQLG Monitoring Plan (1999):

- How do TES plant species respond to resource management activities? Randomly selected units without TES plants will also be selected to determine if any new TES plant occurrences have occurred in response to management activities.
- Were existing infestations of noxious weeds eliminated or contained?
- Were all new infestations of noxious weeds eliminated or did some become established?
- Did new infestations of noxious weeds occur during or following project implementation?

A sample pool of botanical sites will be developed to address each of the above questions (Table 2). The number of sites in each sample pool is limited to thirty and if that limit is exceeded then the sites to be monitored will be chosen randomly. If the limit is not reached then every site in the pool will be monitored. The monitoring will be done by forest service botanists who will conduct field visits and record and analyze the results.

This monitoring plan follows the direction of the HFQLG Forest Recovery Act. Monitoring requirements are detailed in Chapter 6, Monitoring Strategy, of the HFQLG FRA Final Environmental Impact Statement.

Table 2. Pool of potential sample sites in the Freeman Project area

Unit number	Prescription	Species	Occurrence Number	Mitigation
53	Mechanical thin	*Astragalus lentiformis*	ASLE 11-054	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036B	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036C	Control Area
72	Mechanical thin	*Astragalus lentiformis*	ASLE 11-036D	Control Area
none	none	*Meesia uliginosa*	MEUL 11-001	Control Area
113	Mechanical thin	*Botrychium minganense*	BOMI 11-002	Control Area
114	Grapple pile	*Botrychium minganense*	BOMI 11-002A	Control Area
114	Grapple pile	*Botrychium minganense*	BOMI 11-002B	Control Area
94	Mechanical thin	*Botrychium minganense*	BOMI 11-003	Control Area
94	Mechanical thin	*Botrychium minganense*	BOMI 11-003A	Control Area
93	Helicopter ITS	*Botrychium minganense*	BOMI 11-003B	Control Area
006	Grapple Pile	*Botrychium minganense*	BOMI 11-004	Control Area
25	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010B	Control Area
25	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010O	Control Area
83	Mechanical thin	*Ivesia sericoleuca*	IVSE 11-010P	Control Area

Implementation Canopy Cover Retention Monitoring

Canopy cover plays a vital role in ecosystem processes and wildlife habitat. The HFQLG standard and guidelines require specific canopy cover management objectives. Implementation of a canopy cover monitoring program will address the needs for guiding adaptive management action. canopy cover monitoring will attend to the following concerns and needs:

- canopy cover will be measured after project implementation to confirm a minimum of 40% canopy cover in DFPZ's, 50% in individual tree selction areas and 60% in riparian habitat conservation areas.
- Provide information useful to managers applying the principles of adaptive management.
- Assess the effectiveness of silvicultural activities in achieving canopy cover objectives.

Canopy cover sampling will be done using the GRS densitometer (Figure 1). This common canopy cover sampling tool is also used by the California Department of Fish and Game. Since our management direction measures wildlife in terms of CWHR specifications set by the California DFG, application of the densitometer will lend to overall consistency in management.

Depending upon the size of the area being surveyed, the number of sample points will vary. The goal of sampling will be to cover an area thoroughly without over-sampling. canopy cover will be calculated using the following formula:

(canopy hits/sample points) * 100 = percent canopy cover

where "canopy hits" is the vertical interception of crown cover with the crosshairs as viewed through the densitometer.

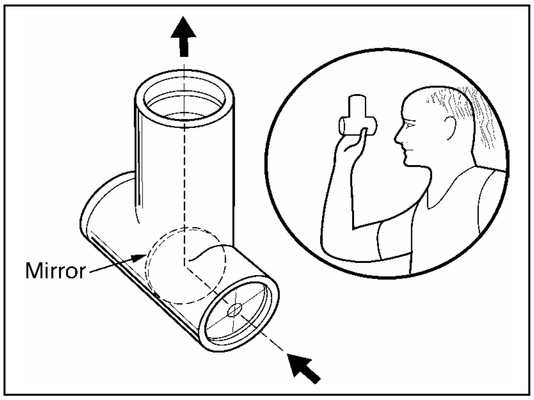

Figure 1. Different perspectives of vertical densitometer

Aspen Effectiveness Monitoring

Aspen effectiveness monitoring will be a useful tool in gauging the success of aspen treatments. Future treatments can either be copied or adjusted, depending on the efficacy of the aspen prescription within Freeman.

Monitoring protocols would mirror those used by the Aspen Delineation Crew in 2005. The crew examined the existing condition of aspen using an analysis done according to US Forest Service Region 5 protocols (USFS 2002). This same analysis would be used to assess the effectiveness of aspen prescriptions in the Freeman Project. If aspen stands show a decrease in the risk of loss (Table F.1.4), it can be interpreted that the prescription is having a positive effect.

Table F.1.4. Factors used by the Aspen Delineation Crew in determining aspen stand loss.

Risk Rating	Defining Factors
Highest	• The clone is being lost from above AND is not being replaced from below. • •Conifer crowns have overtopped the aspen crowns, (primary risk factor) and • •Conifer species comprise at least half the canopy (primary risk factor) and • •Regeneration absent or unsuccessful due to excessive browsing or other factors (primary risk factor)
High	• The clone is being lost from above OR is not being replaced from below
Moderate	• One or more risk factors below is present, but clone not in immediate danger. May include one or more of the factors below: • •Conifer closure > 25%, but < 50% [if > 50%, ranking is High or Highest] • •Aspen cover < 40% • •Dominant aspen are decadent • •Aspen regeneration 5 – 15 ‘ tall is < 500 stems per acre • •Regeneration being excessively shaded by conifers • •Browsing is limiting extent and numbers of successful (> 5’ tall) regeneration
Low	• Clone essentially healthy, either mature trees and /or regeneration for the most part healthy and vigorous, no obvious signs that the clone has receded, < 15% of the clone affected by risk factors.
None	• None of the above risk factors present, mature trees vigorous, regeneration 5–15’ tall ≥ 500 stems.

Range Monitoring

Browsing of aspen by deer and cattle will be part of the aspen monitoring being conducted to confirm achievement of project objectives for aspen regeneration. On a sample basis, aspen browse will be monitored before livestock are turned into the pasture and after livestock are removed from the pasture. If livestock use is shown to increase above the 20% standard from the SNFPA, then timing, season, frequency or intensity of livestock use may be adjusted through adaptive management (FSH 2209.13.92.23b). The exact criteria and steps to follow have not been identified as part of this project.

Implementation Monitoring for Prescribed Fire

Elements that may be measured in prescribed fire monitoring may include the following:

- surface fuels
- canopy base height

- flame length (feet)

These measures relate to fire types (surface, active crown, passive crown, etc.) and allow the fuels specialists to model and predict fire behavior.

DFPZ Maintenance Monitoring

Although the DFPZs were designed to remain effective for 10-years, monitoring will begin no later than 4 years after construction is completed. The monitoring plan would be completed at least every two years thereafter. Results of this monitoring would be available to the public. When surface fuel conditions reach a level of five to seven tons per acre, DFPZ maintenance activities may be necessary

Photo plot monitoring

Plots will be placed in RHCA's, edges of burn units (along roads and lines) and near areas of special resource concern. Private property, archaeological, botanical and wildlife sites are some of the areas of special resource concern. Plots will also be placed near areas with high fuel loading, logs and snags to show fire behavior, consumption and retention.

The Burn Boss and Fuel Officer will determine the photo plot location during burn plan development. GPS will be used to mark and establish plots for photo monitoring. Photos will be taken as the flaming front is passing through the plot area. Different angles might be taken to best illustrate fire behavior. Plots will be revisited one to two days after ignition to compare and contrast consumption and scorch. Revisits to plots will occur one, three and five years after ignition. Photos will be taken to illustrate scorch, mortality and regeneration.

Features that we want to display with photos:

Pre-burn—to show existing fuel conditions.

Photos during ignition - to show fire intensity/behavior.

Postburn—taken 1-2 days post ignition to show burn accomplishments (consumption, scorch)

Postburn—taken 1, 3, 5 years post ignition to show accomplishments and effects of fire behavior. (scorch, mortality, regeneration)

Appendix G Public Response to Comments

Freeman Project Response to Comments on the Draft Environmental Impact Statement

The Council on Environmental Quality (CEQ) regulation 40 CFR 1503.4 states that an agency preparing a final environmental impact statement (EIS) shall assess and consider comments both individually and collectively. The agency shall respond by one or more of the following means:

1. Modify alternatives
2. Develop and evaluate alternatives not previously given serious consideration
3. Supplement, improve, or modify its analyses
4. Make factual corrections
5. Explain why the comments do not warrant further agency response.

All substantive comments received on the draft EIS are included and the comment letters follow the Table.

Comment Coding Structure

As the comment letters were received, each was assigned a number for tracking purposes:

Letter Number	Commenter
1	U.S. Environmental Protection Agency
2	U.S. Department of the Interior
3	Northern Sierra Nevada Air Quality Management District
4	Sierra Pacific Industries
5	Sierra Nevada Forest Protection Campaign
6	Frank Stewart, Counties QLG Forester

Comments from each letter were then sorted by **subject** or resource area (for example, “Fire/Fuels”) and then by **category** (such as “Air Quality”). The comments in each comment letter were numbered sequentially from the beginning of the letter. Each code has the following format:

letter # - comment #

EXAMPLE:

Comment: EPA recommends that the cumulative impact [of all action alternatives on noxious weed invasion], which the DEIS identifies as moderate, be mitigated by reducing the acreage of group selection units where these species will likely become established.

Code: 5.68

Comments were taken from the letters verbatim. If some text needed to be added in order to clarify the intent, it is shown in brackets, as in the example above. Ellipses (. . .) are used if extraneous text was left out.

Master Code List

Subject	Subject Code	Category	Category Code	Definition
Forest Resources	FOR	General	100	General comment
		Canopy cover	101	Specific to canopy cover and crown closure
		Group selection	102	Specific to group selection
		Individual tree selection / area thinning	103	Specific to ITS
		Upper diameter limits	104	Specific to fuel reduction objectives, forest health
		DFPZ / WUI	105	Specific to location, size, adequacy, purpose
		Seral stage / size class	106	Specific to effects on habitat
Wildlife	WILD	General	200	General comment
		TES	201	Specific to TES (includes PACs, SOHA, LOPs, HRCAs), habitat
		Forest carnivores	202	Specific to forest carnivores, habitat / habitat connectivity
		MIS/Neotropical	203	Specific to MIS/Neotropical
Hydrology	HYDRO	General	300	General comment
		Riparian areas	301	Specific to riparian areas, Riparian Habitat Conservation Areas and Riparian Management Objectives
		Watersheds	302	Specific to watershed effects, restoration, Threshold of Concern, Cumulative Watershed Effects
Soils	SOIL	General Soil Disturbance	400	General comment
		Compaction	401	Specific to compaction
Botany	BOT	General	500	General comment
		Noxious weeds	501	Specific to noxious weeds
		TES	502	Specific to TES
Planning/Process	PLAN	General	600	General comment
		NFMA/Forest Plan/Framework	601	Specific to 1988 *Plumas National Forest Land and Resource Management Plan* (Forest Plan) and the 2001 and 2004 Sierra Nevada Forest Plan Amendments (Frameworks) that amend the Forest Plan
		NEPA	602	Specific to NEPA process
		HFQLG	603	Specific to HFQLG Act
		Proposed Action / Alternatives	604	Adequacy, proposes new

		EIS	605	Overall analysis, content, maps, Standards and Guidelines, indicator measures
Fire/Fuels	FUEL	General	700	General comment
		Air quality	701	Specific to effects from treatments (prescribed fire, mechanical treatments
		Air quality standards	702	Meeting or exceeding ambient air quality standards
Social/Economics	ECON	General	800	General economics/social comment
		Sawlog volume	801	Specific to economics of harvest methods
		Use of forest products / biomass	802	Specific to effects on local economy
Other	OTHER	General	900	General comment
		Transportation	901	Specific to system roads, OHV route designation process
		Scenery	902	Specific to scenery/viewsheds
		Recreation	903	Specific to recreation
		Heritage	904	Specific to heritage resources

Table H-1. Forest Service responses to comments received on the Freeman Project Draft Environmental Impact Statement. The comments are arranged by Subject Code then Category Code (see the Master Code List above). “Comment ID” refers to the number assigned to each comment letter followed by the specific comment number.

Subject Code	Category Code	Comment ID	Comment	Forest Service Response
ECON	801	4.04	Sierra Pacific Industry is concerned about the overall economic viability of the project . . . The defensible fuel profile zones and individual tree selection acres have a volume per acre less than 2 MBF . . . Helicopter logging is being proposed on 186 acres averaging less than 2 MBF per acre. The value of the sawlogs generated from these acres will not economically support this expensive harvest method. Units 87 and 93 also require removal of biomass by this harvest method. Yarding biomass with a helicopter cannot be supported by the sawlog value . . . All timber sale contracts require Project Activity l[L]evel Emergency Precautions, which potentially restricts the contractor’s amount of time and productivity for a sale during fire season. The economic analysis provided does not consider the cost implications related to operating a sale with these possible restrictions.	Based on further field review, sawlog volume per acre in the helicopter units would be less than originally estimated; therefore, these units may not be part of any timber sales or service contracts. The Forest Service recognizes that the volume per acre would be low even in the mechanical treatment units, but the treatments would take canopy cover down to the desired and/or minimum allowed. For a discussion of Project Activity Levels (PALs), please refer to the response to Frank Stewart’s comment (6.10).
ECON	801	6.05	What “decisions” regarding the transportation system in this project are being “coordinated” with the ongoing planning for designation of off-highway vehicle routes? What QLG funds are being used for this process . . .?	In an effort to not close roads that are identified in the Off-highway Vehicle (OHV) route designation process as receiving OHV use, the Forest Service is not closing them until after the OHV decision is signed (see footnote #1 in Table B.4 in Appendix B). No Quincy Library Group (QLG) vegetation or fuels funding would be used.
ECON	801	6.08	Are QLG funds being used for the chip seal to enhance the recreational use of 24N10 and 23N10Y at the Camp 5 boat launch facility?	Other sources of funding are planned.
FOR	101	6.01	Page 8, Table S-2: Crown Closure “%” targets should be	The number of acres not meeting the desired canopy cover

Subject Code	Category Code	Comment ID	Comment	Forest Service Response
			included for each alternative under the "Reduce Hazardous Fuels" portion.	for Defensible Fuel Profile Zones (DFPZ) and Area Thin are displayed in Table 2.5 of the Draft Environmental Impact Statement (DEIS). The number of acres meeting the desired condition will be added to the Final Environmental Impact Statement (FEIS).
FOR	101	6.06	Group canopy closure measures are not to be included in DFPZ or ITS units.	The Herger-Feinstein Quincy Library Group (HFQLG) Implementation Team has provided direction that requires canopy cover be calculated by factoring in the groups in the area thinning units and not factoring the groups into the DFPZ units. (April 20, 2005)
FOR	102	4.02	The proposed project has 175 acres identified for treatment using group selection. According to our calculations using a 20-year cutting cycle we estimate that 900 acres could be treated by group selects.	If the Forest Service uses a 20-year cutting cycle, the project would generate approximately 500 acres of groups in the approximate 4,300 acres proposed for mechanical thinning. However, not all of the mechanical thinning would be in commercial-sized stands (average diameter of 12" diameter breast height (dbh) or greater). The Freeman area was heavily salvaged from the late 1980s into the mid 1990s and is already full of small under-stocked patches. These small patches are not factored into the size class designations for the seral stage analysis (in other words, they usually are small enough that a separate stand is not broken out and called size class 0-1). The seral stage analysis done for the project indicates that there is no need for additional early seral habitat, but there is a significant need to develop late seral habitat. The group selections would be placed in areas where there are forest health issues (such as mistletoe, root disease, or bark beetles) to the extent that the Forest Service could make these areas economic to treat as a timber sale.
FOR	103	4.03	The agency may want [to] consider thinning adjacent stands within the project area that contain more volume per acre to help offset the costly low volume per DFPZ and ITS acres.	All stands outside the DFPZ that were not part of Spotted Owl Habitat Areas (SOHAs) or Protected Activity Centers (PACs) that had sawlog-sized trees of sufficient density and

Subject Code	Category Code	Comment ID	Comment	Forest Service Response
				could be accessed for harvest (even by helicopter) were considered for thinning. Some were not treated due to heritage, watershed, or other resource issues.
FOR	104	5.16	The DEIS and Fire and Fuels Report (FFR) do not attempt to justify the Forest Service's assumption that the logging of larger, co-dominant trees (up to 30" dbh) is necessary to avoid stand replacing fires.	Logging of larger codominant trees up to 30" dbh is not necessary to meet fuel reduction objectives; however, the logging of trees between 20" and 30" dbh that are in subordinate crown positions and/or are at high risk of mortality (above those needed for snag recruitment) is necessary to make the project cost effective. Other objectives of the project are to improve forest health and contribute to the economic stability of the community.
FOR	104	5.18	The Forest Service does not provide any explanation why it is necessary to log trees above 20" to improve forest health.	Harvesting trees above 20" dbh that are in subordinate crown classes and/or are at high risk due to disease and insects improves forest health. For more discussion on this subject, see page 108-109 of the FEIS (pages 109-110 of the DEIS).
FOR	105	6.04	Your assumption that DFPZ's are being constructed to prevent ground fires from turning into crown fires within the DFPZ is incorrect. The QLG DFPZ network is being strategically constructed to break up landscape hazardous fuel conditions and bring "oncoming crown fires" to the ground and give safe working locations for fire fighters to initiate fire suppression activities.	The Forest Service agrees with the commenter; however, the statement in the DEIS is not defining what a DFPZ is, but rather it is referring to existing surface fuel conditions and live crown base heights and the potential for a fire to move from the ground surface to the forest canopy under 90th percentile weather conditions.
FOR	105	6.07	What is the reason for separating WUI and DFPZ acres when both the HFQLG Act and Healthy Forest Restoration Act support the acre designation and treatments?	The HFQLG Implementation Team has provided direction that requires the Forest Service to treat the Wildland/Urban Interface (WUI) outside of the DFPZ according to ITS Standards and Guidelines. The WUI is up to 1.5 miles wide while the DFPZ is generally up to 0.5-mile wide. The 2004 Framework modeled treatments in the HFQLG Pilot Project area with the WUI having a 50% canopy cover.

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FUEL	701	1.02	. . . while the DEIS contains information regarding air quality mitigation for prescribed burning (p. 76), there is no information regarding mitigation for air impacts that result from mechanical thinning.	In the FEIS the Forest will calculate and display the smoke related emissions from PM 2.5 by alternative clearly demonstrating the insignificance of the mechanical treatment emissions (FEIS pg. 88-89, 98-103)
FUEL	701	3.02	. . . the District recommends that careful surveillance of smoke generated by the project be performed, in order to document the source of any smoke that may work its way into the Portola or Graeagle area, or any other populated area. This should include written descriptions of smoke behavior and time- and date-stamped photographs from high points on the landscape or aircraft, preferably at least twice per day while burning is taking place.	The Smoke Management Plan included in every Prescribed Burn Plan requires that smoke travel is monitored closely during all phases of the project. Photographs and written descriptions of smoke dispersal are included as part of the monitoring, which is contained in the project record.
FUEL	701	3.03	. . . the District strongly recommends that the Forest Service coordinate early in the planning process with local businesses involved with using woodwaste for power generation or other purposes . . ., in order to make as much waste vegetation available to these businesses as possible. Such methods of disposal . . . result in lower levels of air pollution emissions and are therefore preferable to open burning.	Alternative 4 was designed with the intent of removing more fuels in the form of biomass in order to provide wood waste for power generation and to reduce emissions from open burning. Table 2.5 (under “Cost Effectiveness and Support of Local Communities”) shows the reduction in the amount of pile burning (in acres) and number of piles associated with Alternative 4. Additional text has been added to the “Comparison of Alternatives” section in Chapter 2 and the “Fire, Fuels and Air Quality” section in Chapter 3. DEIS Pg. 119 of the Forest Resources Report discusses generation of power as an advantage of mechanical thinning.
FUEL	702	3.01	The EIS should specifically discuss ambient air quality standards in the area and address the potential and consequences of exceeding them.	See Forest Service Response 1.02. The FEIS also discloses the steps involved in avoiding exceedance that every prescribed burn undergoes.

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HYDRO	301	5.23	Harvest activities in the Riparian Habitat Conservation Areas (RHCAs) are regulated by the direction in the 2004 ROD…The 2004 ROD directs the HFQLG forests to follow the SAT Guidelines as presented in the 1998 QLG ACT and partially represented in Appendix L of the HFQLG FEIS…provide for the removal of timber from RHCAs only when necessary to “acquire desired vegetation characteristics needed to attain Riparian Management Objectives.”…Further, the SAT guidelines explicitly “prohibit scheduled timber harvest” in RHCAs and “prohibit activities…that are not designed specifically to improve the structure and function of the Riparian Habitat Conservation Areas and benefit fish habitat.”... These directives mean that the RHCAs are to be harvested only if that activity maintains or restores the natural structure and function of the area. . . . Alternatives 1, 3 and 4 harvest at an intensity beyond what is necessary to meet the Riparian Management Objectives. A review of the Vegetation Report and Fire and Fuels Report indicates that it is not necessary to reduce canopy to 30% and remove trees over 20” dbh to increase the fire resiliency and reduce stand density of the affected stands. . . . Thus, the objectives supported by the SAT guidelines to increase fire resiliency and improve forest health can be achieved by limiting reduction of canopy cover to 50% and to retaining trees over 20” dbh. . . . SAT requires that Riparian Habitat Conservation Areas be established and that watershed analysis be completed at appropriate scales for habitat protection and restoration. . . . Several subwatersheds in the Freeman DEIS are at or approaching TOC… Val (U) and Cow (U) are at high risk of CWEs. The Freeman DEIS fails to explain how logging in these high risk watersheds will benefit the RHCAs and meet the Riparian Management Objectives in the SAT Guidelines.. above….	Canopy retention in the Riparian Habitat Conservation Areas (RHCAs) would be a minimum of 40% and 60% where available (see page 49 in the DEIS). The inner RHCAs (25’ along each side of the stream channel) would be hand thinned to an upper diameter limit of 8” dbh, beyond the reach of the boom arm and on slopes greater than 15%, except in aspen treatment areas. The rationale for treatment of the RHCAs is provided for in the FEIS, Appendix H. The existing condition prior to treatment is well below threshold. The short-term increase in ERAs resulting from this action would be significantly lower when compared to predicted increases in ERAs resulting from a high-intensity fire, for additional discussion, see the RMOs (Appendix H of the FEIS). A Rapid Landscape Assessment was completed for the project area prior to the development of the Proposed Action. Most of the elements required for a Watershed Analysis were provided for in this document. The rapid landscape assessment formed the foundation for our Proposed Action, Purpose and Need on this project area. In addition, a Draft Watershed Analysis was developed for the watershed and will be finalized prior to the signing of the decision.

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PLAN	601	5.20	The Campaign reiterates its prior comments that the environmental review document must assess an alternative that implements the 2001 ROD standards to determine whether project objectives can be met with less significant impacts on wildlife. . . . The Forest Service’s alternatives analysis establishes a false choice between 3 similar “action” alternatives and no treatment whatsoever. This is not a reasonable approach under NEPA. . . . In response, the DEIS (p. 83) states that an alternative based on the 2001 ROD is not required because this issue is “already decided by law.” The DEIS does not explain how or why an alternative based on the 2001 ROD would be inconsistent with the 2004 ROD, so we cannot respond to this claim in detail. However, with limited exceptions, the QLG pilot project can be implemented consistent with the 2001 ROD. (USDA Forest Service 2001b, p. 50).	The inapplicability of the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) has already been decided (that is why Alternative 9 was not analyzed in detail—see section 2.1.3.5 in Chapter 2 of the Freeman Project DEIS and FEIS). The 2004 SNFPA ROD replaced the 2001 SNFPA ROD in its entirety. The Responsible Official will take into consideration all of the potential effects of the alternatives at the time of the decision. The DEIS (and FEIS) contain two additional action alternatives to the Proposed Action that were studied in detail, as well as a description of five alternatives that were considered but eliminated from detailed study. Therefore, a number of alternatives were considered in the EIS (see Chapter 2). Further clarification has been provided in the FEIS.
PLAN	604	1.01	Alternative 3 would have fewer impacts to habitat, soil resources and watersheds than Alternative 4 while meeting the project’s Purpose and Need.	The comment will be factored into the Deciding Officers decision.
PLAN	605	2.01	[The commenter highlights grammatical and typographical errors only.]	The FEIS corrects these errors.
PLAN	605	5.17	The DEIS and [Fire and Fuels Report] (FFR) reiterate the goal of fire risk reduction, without ever setting forth measurable standards that can be evaluated.	Table 2.5 (“The Freeman Project Purpose and Need and Issues Objectives Comparing Each Alternative and the Proposed Action”), page 64, under “Reduce Hazard Fuels,” does show measurable standards that were evaluated by alternative.
PLAN	605	5.21	In response, the DEIS (p. 82) states that the Forest Service	Further clarification has been provided in the FEIS.

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			has already determined that this alternative does not meet its Purposes and Needs in prior Forest Service projects Happy Jack, Empire and Watdog and that there "was no difference in effects to watershed, wildlife or fuels objectives." There are numerous problems with this analysis.	
PLAN	605	6.13	You need to include the unit numbers with the units. The maps are small and cluttered and a larger scale would help the reader.	The FEIS provides unit numbers on the maps. As noted in the Forest Service scoping letter for the Freeman Project, a larger-scale map is available upon request at the District office.
SOIL	400	4.01	Soil protection measures recommend skid trail spacing would generally average 120 feet center to center.	The DEIS has been revised to state "Generally use skid trail spacing averaging 80 to 120 feet . . ." (see page 539 of the FEIS). This reflects recent discussions held with Forest Service specialists and industry representatives.
SOIL	401	5.25	The Freeman DEIS Soils Analysis p. 338 displays the level of compaction in various unit areas in the project area in Table 3.74. Even with sub-soiling, the level of compaction is significantly higher in several units than the Plumas Forest Plan allows. . . . The DEIS states at p. 337 the historic condition of "three units" (actually it is four units) 1, 9, 48, 74 are over 15% compacted. These same four units remain over 15% compacted post-treatment and two additional units would experience increases of >15% compaction post treatment. This is a violation of NFMA and the existing PNF Forest Plan Soil Quality standards.	Monitoring and mitigation have been added to the FEIS to do additional subsoiling in these units if it is needed (see page 78, 556).
SOIL	401	5.26	All three of the action alternatives involve significant logging (mechanical treatments) in the RHCAs (Alt 1-840 acres; Alt 3-750 acres; Alt 4-747 acres). The DEIS fails to disclose the specific levels of historic compaction in RHCAs	The level of compaction is displayed In the existing condition (Table 3.74). Equivalent roaded acres (ERAs) are analyzed for each alternative, as a measure of loss of hydrologic function resulting from compacted surfaces.

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			or the amount of project-related compaction in the RHCAs under the various alternatives.	Cumulative effects on the RHCAs are reflected in the ERA analysis for sensitive areas (DEIS Table 3.77). Sensitive areas/RHCAs are typically defined as those within 200' of perennial streams; however, to build more sensitivity into the ERA analysis, the assessment focuses on the sensitive areas near the stream channel network, including riparian areas, meadows and wetlands (Page 342, DEIS).
WILD	201	5.01	The Freeman Project is located in the vicinity of Area of Concern (AOC) Nos. 1 and No. 2 for the California spotted owl . . . Any further reduction of habitat in this region thus threatens long term owl viability	The Wildlife Effects of the DEIS Pg. 170 (FEIS Pg. 207) make it clear that the Freeman Project is not located in any Area of Concern(AOC), nor does the Freeman Project have the characteristics described for why an area has been designated an AOC. The AOCs were designated in the California Spotted Owl (CASPO) guidelines, which have been replaced by the Standards and Guidelines of the 2004 SNFPA ROD. AOC 1 is 28 miles to the north of the Freeman Project and AOC 2 is 20 miles to the northwest of the Freeman Project area. This distance is not considered "in the vicinity".
WILD	201	5.02	… there is substantial uncertainty and thus substantial cause for concern regarding the owl's population throughout the Sierra Nevada, within the Plumas National Forest and within the Freeman Wildlife Analysis Area. [The SNFPC noted the history of the petitioning process.]	Although it is true that the United States Fish and Wildlife Service (USFWS) has been petitioned by the commenter to list the California spotted owl, the comment letter does not include the most recent 12-month finding by the USFWS posted on May 24, 2006, in the *Federal Register* (Vol. 71, No. 100, 50 CFR Part 17) which states that "after reviewing the best available scientific and commercial information, we find that the petitioned action is not warranted." And then goes on to state . . . "Existing habitat used by California spotted owls appears to be vulnerable to stand-replacing catastrophic fire. " . . . "However, . . . the best-available data indicate the SNFPA

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				does adequately protect spotted owl habitat while lessening the threat of wildfire and that it includes many restrictions and guidelines that limit the proportion of areas that can be logged.” . . . “On the basis of this review, we find that the listing of the California spotted owl is not warranted at this time because: (1) The best-available data indicate that California spotted owl populations are stationary throughout the Sierras, ... (2) We anticipate that planned and currently implemented fuels-reduction activities in the Sierras . . . will have a long-term benefit to California spotted owls by reducing the risk of catastrophic wildfire... (3) Although survey data for spotted owls in southern California are incomplete, the best-available data do not show statistically significant declines.. . . . “ These findings were published the day that the Freeman Project DEIS was sent to the public for comment; these findings have been incorporated into the Freeman Project FEIS.
WILD	201	5.03	Extensive logging within HRCAs is likely to adversely affect owl reproduction and occupancy. . . . …the Freeman Project proposes to log approximately 630 acres of owl home range core areas. In particular, the Project will reduce suitable HRCA habitat from 597 to 310 acres in PL203, a reduction of 48% and from 476 to 134 acres in PL204, a reduction of 72%. (DEIS, p. 227, Table 3.47.) The remaining suitable habitat in these HRCAs will be 44% (310/700 acres) for PL203 and 17% (775/134 acres) for PL204. . . .	Table 3.46, page 227 in the DEIS shows there is a potential risk to PAC viability/owl occupancy after treating HRCAs. However, it has been determined that the Freeman Project “may affect, but is not likely to adversely affect or cause a trend toward federal listing “ for the spotted owl. For a correct interpretation of the impacts on owl HRCAs, see Table 3.47 on page 227 in the DEIS, (Tables 3.41 and 3.42 Page 201-227 in the FEIS). The Wildlife BA/BE pages 90-94 and DEIS pages 226-232 disclose the effects on owl viability from logging within HRCAs. Specifically, pages 227-228 of the DEIS discuss the analysis and explains the potential high risk to viability.

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			Further, both the DEIS and BE confirm that existing habitat may already be inadequate to support owls in the Wildlife Analysis Area. . . . The DEIS notes that logging within HRCAs and home range areas may increase competition among remaining owl pairs, but offers no analysis of why such loss of quality habitat does not pose a high risk for the owl.	
WILD	201	5.04	The Forest Service dismisses the impacts of harvesting co-dominant conifers between 20-30" dbh. *See* DEIS, p. 82. . . . Similarly, in the Freeman Project, the Forest Service provides no information as to how many larger co-dominant conifers will be removed, except to provide information that over 3,000 acres of suitable habitat will be eliminated.	The information on page 82 of the DEIS addresses alternatives that were dismissed from analysis. The impacts on spotted owl due to changes in structural components caused by fuels reduction treatments are discussed in the DEIS on 224-226 and Table 3.29. Further clarification for why this alternative was not analyzed has been added to the FEIS in the "Alternatives Eliminated from Detailed Study" section (Freeman Project FEIS, Chapter 2). This alternative was analyzed on the Plumas National Forest in both the Watdog Project on the Feather River Ranger District and the Empire Project on the Mt. Hough Ranger District. It was also analyzed on the Beckwourth Ranger District. In all three analyses, it was shown that this alternative would neither meet the purpose of the project nor resolve the need for the project. The alternative would not fully implement fuel treatments to be tested under the HFQLG Pilot Project. The analyses indicated a higher probability of crown fire. It also reduced the economic contribution. And did not allow for the removal of dead and dying trees in that diameter range. Trees in the size range of 20 to 30 inches dbh have over twice the value of smaller trees and much greater board foot volume. Though fewer of these large trees have to be removed compared to smaller diameter trees, they greatly increase the economic feasibility

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				and efficiency of the project by providing much-needed value. The Watdog Project demonstrated an approximate 115 percent loss of net revenues and 50 percent loss in potential job creation under an alternative that proposes a 50 percent canopy cover and a 20-inch dbh limit compared to an alternative that proposes a 40 percent canopy cover and dbh limit of 30 inches. Similarly, the Empire Project showed an approximate 40 percent loss in net revenues and 10 percent loss in job creation. The economic feasibility of the Freeman Project is likewise tied to the removal of trees with a dbh limit of 20 to 30 inches. Furthermore, these analyses indicated that there would be little difference in adverse environmental effects, at a landscape or project area level, in treating stands to 40 percent canopy with a dbh limit of 30 inches versus treating stands to achieve a 50 percent residual canopy cover with a dbh limit of 20 inches.
WILD	201	5.05	. . . because the project implements the 2004 Framework and QLG project, the DEIS (p. 234-235) concludes that the project "would not contribute to a trend toward listing nor cause a loss of viability." . . . Therefore, the fact that this project implements the 2004 ROD in no way ensures the owl's viability. The 2004 ROD and FSEIS did not analyze the site-specific impacts of logging pursuant to the Freeman and similar projects. Rather, the FSEIS deferred detailed analysis of environmental impacts to future site-specific projects, such as Freeman. As discussed above, however, the Freeman Project DEIS does not provide any analysis or basis for why further cutting in critical owl habitat and further reduction of owl habitat home range will not contribute to long term	No activities will occur in PACs and SOHAs, which are the areas historically known to be used by spotted owls. Of the potential suitable nesting habitat, 94%-96% would be retained in the analysis area under all action alternatives. Of the potential suitable foraging habitat, 84%-86% would be retained in the analysis area under all action alternatives. For example, the discussion on page 89 in the BE shows that the total current foraging habitat in the Freeman Project area is 18,684 acres. Of these 18,684 acres, 2,610-3,037 acres (14%-16.3% of 18,684 – see Table 3.44) would be affected (or 84%-86% would not be affected) by proposed treatments. Therefore, this would not contribute to a loss of owl viability under the Freeman Project and is not considered a significant adverse impact. Potential effects of the No-action Alternative are discussed

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			population decline. Given that the analysis in the BE demonstrates the possibility of significant adverse impacts to the owl and its habitat, there is no legitimate basis for concluding that the Freeman Project will not threaten owl viability, despite the fact that it is being carried out pursuant to the 2004 ROD.	in the BE. Fuel loads left untreated, would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire occurred suitable owl habitat could become patchy and could lead to reduced or lower abundance of owls within the Wildlife Analysis Area. The amount of nesting and foraging habitat retained under the action alternatives is above and beyond those acres retained within PACs and SOHAs in the anaylsis areas
WILD	201	6.02	Mr. Steward made several comments that questioned why the Forest Service did not consider thinned stands with 40% canopy cover as suitable owl habitat.	The 40% crown closure is still suitable; however, after the understory structure components are removed, the habitat would be unsuitable. Suitable owl habitat contains three basic components; Canopy cover, multi-layered tree structure and snags & down woody debris. All three of these components need to be retained in order to maintain suitability.
WILD	201	6.03	… Table [S-2.]: You show nesting habitat losses for three critters when in reality it is the development of additional foraging habitat for each of these critters.	The removal of understory structural components from the habitat leads to unsuitable foraging and nesting habitat. See Comment ID 6.02
WILD	201	6.09	What efforts are being undertaken to reduce the number of LOP’s and associated time constraints?	Surveys have been conducted in the project area to minimize the need for Limited Operating Periods(LOPs) during project implementation. At this point, we anticipate that 5 of the 14 LOPs would be necessary. These LOPs are for the spotted owl, northern goshawk, great gray owl, bald eagle and a bald eagle winter roost. These 5 LOPs were mapped and reviewed by contracting personnel and were felt to be feasible.
WILD	201	6.10	In addition to the reduced operating time from the wildlife	The new PAL measures are weather dependent and there

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			species LOP's, what is the operating and cost effect of the new PAL measures on the proposed operations? These operational delay costs must be clearly displayed in the FEIS.	currently is no way to predict the impact.
WILD	201	6.11	Why are you treated PAC's 203 and 204 to the level that owls will abandon them when the HFQLG-Act says to stay out of PAC's? . . . Why are you applying HRCA land designations when the Act only calls for PAC's and SOHA's?	The PACs would not be treated; however, the Home Range Core Areas (HRCAs) surrounding the PACs would be treated, potentially putting the PAC occupants at risk. The Forest Service is disclosing the impacts on HRCAs on a project-specific basis, but it is not applying the Standards and Guidelines of the 2004 Framework for HRCA land allocation. In addition, tracking impacts to HRCAs is needed now for use in assessing impacts to owls once the Act expires.
WILD	201	6.12	I urge you to read the most recent scientific Meta analysis and the Fish and Wildlife Spotted Owl Findings to correctly state the habitat concerns and requirements of the owl.	This new information has been considered in the FEIS.
WILD	202	5.06	. . . habitat changes that would alter the marten's preferred habitat, such as the changes that would result from the Freeman Project, could reduce the marten's range and distribution and lead to local extirpation. . . . Overall, the Freeman will render approximately 3,416 acres of habitat for the marten unsuitable. (DEIS, p. 250). This habitat reduction is particularly problematic given that the marten has not been detected in the project area in recent years, thereby raising the likelihood that this area may presently act as a barrier to habitat connectivity within the Plumas National Forest.	Indeed, 3,416 acres of the 24,826 acres of potential marten habitat could be affected by proposed treatments. However, this amount of affected acres would not lead to local extirpation of a species that is currently not present in the project area. The remaining 21,410 unaffected acres (86.3%) would still provide suitable marten habitat and habitat connectivity to other suitable marten habitat on the Plumas National Forest and other private lands. Pages 250-254 in the DEIS provide detailed discussions on potential effects on the marten, fisher and draft Forest Carnivore Network. Approximately 7,364 acres of suitable Draft Carnivore Network habitat are located within the Wildlife Analysis Area. Depending on which Alternative is chosen, between 692 and 897 acres of suitable habitat in the Draft Carnivore Network would be effected by the Freeman Project (BE/BA

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				Pg. 143).
WILD	202	5.07	. . . the conclusion in the BE (p. 147) that the Freeman Project is not likely to threaten the viability of the marten or contribute to a trend towards federal listing under the Endangered Species Act "is not supported by analysis in the record." (Kucera 2004a, p. 3; *See also* Kucera 2006.)	Page 147 in the Wildlife BA/BE shows that a high percentage of habitat would be retained for the marten (which currently is not present in the project area) and explains that the fuel treatments would contribute to a reduction in habitat loss from wildfire. Page 144 in the DEIS explains that habitat connectivity would be maintained across the Forest. To date across the HFLG pilot area suitable habitat (5M, 5D, & 6) affected amounts to only 1.7%o the habitat available. This amount is minimal and does not pose a risk to Marten viability.
WILD	202	5.08	The Pacific fisher is a forest carnivore that is closely associated with older forests with medium and large trees, dense canopy cover and abundant large snags and down wood. The Freeman Project would degrade fisher habitat by logging medium and large trees, reducing canopy cover and removing large snags and down logs.	The wildlife terrestrial habitat effects from the action alternatives are discussed on pages 195-201 in the DEIS with particular discussion about the specific amounts of existing large trees, snags, large woody debris and canopy cover reductions. The effects to forest carnivore habitat components are discussed on pages 249-252 of the DEIS.
WILD	202	5.09	The DEIS and BE fail to disclose the ecological significance of the project area. The Freeman Project is located just south of Areas of Concern that threaten north-south habitat connectivity for owls, forest carnivores and other sensitive species. Yet the role of the Project and Wildlife Analysis Areas in furthering the necessary habitat connectivity is not provided in the planning documents.	The Forest Service acknowledges that the Freeman Project area is an ecologically diverse area. The proposed DFPZ, group selection and area thinning treatments may not further habitat connectivity in the short term, but would further the protection of habitat from wildfire and improve forest health—both of which would contribute to habitat connectivity over the long term. See pages 195-201 in the DEIS.
WILD	202	5.10	The DEIS and BE fail to include accurate information and analysis regarding the location and amount of suitable spotted owl nesting habitat currently within the project area and the amount that will be rendered unsuitable if the project is implemented.	Please see pages 224-225 and Table 3.44 in the DEIS.

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WILD	202	5.11	The DEIS/BE do not adequately assess the critical factor for owl persistence which is high quality, 5D and 6 habitat, that supporting adult survivorship. . . . In other words, habitat that supports adult survival, not reproduction, is the critical factor for land managers to address.	The Wildlife Analysis Area for the Freeman Project was developed to include owl PACs/SOHAs/HRCAs that would incur potential direct, indirect and cumulative effects on California spotted owl PAC and HRCA distribution. Therefore, the Wildlife Analysis Area for the Freeman Project goes out to and encompasses the closest PACs/HRCAs in the project area. The Wildlife Analysis Area totals approximately 46,039 acres, of which 41,388 acres are National Forest lands. There are a total of 7 PACs/SOHAs/HRCAs included in the Wildlife Analysis Area. Changes to suitable owl habitat, including California Wildlife Habitat Relationships (CWHR) size class 5D, across this analysis area have been disclosed in the Wildlife BE/BA and DEIS. Table 3.31 of the DEIS displays the amount of "Spotted Owl Habitat on National Forest Land by CWHR Type." There are approximately 6,306 acres of CWHR size class 5 in the Wildlife Analysis Area. Table 3.44 displays the effect of the action alternatives on potential spotted owl nesting and foraging habitat. Approximately 94% of the CWHR size class 5 would remain under the preferred alternative. There is no mapped CWHR size class 6 in the project area.
WILD	202	5.12	. . . the Freeman DEIS and BE acknowledge the poor habitat quality for sensitive forest species between owl PACs and SOHAs, yet do not provide adequate information as to overall quality of home range and HRCA habitat for owls existing in the Wildlife Analysis Area.	Table 24 in the Wildlife BA/BE displays the amount of suitable habitat present in the three HRCAs and how the amounts would be modified by each action alternative.
WILD	202	5.13	6. DEIS Fails to Analyze the Significant Impacts to Spotted Owls by Increasing the Presence of Spotted Owl Predators and Reducing Owl Prey Base	Pages 232-237 in the DEIS address the issue of spotted owl predators and its prey base. Barred owls are currently not present in the project area. Great horned owls are present in the project area and may increase, but the response of the

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				great horned owl and spotted owl to treatments is not known. With the growth of early successional habitat (brush and seedlings) following treatment and the retention of downed logs and woody debris, small mammals (such as woodrats) would recolonize the area sooner.
WILD	202	5.14	7. The DEIS Fails to Analyze the Inadequacy of Present Habitat in the Project and Wildlife Analysis Area to Support Martin and Fisher	Pages 182-188 in the DEIS discuss the type of habitat preferred by fisher and marten (that is, “suitable habitat”). There are approximately 25,000 acres of suitable habitat in the Wildlife Analysis Area (see Table 3.36 in the DEIS) to support fisher and 25,000 acres of suitable habitat (see Table 3.37 in the DEIS) to support marten.
WILD	202	5.15	The Freeman Project DEIS and BE do not provide an adequate discussion of the cumulative impacts and location of past, present and planned projects in the vicinity of Freeman [Project] that are likely to affect owl or forest carnivore habitat.	The cumulative effects analysis for each resource was based on the boundary of each specific resource analysis area (which can extend beyond the project area). For example, the Wildlife Analysis Area extends to a point at which no direct or indirect effects would be discernable and would not act cumulatively with other actions. This Wildlife Analysis Area boundary for terrestrial wildlife was delineated based on the potential direct, indirect and cumulative effects on California spotted owl PACs, HRCAs and breeding home range distribution. The Freeman project area encompasses the next outlying HRCA beyond where project activity would occur. See page 29 in the BA/BE. This analysis area was used for all wildlife species since project effects to these species would not be felt beyond this analysis boundary.
WILD	203	5.19	The Freeman DEIS/MIS Report claim that the thinning and fuels reduction treatments will benefit Mule Deer by allowing for increases of brush species as a result of treatments (MIS report p. 12). This is a misleading statement based upon the stated object[ive]s in the DFPZs and GS units in Freeman and throughout the [Q]LG project area.	Mule deer are used as a habitat indicator for early seral shrub habitats. The creation of mule deer habitat is not an objective of DFPZ and groups selections; rather, the creation of habitat for mule deer is a direct result (beneficial effect) of the treatments (including logging, fire, area thinning and group selection). See pages 12-15 in the MIS report. Also refer to

Subject Code	Category Code	Comment ID	Comment	Forest Service Response
			The Forest Service has no quantitative data to document habitat use in the project area for winter range, fawning habitat, summer range, or migration corridors	Table 3.19 of the DEIS. The most current population and trend data available and data from several differing censusing methods have been added to the FEIS in the Chapter 3 Wildlife Section. Habitat trends and use are also discussed, as are the condition of forage and impacts of management actions.
WILD	203	5.22	The Freeman DEIS is flawed in its analysis of direct, indirect and cumulative impacts on gray squirrel (see cumulative impacts discussion below). To analyze the cause and effect of the project to populations of this species, the habitat and population concerns must be address with scientifically sound quantitative analysis and monitoring methodology. There have been no surveys or monitoring (for the woodpecker group) conducted on the Plumas National Forest in spite of the fact that both the SNFPA Section 3.2.3. and the 1999 H-F QLG ROD/FEIS revealed significant habitat declines for several MIS based on the 5-year QLG Pilot Project (Freeman DEIS p. 259; 1999 QLG EIS p. AA-19).	The Woodpecker Group and gray squirrel are not identified as Management Indicator Species (MIS) in the 1988 *Plumas National Forest Land and Resource Management Plan* ("Forest Plan") Appendix G and are therefore not subject to Appendix E of the 2001 Sierra Nevada Forest Plan Amendment (2001 Framework). For the Woodpecker Group and gray squirrel, the Monitoring Plan for the Plumas Forest Plan speaks to monitoring habitat, specifically with regards to meeting Standards and Guidelines for snags and hardwoods and does not discuss monitoring populations of woodpeckers and gray squirrels. The effects of the Freeman Project and subsequently woodpecker species and gray squirrels, are collectively discussed in the Freeman Project Wildlife Supplemental Report.
WILD	203	5.24	II. The Freeman DEIS fails to identify how the project's RHCA logging will benefit these key riparian and aquatic management objectives (particularly #7) since the DEIS lacks specific data on population trend and habitat quality and needs for the aquatic-riparian MIS/SARs in the 2004 SNFPA Appendix E-98 Table 11. The DEIS suggest[s] that Trout/MIS populations suffer from a lack of clean spawning gravels. How will logging in RHCAs improve this existing condition?	The RMO analysis discusses the benefit of doing fuel reduction in the RHCA and will be added to the FEIS (Appendix H). Habitat quality was discussed under the Water Quality section of the DEIS. For further discussion on Trout/Management Indicator Species (MIS) populations, the MIS are being revised and will be incorporated in the FEIS.

Appendix H Riparian Management Objectives

Riparian Management Objectives

In general, the HFQFLG-EIS guidelines prohibit activities within the RHCA unless they are specifically designed to improve the structure and function of the RHCA and benefit fish habitat. The RMOs in Appendix L of the HFQLG-EIS that specifically relate to Hydrology and apply to the construction of the DFPZ and operations within RHCAs are presented below:

The following riparian management objectives would apply to the Freeman DFPZ and GS Project. Under all action alternatives, treatments are proposed within many of the RHCAs. In the discussion that follows, most references to treatment within RHCAs are specifically limited to those treatment areas. No RHCA treatment would occur under the No-action Alternative. Under all action alternatives some level of aspen release would occur. In these stands, conifers less than 30-inches dbh that are encroaching on aspen stands may be removed.

The objective of the RHCA treatments within treatment units is to reduce the potential for adverse impacts from high intensity wildfire. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). These RHCA treatments would provide a safer and more effective fire suppression environment, improve forest health and provide for a more sustainable vegetation condition consistent with protecting and maintaining riparian habitat values, as discussed below. Field surveys were conducted to verify the existence and condition of the streams within units that would be mechanically treated. All RHCA treatments are designed to minimize erosion from soil disturbance and to protect and maintain the riparian vegetation that provides bank stabilization and habitat for wildlife, fish and other aquatic species. The ten riparian management objectives for the Project are discussed below.

1) Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems. Water quality parameters that apply to these ecosystems include timing and character of temperature, sediment and nutrients.

In addition to reducing the risk of high-intensity fires, thinning RHCAs will allow the ecosystem within this corridor to return to a more productive historic condition. Competition between co-dominates and dominant trees will decrease and growth rates will increase while mortality rates decline. Over time, the crowns of larger more fire resistant trees will fill in increasing the necessary shade for temperature regulation. Retaining 60 percent crown cover, where available, along fish baring streams and 40 percent everywhere else except aspen units will maintain adequate cover in the interim.

Thinning which will occur throughout most RHCA's within the project area would encourage forest growth, which would hasten the development of larger trees and the recruitment of large woody debris to stream channels. Large woody debris is generally scarce throughout the RHCA's due to a shortage of old growth vegetation. In addition, thinning overstocked RHCAs can decrease tree mortality. Reducing tree mortality within the RHCA will mean less risk of debris jams. Reducing the quantity of dead and downed trees inside the channel will result in fewer point erosion sources. This point source erosion is caused when hydrologic forces erode the bank around the ends of woody obstructions in otherwise stable channels. Reducing the sources of sediment will have a positive effect on water quality as it relates to turbidity and sedimentation within the channel.

No change is expected in dissolved oxygen levels as they relate to treatments, since any newly created slash would be removed from stream courses within 48 hours after deposition. Thinning RHCAs adjacent to low velocity streams may actually improve oxygen levels by decreasing nutrient overloading from materials decaying in place. All of the streams within the Freeman DFPZ are low velocity. In streams, the consumption of organic matter by bacterial requires oxygen. The amount of oxygen required for bacterial decomposition is the biochemical oxygen demand (BOD), a commonly used measure of water quality. When consumption by bacteria is high, oxygen levels in the water are reduced. When oxygen levels are too low fish and other organisms die.

Where RHCAs would be mechanically treated, ground based equipment would only be used on slopes less than or equal to 15% and on stable soils. Aspen units in RHCAs in Alternative 3 and 4 would have slope restrictions of less than or equal to 35 %. RHCAs with sensitive areas (e.g., springs, bogs, erosive soils, etc.) would not be entered with ground-based equipment. All mechanical equipment would be excluded from within 100 feet (horizontal) of fish baring streams, 50 feet of perennial streams, 25 feet from intermittent and ephemeral streams and 25 feet from all non-fish baring streams within aspen units. These streamside zones would serve as effective filter and absorptive zones for sediment originating from upslope treatment areas. Removal of vegetation within these equipment exclusion zones would be allowed and, would be determined on a site-by-site case to protect the sensitive attributes associated with the riparian area.

No ignition of prescribed fire would occur within 50 horizontal feet of all streams; however, backing fire would be allowed into these areas. Short-term sediment delivery to streams may occur after burning. However, scorched conifers often drop needles following low or moderate severity fires. This needle cast provides ground cover that can help reduce rill and interrill erosion and sediment delivery (Pannkuk and Robichaud 2003). Despite the risk of erosion, the greater long-term benefit of treating these RHCAs is the potential protection from catastrophic wildfire.

Sediment may be reduced due to proposed road activities. Ten miles of roads are proposed for decommissioning. This action would allow vegetative recovery, which can decrease compaction, increase infiltration into the roadbed, increase soil stability and limit concentrated flow as well as surface erosion derived from temporary roads. All temporary roads would be decommissioned after use.

Retention of larger fuels, forest floor cover and deciduous hardwood trees would help maintain the nutrient reservoir stored in organic material.

2) Maintain or restore the stream channel integrity, channel processes and sediment regime under which the riparian and aquatic ecosystems developed. Elements of the sediment regime include the timing, volume and character of sediment input and transport.

In addition to reducing the risk for high-intensity fires, thinning of the RHCA will allow the ecosystem within this corridor to return to a more stable historic condition. Historically woody debris was a combination of large and intermediate logs. Debris jams; especially logjams of small material will alter the natural sediment regime. Small material decays at a faster rate; entrainment of sediments is short term as decaying logs fail. During peak events small material cannot hold sediment in place. Released sediment will affect timing, volume and character of the input. End cutting and scouring within the channel caused by heavy loading of dead and downed material will influence the timing, volume and character of sediment being transported through the system.

Ground disturbance by equipment would be limited because only slopes less than or equal to 15% would be entered with ground-based equipment, except in Aspen units which would be less than or equal to 35% under Alternative 3 and 4. Retention and concentration of large diameter snags within RHCAs would occur. There may be short-term erosion from management activities, as discussed above, with a longer-term reduction in the risk of catastrophic wildfire. Ten miles of roads are proposed for decommissioning/closing, which would reduce erosion into the aquatic system. The green-line characteristics would not be compromised and thus stream channel integrity would be maintained.

3) Maintain or restore in-stream flow to support desired riparian and aquatic habitats, the stability and effective function of stream channels and the ability to route flood discharges.

Thinning of the RHCAs will reduce transpiration and interception. If transpiration is reduced, then runoff and groundwater infiltration could increase. Also interception of rain, snow and the subsequent evaporation effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will initially reduce the interception of precipitation and possibly provide more water to meadows and wetlands. Runoff may increase in the short term. This additional water may increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

The main objective is to reduce the potential for catastrophic wildfire and thus retain the RHCA's desired riparian and aquatic habitats, effective stream channel function and the ability to route flood discharges. In-stream flows would be assessed during equipment operations, with respect to drafting requirements.

Within RHCAs, the green line would be preserved and remain unaffected by harvest activities. Within the immediate riparian areas the physical effects derived from in-channel large woody debris (LWD) would be sustained, as no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers and the snag retention standards for channel morphology, channel function and bank stability.

Most streams within the project area flow into Lake Davis where they become part of the water the feeds the state water project. Water is subsequently released from the reservoir and made available for downstream beneficial use. The effect of water diversion on future instream flow is beyond the scope of this project.

4) Maintain or restore the natural timing and variability of the water table in meadows and wetlands.

Plants are continuously pumping water from the ground to the atmosphere through a process called transpiration. Transpiration is a function of the density, root mass and size of that vegetation. If transpiration is reduced, then runoff and groundwater infiltration could increase. Also interception of rain, snow and the subsequent evaporation effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will provide more water to meadows and wetlands. This additional water will increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

Activities proposed in the project area are not expected to maintain or improve the timing and variability of water tables within meadows and wetlands. All sensitive riparian areas (springs, bogs, wetlands and meadows) would be protected by the SAT guideline buffers and the implementation of BMPs. Wet meadows and green-lines would not be entered. Ground based equipment would only be allowed on stable soils, slopes less than or equal to 15% and non-sensitive locations.

5) Maintain or restore the diversity and productive nature of native and desired non-native plant communities in the riparian zone.

Thinning of conifers and retention of all hardwood species within RHCAs would reduce competition and improve diversity. Within the RHCAs aspen would be released to promote aspen health.

6) Maintain or restore riparian vegetation to provide an amount and distribution of large woody debris characteristics of natural aquatic riparian ecosystems.

Large woody material adds structure to stream channels and creates fish habitat. It also provides habitat for small burrowing mammals and acts as a reservoir, retaining moisture throughout the summer months. This moisture is used by a host of organisms. Another benefit of large woody material is it provides nutrients to the ecosystem over the long term.

Thinning of the RHCAs will return the project area to a level of stocking and health that is more closely related to its natural condition. While biomass volume may be near historic levels, we must recognize that instead of being in the boles of a few large trees it is in numerous small, less fire resistant trees. Removing the ladder fuels will encourage the stand to return to its natural state and greatly enhanced it by reducing competition for nutrients, water and sunlight.

Within treatment units, the objective is to reduce the concentrations of fine fuels. Where down logs exist, 10-15 tons per acre of the largest down logs having diameters greater than 12 inches would be retained. There would be minimal burning of LWD logs greater than 12 inches dbh. Thinning within RHCAs may release the residual conifers and deciduous trees to increase diameter growth. LWD retention standards would be implemented. Potential recruitment of LWD into the stream channel would be retained and enhanced. There would be a reduction in potential catastrophic wildfire and therefore a greater potential of LWD retention. Back burning would occur during times where there is increased moisture, resulting in less LWD consumption. Also, the prescription is to consume the fine fuels- residual fine fuel (less than 3 inches in diameter) would not exceed 5 tons per acre.

7) Maintain or restore habitat to support populations of well-distributed native and desired non-native plant, vertebrate and invertebrate populations that contribute to the viability of riparian plant communities.

Living plants provide erosion control, shade and their root systems create macro-pores increasing infiltration rates. The decomposition of plants and contributes to soil matter and composition, provides nutrients and water storage. During thinning of the RHCAs measures will be applied to insure ground cover levels are maintained and vegetation providing stability to channel banks is not removed. Riparian zones (specifically the green line), springs, seeps and bogs would be identified and protected from harvest activities. Impacts would further be reduced by the application of BMPs and standard management requirements.

Vertebrates that influence the viability of riparian plant communities include pocket gophers, moles, butterflies, bats and ground squirrels. Thinning of the RHCAs will have no detrimental effect on these species, thus their populations will continue to maintain the viability of riparian plant communities.

Invertebrates contribute to the viability of riparian plant communities in many ways. They act as decomposers, shredding dead plant materials and they burrow into woody debris. Invertebrates recycle nutrients and influence soil structure. They improve soil porosity and improve oxygen-penetrating capabilities. To maintain invertebrate populations, compaction will be minimized and ground cover disturbance will be minimized through the use of low ground pressure equipment, hand treatments methods and sub-soiling of skid trails.

8) Maintain or restore riparian vegetation to provide adequate summer and winter thermal regulation within the riparian and aquatic zones.

Summer and winter thermal regulation within the riparian and aquatic zones would be maintained. Trees shading stream channels would not be harvested and canopy cover within the RHCAs would be maintained at 40 percent and would not be reduced below 60 percent along any fish-baring stream. Activities proposed in the project area are not expected to negatively impact riparian vegetation. Group selection harvest would only occur outside of RHCAs.

9) Maintain or restore vegetation to help achieve rates of surface erosion, bank erosion and channel migration characteristics of those under which the desired communities developed.

Riparian vegetation will be protected and maintained while coniferous ladder fuels are thinned. Except at designated crossing stream banks will not be impacted by equipment and it is not expected bank erosion will be accelerated either by equipment or by the implementation of the project.

Thinning RHCA will promote diversity and increase production of riparian communities. Burning of isolated handthin piles will remove groundcover at point locations but soil moving from these points will be trapped by ground cover immediately adjacent to the hand piles.

The maximum erosion hazard for soil types within the project area, ranging from low to very high, suggests that channel development has occurred under significant sediment loads. The riparian green line of stream channels would not be impacted by the proposed management activities and natural recovery processes within the streamside area would help moderate stream temperatures. Riparian vegetation may increase in vigor due to increased water yield and reduced competition by conifers through thinning in the RHCAs. Within the immediate riparian areas, the physical effects derived from in-channel LWD would be retained, as no natural debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function and bank stability, would be encouraged through snag retention requirements and release of existing live conifers.

10) Maintain and restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic ecoregion.

Maintenance of the riparian habitat necessary to foster unique genetic fish stocks will be accomplished by prescribing treatment that will maintain bank stability, ground cover and restrict erosion. In the all action alternatives no mechanical treatment will occur in the first 100 feet of all fish bearing streams.

Short term increase in sediment yields during storm events within the analysis area could reduce available gravels for spawning and, to a minor degree, may alter the composition of aquatic invertebrates in Freeman, Cow and Dan Blough Creeks but it is expected that any change would be minimal and not measurable. It is expected that water temperatures in the intermittent and perennial streams early in the summer would not be affected by project activities, since vegetative shading would not be reduced to detrimental levels within the RHCA's.

It is expected that the alternatives would not have a substantial impact on the fish populations in Freeman, Cow and Dan Blough Creeks. The best opportunity to improve channel conditions and fishery habitat along these streams is through the decommissioning and relocation of roads adjacent to stream channels, stream channel restoration and improved grazing strategies along streams

Appendix I Freeman Project Maps

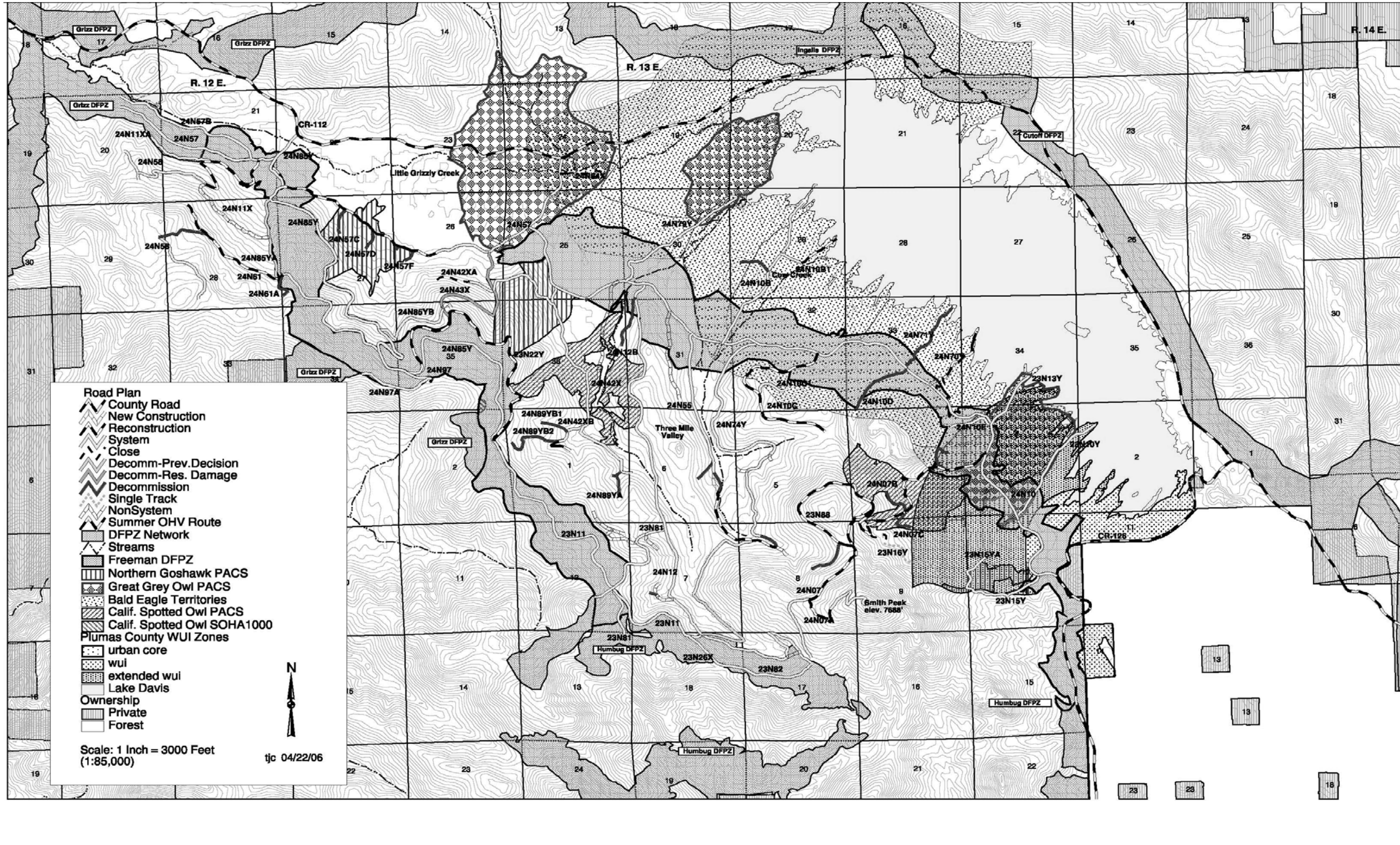

Figure I.1 Freeman Project land allocations

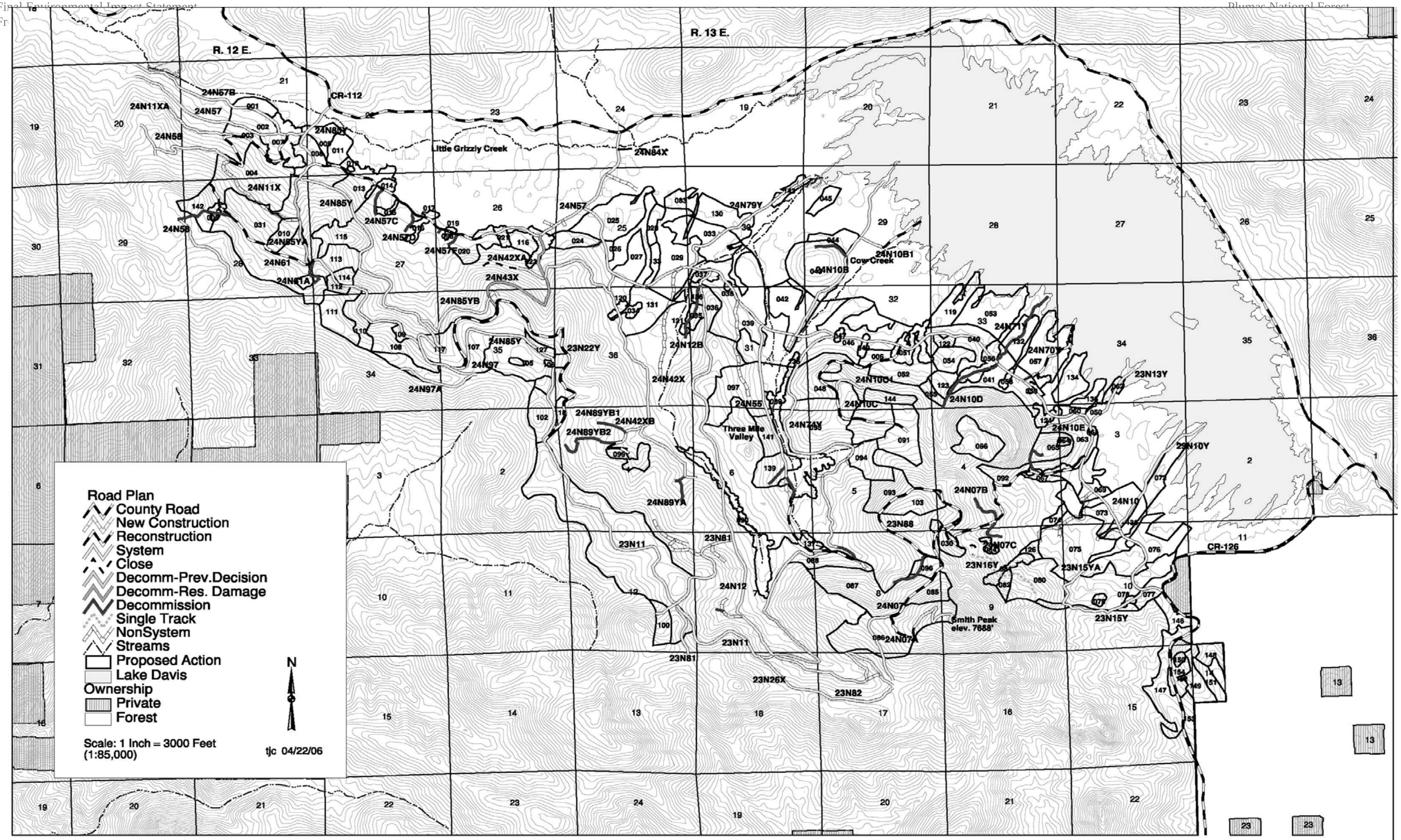

Figure I.2 Freeman Project Proposed Action

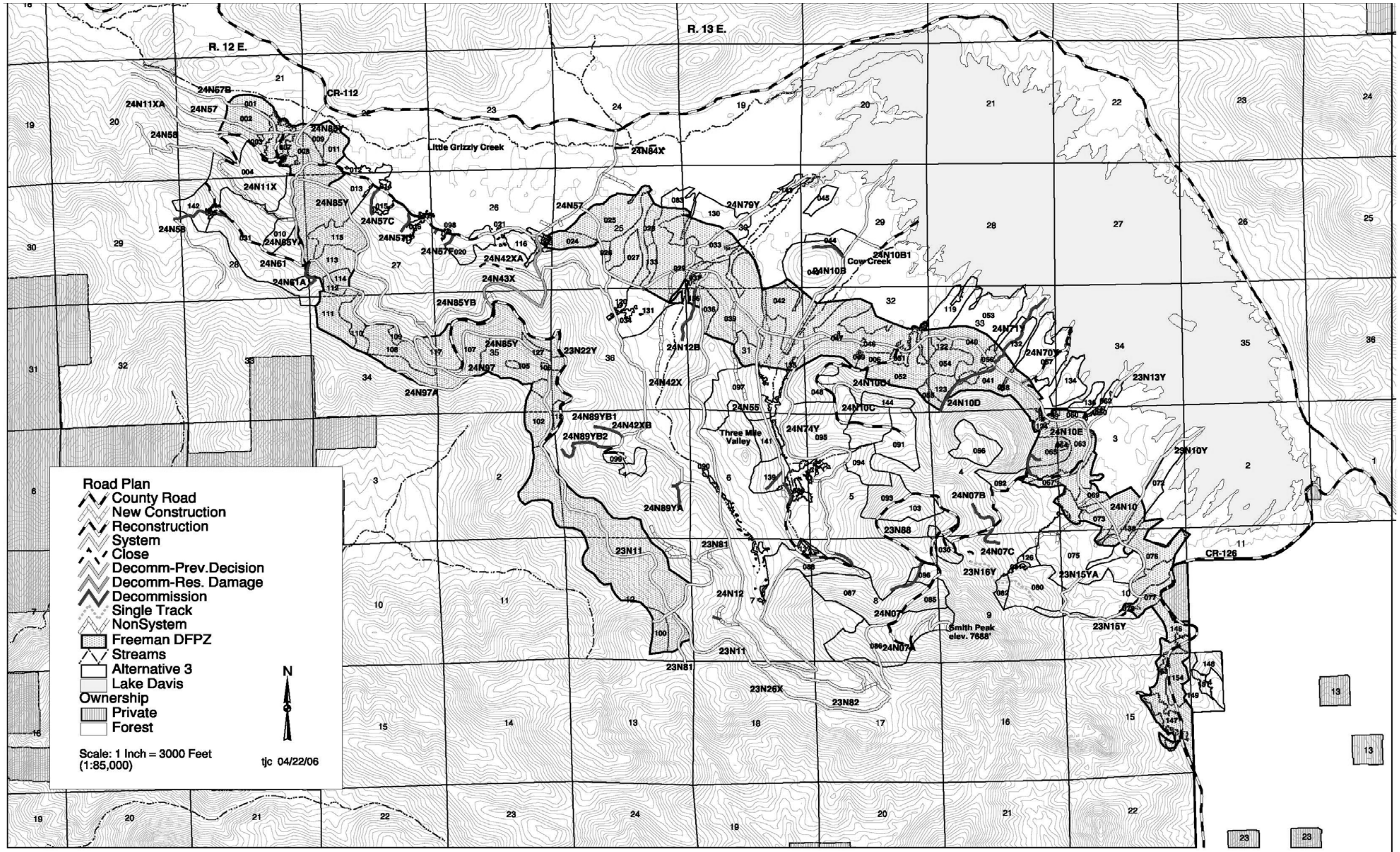

Figure I.3 Freeman Project Alternative 3.

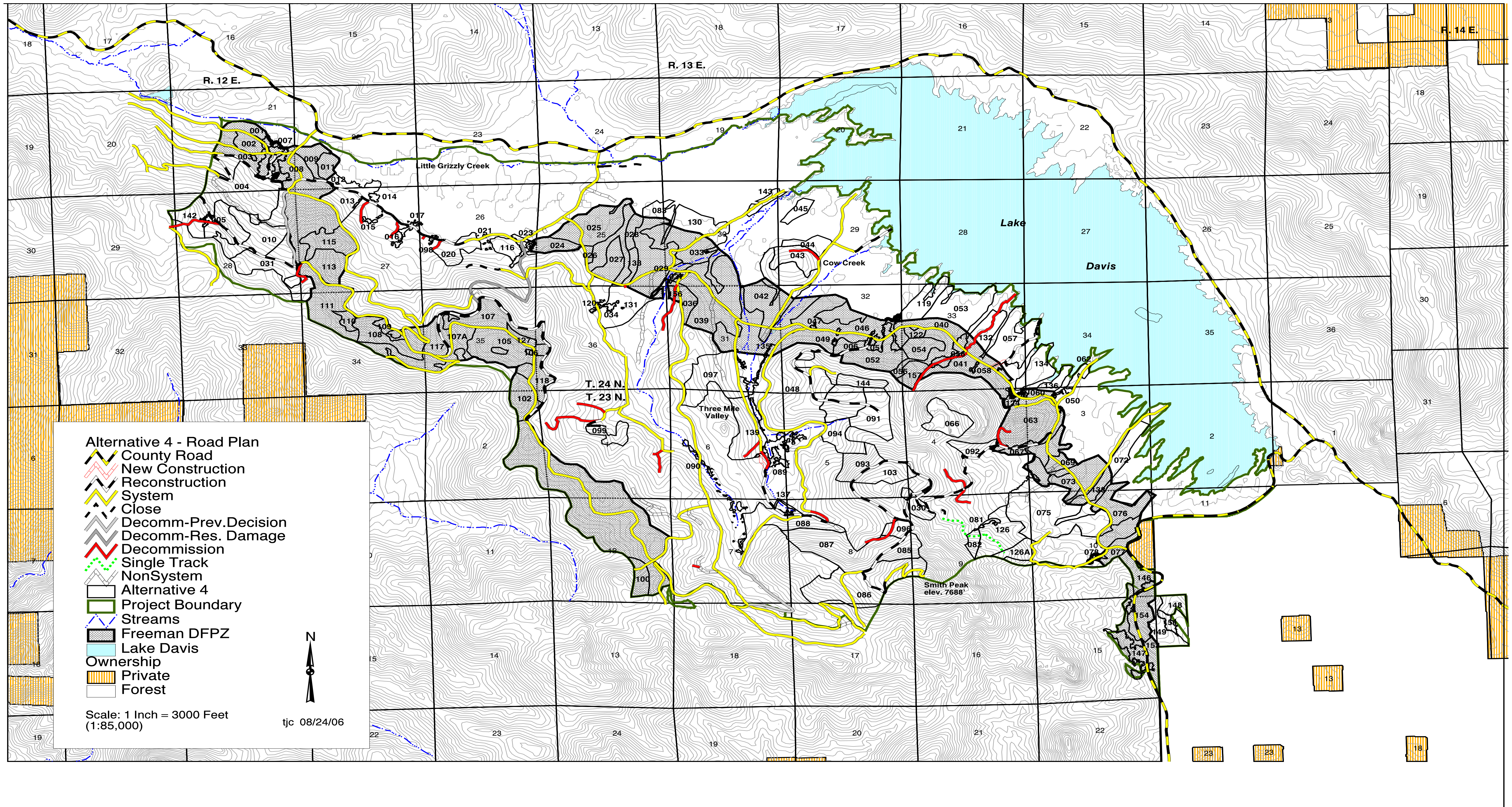

Figure I.4 Freeman Project Alternative 4.

Appendix J Index

DISTRICT HEADQUARTERS
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Mailing Address: P.O. Box 2509
Grass Valley, CA 95945
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email: office@myairdistrict.com or www.myairdistrict.com

NORTHERN FIELD OFFICE
257 E. Sierra, Unit E
Mailing Address: P.O. Box 2227
Portola, CA 96122
(530) 832-0102 / FAX: (530) 832-0101
email: ryan@myairdistrict.com or www.myairdistrict.com

AIR POLLUTION PERMIT

☐ AGRICULTURAL BURNING ☐ RANGE IMPROVEMENT BURNING ☐ WILDLAND VEGETATION MANAGEMENT

☐ FORESTRY MGMNT. BURNING ☐ HAZARD REDUCTION BURNING ☐ LAND CLEARING FOR DEVELOPMENT

FEE AMOUNT________________ ☐ CASH ☐ CHECK #____________ ☐ ________________________________

Permit No.:________________ Date Issued:_________________Expiration Date:___________________

Issued to:____ Phone No.:______________________

Address:____

Location of Burning Site:____T_____R_____S_____

____Drying Time:_______*weeks*

Landowner:____ Phone No.:________________

Distance to Nearest Residence:________ Type of Material to be Burned:___________________________

Tons/acre:______ Total # of Piles:_______ Total Acres Involved:_______ SMP Required:___Yes ___No

Advanced Notice to NSAQMD:___Yes ___No Advance Notice to Local Fire Agency:___Yes ___No

CONDITIONS

The Permittee shall, in addition to all of the conditions detailed on the back of this form, take the following precautions:

Any person who violates Northern Sierra Air Quality Management District Rules and Regulations is guilty of a misdemeanor punishable by imprisonment in the County Jail not exceeding 12 months and/or a fifty thousand dollar ($50,000) fine. The cost of putting out any unauthorized open outdoor fire may be imposed on any person when applicable. I have read and fully understand the conditions of this permit. I understand I could be liable in the event the fire creates a nuisance, a hazard or escapes control. I also understand noncompliance with the conditions of this permit may result in the assessment of penalties pursuant to the California Health & Safety Code §42400 et seq.

Signature:_____________________________________ Issued by:___________________________________

Title:____ Title:_______________________________________

CALL FOR BURN DAY INFORMATION EACH DAY ***BEFORE*** YOU BURN!!

274-7928	582-1027	289-3662	994-3561	832-4528	283-3602	284-6520	258-2588
Western Nevada Co.	*Eastern Nevada Co.*	*Western Sierra Co.*	*Eastern Sierra Co.*	*Portola area*	*Quincy area*	*Greenville area*	*Chester area*

The permittee is responsible for complying with all of the following conditions:

1. This permit is valid only on "Burn Days" as designated by the State Air Resources Board or the Air Pollution Control Officer.
2. The material to be burned shall meet District requirements for minimum drying times. Specifically, 3 weeks minimum for all material and 6 weeks for trees, stumps, and branches greater than 6 inches in diameter.
3. The use of tires for ignition of fires is prohibited.
4. The material to be burned shall be arranged to facilitate efficient burning and shall be free of waste such as tires, rubbish, tar paper, construction debris, and excessive amounts of soil or moist materials.
5. All open outdoor fires shall comply with applicable Local, County, and State regulations.
6. This permit is valid only for the location as specified in the "Location of Burning Site" field on the front of this permit.
7. This permit or a copy thereof shall be available at the burn site for review by any Air District personnel upon request.
8. A responsible party must be in attendance and control of burn at all times.
9. This permit may be revoked or suspended for violation of any conditions of this permit or when it is necessary for public safety.
10. All burns shall be hot, clean and have little to no smoke impact on surrounding residents.
11. Only those burn piles that can reasonably be expected to completely burn within the following 24 hours shall be ignited in any one day.
12. The permittee agrees to extinguish any and all of his burn piles upon the request of any Air District personnel or any Fire Agency personnel.

Pursuant to the California Health and Safety Code §42409, the Northern Sierra Air Quality Management District is publishing and making available a list of potential violations subject to penalties that may be assessed by the District. Additional violations and penalties are as specified in the California Health & Safety Code.

Health & Safety Code §42400 provides (except as outlined in subsequent sections) that any person who violates any provision of Health & Safety Code Part 3, or any order, permit, rule or regulation of the state board, or the District, including the District Hearing Board, is guilty of a misdemeanor and is subject to a fine of up to $1,000 per day or imprisonment in the county jail for not more than 6 months, or both.

Health & Safety Code §42400.1 provides that any person who negligently emits an air contaminant in violation of any rule, regulation or order of the state board or of the District pertaining to emission regulations or limitations is guilty of a misdemeanor and is subject to a fine of up to $25,000 per day, or imprisonment in the county jail for not more than 9 months, or both, with more severe penalties in the case of great bodily injury or death.

Health & Safety §42400.2 provides that any person who emits an air contaminant in violation of any provision of the Health & Safety Code Part 3, or any order, rule or regulation of the state board or the District pertaining to emission regulations or limitations, and who knew of the emission and failed to take corrective action within a reasonable period of time under the circumstances, is guilty of a misdemeanor and is subject to a fine of up to $40,000 per day, or imprisonment in the county jail for not more than one year, or both.

More severe penalties than those listed above may be applied to willful or intentional violations.

A person who owns or operates any source of air contaminants in violation of §41700, Public Nuisance, which causes actual injury to the health and safety of a considerable number persons or the public, is liable for a civil penalty of not more than $15,000. Each day on which a violation occurs is a separate offense.

The recovery of civil penalties pursuant to Health & Safety Code §42402 *et seq.* precludes prosecution for the same offense. When the District refers a violation to a prosecuting agency, e.g. District Attorney, the filing of a criminal complaint requires the dismissal of any civil action for the same offense.

In addition to any civil or criminal penalties prescribed under Health & Safety Code Part 3, the Northern Sierra Air Quality Management District may impose administrative civil penalties (§42402.5), not to exceed $500 for each violation of State or District rules and regulations.

NEPA Status

Categorical Exclusion

Submit the signed, approved Decision Memo and Categorical Exclusion, as well as documentation to support the Categorical Exclusion, including any permits, surveys, and/or reports that have been completed to support this NEPA status.

All NEPA documentation can be found in the NEPA folder on the compact disk that accompanies this application.

Environmental Assessment & Finding of No Significant Impact

Submit the signed, approved Environmental Assessment and Finding of No Significant Impact along with any permits, surveys, and/or reports that have been completed to support this NEPA status.

All NEPA documentation can be found in the NEPA folder on the compact disk that accompanies this application.

Environmental Impact Statement

Submit the Draft and approved, Final Environmental Impact Statement, along with the Record of Decision and any permits, surveys, and/or reports that have been completed to support this NEPA status.

All NEPA documentation can be found in the NEPA folder on the compact disk that accompanies this application.

Decision Notice and Finding of No Significant Impact

for

Ingalls Project Environmental Assessment

USDA Forest Service, Plumas National Forest
Beckwourth Ranger District

Plumas County, California

Location

The Ingalls project area covers 17,909 acres of the Beckwourth Ranger District on the Plumas National Forest. The project area is located northwest of Lake Davis. It is within all or parts of T25 N, R.12 E, Sections 13, 22-28, 33-36, T25 N, R13 E, Sections 30-33, T24 N, R12 E, Sections 1-3, 11-16, and 21-24, T24N, R13E, Sections 3-10, 14-27.

Decision

I have read the Ingalls Project Environmental Assessment (EA), reviewed the analysis in the project record, including documents incorporated by reference, and fully understand the environmental effects disclosed therein. Based upon my review of all the alternatives and the comments received from the public for this project, I have decided to implement Alternative 1. Alternative 1 is described fully in Chapter 2 of the Ingalls Project EA (pages 23-29).

This decision will treat approximately 3,401 acres within defensible fuel profile zone (DFPZ) units, 599 acres within area thin units, 95 acres within aspen units (Table 1) and approximately 44 acres of group selections that fall within mechanical thinning units. This decision will implement the following road treatments: decommission/obliteration (4.8 miles), reconstruction (14 miles) and construction/obliteration of temporary roads (8.4 miles).

Table 1. Summary of actions and acres treated in the Ingalls Project area.

Actions	Acres (approximate)
DFPZ	
Mechanical thinning	1,231
Mastication	166
Grapple pile with hand thin	110
Hand thin with underburn	780
Underburn	343
No treatment	771
Total DFPZ	3,401
Area thin	
Mechanical thinning	599
Total area thin	599
Aspen/cottonwood thin	
Mechanical thinning	95
Total aspen/cottonwood thin	95
Grand Total	**4,095**

Decision Rationale

I considered a number of different criteria when deciding which alternative to select. No single factor or concern entirely prevailed in determining my choice of alternative selection, although certain purpose and need criteria did not differ greatly among alternatives so were not as important when making my decision. The criteria I focused on, because they did differ across alternatives, were the purpose and need criteria related to forest health and fire resiliency, old forest emphasis habitat and associated wildlife species, aspen and cottonwood growing conditions and criteria related to effects to wildlife and hydrology.

I believe Alternative 1 provides a balance in terms of meeting the purpose and need without excessive effects to other resources. Alternative 1 is designed based on recommendations made through group discussions conducted during field visits to the Ingalls Project that centered on creating a healthy fire resilient forest while addressing wildlife concerns, aspen and cottonwood treatments and group selection treatments with interested members of the public. Alternative 1 also addresses off road vehicle (OHV) users concerns regarding road decommissioning.

Overall, my principal aim is the clear need to protect the basic resources, primarily soil, water, wildlife and vegetation from not only the predicted effects of our proposed activities, but also from the potential effects of wildfire. The emphasis on management actions designed to reduce the adverse effects of wildfire in California and throughout the west is emphasized by both national policy and direction. I am all too familiar with the tremendous resource damage and restoration challenges in the aftermath of major wildfires. Any action large enough to truly make a change in the trend of landscape forest conditions will inherently have some short-term and perhaps long-term risks. In the case of this project, I believe the risks have been identified, analyzed and effectively mitigated. I must balance predicted risks and expected benefits. I have decided that on this project the risks are reasonably predictable and can be effectively mitigated. Similarly, the risks associated with wildfire are apparent to me, and that many of the resource impacts caused by wildfire are not easily mitigated or repaired.

Ecological Restoration

In Region 5 of the US Forest Service, the goal of ecological restoration is to retain and establish ecological resilience of lands to achieve sustainable management on our wildlands and forests and to provide for ecologically healthy and resilient landscapes. The goal of ecological restoration is important to me. I believe the activities included in this decision work toward meeting both the project purpose and need and the larger Region 5 goal of ecological restoration. Achieving the purpose and need has been met by working with interested parties using "An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests" (PSW-GTR-220, 2009) as a basis for the design features where consistent with direction in the 1988 LRMP as amended by the 1999 HFQLG ROD and the 2004 SNFPA ROD. The District met with interested parties multiple times throughout the design process. Through this collaboration process the interdisciplinary team incorporated new project design criteria that address ecological restoration across the landscape while creating an effective

DFPZ. The District also collaborated with OHV users to maintain existing opportunities to dispersed camping while mitigating resource needs.

Achievement of Purpose and Need

Strategically Reduce Fuel Loads

This decision will change fire behavior within the DFPZ, increasing our ability to manage fires within the Ingalls Project area. The activities will move the existing conditions toward the desired fuel conditions in areas treated by reducing surface fuels and ladder fuels, raising canopy base heights, and reducing canopy fuels. Fuel reduction treatments will create conditions conducive to reintroducing periodic low-intensity prescribed fire. During 90th percentile weather conditions, implementation of this decision will have raised canopy base height from 6.7 feet to 16.6 feet, reduced expected flame lengths from 9.9 to less than one foot, reduced surface fuels from 20 tons/acre to less than six tons/acre, and reduced expected conifer mortality from 98 percent to less than 10 percent (Ingalls Project EA, page 33).

Implementation of these actions will provide safer locations for firefighters to suppress wildland fire. Implementation of fuel treatments will decrease the risk of fire spread by modifying fire behavior and enhancing the ability of the firefighters to contain, suppress, and control wildfires within and adjacent to the treatment areas (Ingalls Project EA pages 46-52). The treatments within the project area will strategically connect already planned and implemented DFPZs (Freeman, Grizz and Red Clover DFPZs) on National Forest System lands, and further the completion of a DFPZ network on the Beckwourth Ranger District.

Improve Forest Health and Fire Resiliency

This decision will increase stand vigor by reducing competition for limited resources within overly-dense forest stands. Treatments will create a more complex stand structure which focuses on creating variation within and across stands. Activities will be focused on creating structural diversity (varying tree age and size) within stands and across the landscape that provides a variety of wildlife habitat elements, while creating fire-resilient stands. A percentage of smaller trees will be left for diversity, structure, and to provide for the next generation of forest. Preferences for removal of shade tolerant trees that have grown in the absence of frequent fires will provide for a more sustainable species composition. Tree density (basal area and stand density index) will be reduced to a level where stand and tree health will be improved and project activities will move stands toward desired tree species composition and structure (Ingalls Project EA, pages 74-87). By improving forest the risk of high levels of insect-related mortality already seen in the majority of the stands in the Lake Davis area will be reduced.

Provide for Old Forest Ecosystems and Associated Wildlife Species

This decision will focus on promoting old forest ecosystem habitat components for associated wildlife species. Area thin stands within the Ingalls project area are comprised primarily of dense even-aged trees, which do not provide old forest ecosystem habitat components and are at risk of loss to disease/insect infestation. Treatments will focus on promoting structural complexity and improving stand health in order to produce large diameter fire-resilient trees in the future. In general, there will be a small percent reduction in old forest emphasis habitat components in the short term (Ingalls Project EA pages 33-34). However, in the long term treatments are designed to promote large tree growth and structural diversity. Wildlife diversity patches will be located in areas that provide habitat elements for old forest ecosystem wildlife species. In addition, by treating fuels within these stands the risk of losing valuable habitat to wildfire will be reduced.

Improve Aspen and Cottonwood Growing Conditions

This decision will improve aspen and cottonwood growing conditions by removing conifers from aspen and cottonwood stands, thereby increasing light availability and providing the proper growth environment for young aspen and cottonwood. Risk to aspen and cottonwood stands will be lower, overall health of these stands is expected to improve, and conditions for aspen and cottonwood regeneration will be improved (Ingalls Project EA, page 34).

Contribute to the Economic Health and Stability of Local Rural Communities

This decision will provide jobs to the local community and timber products for the local mills. Plumas County's geographic location has historically isolated it from urban job markets. Its reliance on jobs in the woods ties much of the local economy to the proper management of natural resources. The decrease of logging since the mid-1980's has caused the number of sawmills within the area to dwindle from six to one, which is located in Quincy. Alternative 1 is estimated to provide 165 full-time jobs, produce approximately 7.4 million board feet (mmbf) of sawlog volume and generate roughly $6,591,000 in employee-related income (Ingalls Project EA, page 34).

Provide Road Access to Meet Project Objectives while Reducing Transportation System Effects

This decision will reduce transportation system effects within the project area. This decision will decommission segments of existing roads currently causing resource damage, and will help reduce road density, reduce sediment derived from concentrated flow associated with the roads, and enhance infiltration. Activities would improve 14 miles of roads and restore 0.6 acres of hydrologic function (Ingalls Project EA, page 34).

Effects to Other Resources

Alternative 1 will implement a diversity of treatments to modify fire behavior on the landscape as well as improve forest health and fire resiliency, while reducing environmental impacts associated to wildlife and hydrology. Alternative 1 is expected to reduce nesting and foraging habitat of California spotted owl and Northern goshawk (Ingalls Project EA page 34). While there may be short term impacts to these species, treatment designs that enhance structural complexity should provide long term benefits as well as reduced risk of loss due to wildfire. In addition, certain watersheds are over threshold due to many different types of activities occurring within the Lake Davis area. However, mitigation measures are in place to protect soil and water resources (Ingalls Project EA page 167-168, 212-216). While I am aware that project activities present some risk to forest resources, I am committed to implementing protection measures described as part of the proposal for this project. These protection measures are expected to minimize and/or prevent damage to forest resources (Ingalls Project EA pages 31-33, 212-220).

Other Alternatives Considered

Two other alternatives were analyzed in detail for the Ingalls Project. These were the no-action alternative (Alternative 2) and the noncommercial funding alternative (Alternative 3), which was developed based on direction in the Memorandum and Order dated November 4, 2009, United States District Court, during the remedy phase in the complaint of Sierra Forest Legacy vs. Mark Rey. The reasons why Alternatives 2 and 3 were not selected are discussed below.

Alternative 2 (No Action)

I did not choose this alternative because it does not meet the purpose and need for action. It would not enhance the ability of fire management personnel to suppress, control, and contain fires within the Ingalls Project area and could impact wildlife species habitat. This alternative would not provide the connectivity to previously implemented DFPZs: Freeman, Grizz and Red Clover. Firefighter safety would not be improved. Under 90th percentile weather conditions, predicted flame lengths would create a situation where direct fireline attack would be precluded and firefighters would have to employ indirect suppression methods. This would allow fires to become larger, more expensive, and potentially more hazardous for firefighters and the public. In addition, loss of wildlife habitat could impact many wildlife species such as California spotted owl, northern goshawk, bald eagle, great gray owl, etc. This alternative would not: increase forest health or stand resilience to fire, provide for old forest emphasis habitat, improve growing conditions within aspen and cottonwood stands, reduce transportation system effects, or contribute to the economic stability of local rural communities.

Alternative 3 (Noncommercial Funding)

Alternative 3 is described fully in Chapter 2 of the Ingalls Project EA (pages 29-31). These treatments include treating approximately 3,401 acres within DFPZ units with a combination of mechanical thinning (1,231 acres), mastication (166 acres), grapple pile with hand thin (110 acres), hand thin with underburn (780 acres), and underburn only (343 acres). A total of 771 acres would receive no treatment because they already meet desired conditions. Area thin and aspen and cottonwood stands would not be treated. Alternative 3 includes the following road treatments: reconstruct (13.3 miles) and new temporary roads (3.9 miles). No roads would be decommissioned.

Alternative 3 includes treatments to address only the purpose and need for reducing hazardous fuels to modify fire behavior. I did not choose this alternative because it would not fully meet the purpose and need for improving forest health and fire resiliency and improving old forest emphasis habitat. This alternative would not provide the structural diversity of Alternative 1 because it would remove the majority of trees in the understory leaving an evenly spaced stand with trees that are similar in age and size. The resultant stand would not have the characteristics needed for old forest emphasis associated wildlife species. This alternative would not improve growing conditions within aspen and cottonwood stands or reduce transportation system effects because thinning in aspen and cottonwood stands and road decommissioning would not occur in this alternative. Although this alternative could contribute to economic activity within local communities (117 jobs created), this alternative would not achieve the purpose and need of contributing to the stability of local rural communities as well as the selected alternative (165 jobs created) because sawlog volume is greatly reduced in Alternative 3 (1.1 mmbf) compared to Alternative 1 (7.4 mmbf) (Ingalls EA page 96).

Additionally, the ability of the Plumas National Forest (Forest) to fully implement this alternative is questionable. It is important to note that both of the action alternatives would need additional funding to be fully implemented; however, whereas the value of commercial sized material removed through thinning would offset/reduce the cost of implementing most of Alternative 1, the economic value of Alternative 3 is so low that appropriated dollars or grants would be needed to accomplish the work. As more work becomes contingent on these funds, the likelihood of accomplishing proposed activities is greatly reduced. In part my decision not to choose this alternative was based on the lack of certainty that effective treatments could be accomplished within a desirable timeframe.

Conclusion

The focus of Alternative 1 is to implement a diversity of treatments to modify fire behavior on the landscape as well as improve forest health and fire resiliency, while reducing environmental impacts to associated old forest emphasis wildlife species and hydrology. Alternative 1 was designed to provide for old forest ecosystem characteristics by promoting structural complexity across the landscape by incorporating a more restorative thinning prescription. In addition, Alternative 1 improves aspen and cottonwood growing conditions and reduces transportation system impacts. In contrast, Alternative 3 is a thin from below thinning prescription which removes the majority of trees in the understory with an even spacing. This treatment type traditionally does not provide for the structural complexity that many species such as the California spotted owl and northern goshawk need. Alternative 3 would also not treat aspen and cottonwood stands or reduce transportation system effects.

Public Involvement

The "Ingalls Project" first appeared in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) in the 4th quarter, 2009. As required in the Healthy Forest Restoration Act (HFRA) process, the District held a public meeting on November 12, 2009. An announcement was published in the *Feather River Bulletin* and *Portola Reporter* two weeks in advance of the meeting. No comments were received. The District facilitated public collaboration among State and local governments, tribes, and interested persons as follows. The District gave a presentation to the Plumas Fire Safe Council on June 12, 2008 prior to finalizing the Proposed Action, purpose and need. There were two additional group field meetings held with members of Sierra Forest Legacy and Quincy Library Group.

The District started the HFRA (36 CFR 218) public comment process and NEPA scoping process with publication in the *Feather River Bulletin* (and *Portola Reporter*) on May 12, 2010. A detailed scoping letter outlining general existing conditions, proposed treatments, and acres planned for treatments was mailed to 18 individuals, organizations, and government entities. A total of four comment letters were received. The Ingalls project file contains public letters, records of phone calls and visits to the area, mailing lists, and other documentation of the outreach and discussions held with members of the public.

Representatives from the Quincy Library Group, Sierra Forest Legacy, Sierra Pacific Industries and Natural Resource Conservation Service attended an additional public field trip to the Ingalls project area on September 22, 2010. The design of Alternative 1 was a direct result of recommendations made through discussions conducted during field visits to the Ingalls Project that centered on variable density thinning treatments, wildlife concerns, group selection treatments and road decommissioning.

Finding of No Significant Impact

In finding that the Ingalls Project has no significant impact, I looked at the project's effects, both in context and in intensity. I have looked at the action in several contexts such as the affected region, affected interests and the locality. I have addressed the intensity of the project and the extent of its impact. Taking both into consideration, I have determined that there are no significant impacts based upon the following:

a) Context:

The local context of this action is limited to the southeastern portion of the Plumas National Forest, in locations described on pages 11 and 12 of the EA. Proposed treatments focus on reducing surface, ladder, and canopy fuels in order to modify fire behavior, thus reducing fire intensity and fire severity as well as improving forest health by decreasing stand density (trees/acre), improving tree health, growth rates and ability to combat insects and disease by retaining the healthiest fire-resilient trees (Ingalls Project EA, pages 12-14).

The Ingalls Project is part of the larger Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project. The law that authorizes this pilot project was passed by Congress and signed into law by the President in October of 1998. An EIS was completed for this pilot project in 1999, and was supplemented in 2003. The Act limits total acreage affected by resource management activities to about 70,000 acres annually in the pilot project area. The 4,095 acres of treatments proposed for the Ingalls Project, will constitute approximately six percent of the total annual acreage of management activities under HFQLG. For that reason, the scale of the Ingalls Project is not indicative of significant effects, even when considered in terms of local effects within the pilot project area, and even when considered in terms of only one year's program of activities under the pilot project.

b) Intensity:

1) Impacts both beneficial and adverse.

Effects determinations are summarized in the Ingalls Project EA (pages 33-34) and supporting analysis. Both beneficial and adverse effects have been taken into consideration when making the determination of significance. Beneficial effects have not, however, been used to offset or compensate for potential significant adverse effects.

2) The degree to which the proposed action affects public health or safety.

There will be no significant effects on public health and safety because of project specific design features and mitigations and the implementation of standard operating procedures (Ingalls Project EA, pages 194-197, 216).

Access and harvest operations will involve use of mechanical equipment; falling of trees; hauling of harvest products on National Forest System (NFS) roads, county roads, and state highways; and use of prescribed fire, all of which potentially pose risks to workers and to the public. Such risks will be reduced because the public will be alerted to active harvest areas, and haul routes on NFS roads will be clearly signed and monitored as required in contract provisions to warn and protect the public of project activities. Roads within the project area may be closed to the recreating public on a temporary basis for safety reasons. These closures are of limited duration. (Timber Sale Contract Provisions)

The project area lies within the Northern Sierra Air Quality Management District (NSAQMD). In accordance with Title 17 of the California Code of Regulations, a smoke management plan will be submitted to and approved by the NSAQMD prior to any prescribed fire ignitions that are part of this alternative. With adherence to the burn plan including a mandatory smoke management plan (SMP), daily coordination among local fire management officials (Air Quality Management Districts, the California Air Resources Board, the Geographical Area Coordination Center meteorologists and agencies that are conducting prescribed fire operations) and Air Quality Management District requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the Air Quality Management District (Ingalls Project EA, pages 55-60, 212).

Fugitive dust from operations will be mitigated by standard operating procedures and contract requirements for road watering or other dust abatement techniques (Ingalls Project EA, page 216).

3) Unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

There are no parklands, prime farmlands, wild and scenic rivers, or ecologically critical areas within the project area.

The Ingalls Project provides protection to wetlands by implementing Best Management Practices (BMPs). By using BMPs, the Ingalls Project meets the executive orders according to the 2004 Sierra Nevada Framework Forest Plan Amendment Record of Decision (Ingalls EA, page 212-215).

The Ingalls Project will have no significant effect to historic or cultural resources (see #8 below).

4) **The degree to which the effects on the quality of the human environment are likely to be highly controversial.**

The effects on the quality of the human environment are not likely to be highly controversial. Based on comments received during the public involvement process, there is no substantive scientific controversy related to the effects of the proposed treatments on the human environment (Ingalls Project EA, pages 20-21).

5) **Degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.**

The Forest Service has considerable experience implementing the activities in this project. The possible effects of implementing Alternative 1 are neither highly uncertain nor will they present unique or unknown risks. The consequences of these actions are known, as described in each specialist report (Ingalls Project record and summarized in the Ingalls Project EA, pages 33-36).

6) **The degree to which the action may establish a precedent for future actions with significant effects, or represents a decision in principle about a future consideration.**

The Ingalls Project is site-specific and the implementation of this decision will not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration. Any additional resource projects within or adjacent to the project area will require a separate environmental analysis at that time.

7) **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.**

This decision does not represent potential significant cumulative adverse impacts when considered in combination with other past, ongoing, or reasonably foreseeable future actions.

A cumulative effects analysis was completed separately for each resource area. The geographic scope of the cumulative effects analysis area varied among resource areas (Ingalls Project EA, pages 38-40, 46-54, 57-60, 72-73, 85-87, 92, 95-97, 105-108, 110, 117-120, 124, 126, 128-136, 143-148, 164, 167-169, 176-180, 183-184, 186-189, 193, and 195-197). None of the specialists found the potential for significant adverse cumulative effects. A summary of actions considered in each cumulative effects analysis is contained in Appendix C (Ingalls Project EA, pages 221-224). Future maintenance actions will be analyzed separately and site-specifically, in compliance with NEPA.

8) **The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed , or eligible for listing, in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.**

This action will have no significant adverse effect on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or cause the loss or destruction of significant scientific, cultural, or historic properties (Ingalls Project EA, page 193).

9) **The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.**

This action will not adversely affect any endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973 because no federally listed terrestrial, or aquatic wildlife, or botanical species exists within or adjacent to the project area, (Ingalls Project EA, pages 198-199).

10) **Whether the action threatens a violation of Federal, State, or local law or requirement imposed for the protection of the environment.**

The action will not violate Federal, State, and local laws or requirements for the protection of the environment (Ingalls Project EA, pages 238-243).

Findings Required by Other Laws and Regulations

This project was proposed according to management direction provided by the 1988 Plumas National Forest Land and Resource Management Plan (LRMP) as amended by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG FRA) 1999 Final Environmental Impact Statement and Record of Decision (ROD), the 2003 HFQLG FRA Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) Supplemental EIS and ROD (USFS PNF 1988, USFS 1999, USFS 2003, USDA Forest Service 2004). The 2004 SNFPA required that land allocations and application of Standards and Guidelines embodied in the HFQLG ROD be preserved for the life of the pilot project. Planning for this project also involves the use of the Pre-decisional Administrative Review Processes (36 CFR 218) under the authority of the 2003 Healthy Forest Restoration Act (HFRA).

In addition to the FONSI, I find that this project is consistent with the Land and Resource Management Plan for the Plumas National Forest (1988) as amended by the HFQLG Act and the 1999 FEIS ROD and 2003 FSEIS ROD and the 2004 SNFPA ROD. Therefore, this project is consistent with the requirements of the National Forest Management Act of 1976. In addition, the Ingalls Project complies with the Endangered Species Act, and the Clean Water Act (Ingalls Project EA, pages 198-199), and other federal, state, and local laws or requirements imposed for the protection of the environment.

Implementation

Implementation of the decision may occur immediately.

Administrative Review

This project is part of the Herger-Feinstein Quincy Library Group Forest Recovery Act Pilot Project and is being done under the Healthy Forest Restoration Act (HFRA) authority. Therefore, this project decision is not subject to appeal pursuant to 36 CFR Part 215. A 30-day pre-decisional objection period was provided pursuant to 36 CFR 218, ending on September 10, 2011.

On September 9, 2011, Sierra Forest Legacy submitted an objection on the Ingalls Project to Kyla Sabo. This objection was dismissed because it was not filed with the Reviewing Officer (Objection Dismissal Letter dated October 11, 2011).

Contact Person

The Ingalls Project EA and supporting documents are available for public review at the Plumas National Forest, Beckwourth Ranger District, 23 Mohawk Dr., PO Box 7, Blairsden, CA 96103, 530-836-2575. For further information on this decision, contact Kyla Sabo (kylasabo@fs.fed.us), Ingalls Project Interdisciplinary Team Leader at 530-836-2575.

Earl W Ford 10/14/2011

EARL W. FORD Date
Forest Supervisor

Plumas National Forest

United States
Department of
Agriculture

Forest Service
Pacific Southwest
Region 5

August 2011

Environmental Assessment

Ingalls Project

Beckwourth Ranger District, Plumas National Forest
Plumas County, California

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Chapter 1. Purpose and Need

Project Description and Location

The USDA Forest Service, Plumas National Forest (PNF), Beckwourth Ranger District (District) proposes activities to promote healthy, diverse, fire-resilient forest structures, provide for old forest ecosystems and associated wildlife species, improve aspen and cottonwood growing conditions, contribute to the economic health and stability of local rural communities in the northern Sierra Nevada, and provide the road access needed to meet project objectives while reducing transportation system effects. The Ingalls Project area is 17,909 acres with proposed treatments occurring on approximately 4,095 acres (includes no treatment areas that currently meet desired conditions for DFPZs). Activities include mechanical thinning, mastication, grapple piling, hand thinning and underburning in DFPZ and Area Thin treatment units. Also proposed are temporary road construction, reconstruction, decommissioning and obliteration. These actions are part of a broader resource management program, under the authority of the 1988 Plumas National Forest Land and Resource Management Plan (LRMP), as amended by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG FRA) 1999 Final Environmental Impact Statement (FEIS) and Record of Decision (ROD), the 2003 HFQLG FRA Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) SEIS and ROD (USFS PNF 1988, USFS 1999, USFS 2003, USFS PSW 2004). Planning for this project also involves the use of the Pre-decisional Administrative Review Processes (36 CFR 218) under the authority of the 2003 *Healthy Forest Restoration Act* (HFRA).

Following large-scale fires throughout the northern Sierra Nevada, efforts have increased to manage fuel buildup on the District by reducing fuels and introducing fire back into the forest. The 2004 SNFPA and 1998 HFQLG Act directed the establishment of a Defensible Fuel Profile Zone (DFPZ) network, designed to limit the size of large-scale wildfires on the landscape. This DFPZ network extends across the Plumas and Lassen National Forests and the Sierraville Ranger District on the Tahoe National Forest. This project would construct a DFPZ that connects to three previously planned DFPZs: Grizz, Freeman, and Red Clover (Appendix E-2).

The project area is located northwest of Lake Davis within the Beckwourth Ranger District of the Plumas National Forest, Plumas County; the legal description is T. 25 N, R. 12 E, Sections 13, 22-28, 33-36, T 25 N, R 13 E, Sections 30-33, T 24 N, R 12 E, Sections 1-3, 11-16, and 21-24, T 24N, R13E, Sections 3-10, 14-27: Mount Diablo Meridian (Figure 1).

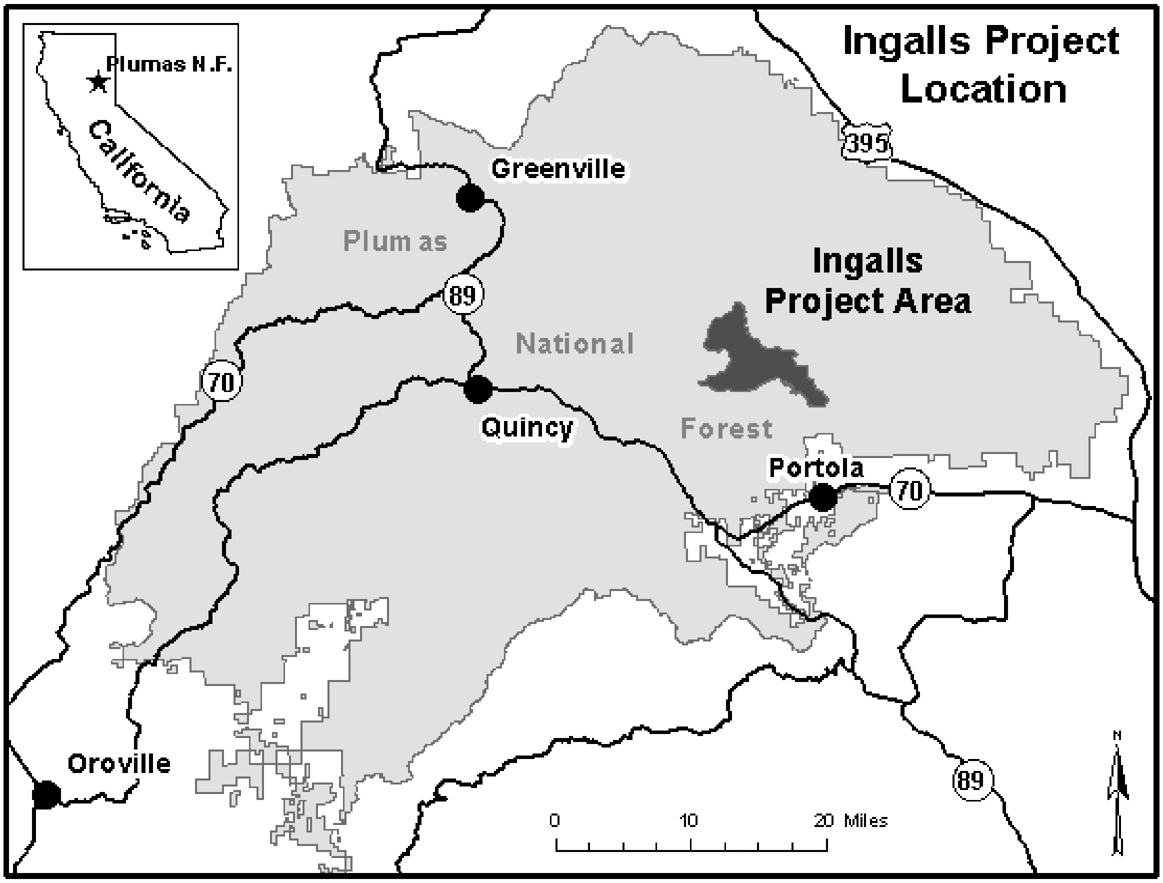

Figure 1. Ingalls Project area within the Beckwourth Ranger District on the Plumas National Forest.

Purpose and Need

Purpose and Need 1: Strategically reduce fuel loads

Objective: Provide connectivity with adjacent DFPZs by modifying surface, ladder and canopy fuels in order to reduce the size, severity and intensity of potential wildfire in the project area, as well as promoting a fire-resilient ecosystem.

Need for Action

The proposed DFPZ locations would provide connectivity to three other DFPZs (Grizz, Freeman and Red Clover) constructing a cohesive network across the landscape. The proposed treatments would modify potential fire behavior by reducing and restructuring surface, ladder and canopy (crown) fuels and promoting a fire-resilient landscape (i.e. open stands, mostly dominated by larger, fire tolerant trees) (Appendix J, HFQLG EIS 1999).

The majority of the Ingalls DFPZ is located on the south facing aspect and ridge top of Turner Ridge near Lake Davis and is in alignment with the prevailing summer wind direction (southwest). This location would provide connectivity to the Grizz and Freeman DFPZs to the west and to the previously implemented Red Clover DFPZ over Bagley Pass in Red Clover Valley. In addition, the location of the Ingalls DFPZ coincides with high recreational use in the Lake Davis area, which has resulted in substantial sources of ignition along County Road 112 and the 28N08 road in the past. Once treated this portion of the DFPZ would provide a safe location for fire fighters to anchor and engage in suppression operations in the event of a fire.

Current forested stand conditions on Turner Ridge consist of moderate to high amounts of surface, ladder and canopy fuels. Existing surface fuel loading across much of the project area would produce flame lengths exceeding the recommended 4-foot flame length. The existing live-crown-base heights are considerably lower than the minimum needed to isolate the tree canopies from surface fire activity. Low crown separation and high tree densities increase the probability of torching of individual trees and subsequent crown fire behavior across stands. The combination of high surface fuel loading, low live-crown-base heights and low crown separation would easily allow a wildfire burning under 90th percentile fire weather to transition from the surface to the forest canopy resulting in rapid large fire growth, moderate to high burn severity and high tree mortality. This would preclude safe, efficient ground based direct attack by wildland firefighters.

Low tree densities and open canopies characterize DFPZ stands located along the base of the slope on County Road 112 on the northeast side of Lake Davis. However, these stands are beginning to experience considerable regeneration and surface fuel build up. In order to maintain DFPZ desired conditions, small diameter trees as well as surface fuels need to be reduced.

Desired Conditions

The desired condition for DFPZ stands would be:

- Reduced surface fuel concentrations to approximately 5 tons per acre (0-1,000 hour fuels (1-4 inches in size)), resulting in shorter flame lengths (< 4 feet); increased fireline production rates for suppression forces, and decreased rate of spread (Appendix J, HFQLG FEIS 1999, 2004 SNFPA ROD).
- Canopy fuels arranged such that the fuel continuity is broken both horizontally and vertically. Horizontal separation of crowns should be sufficient to reduce the potential for crown fire initiation and spread. Vertical separation of the surface and crown fuels, referred to as canopy base height (15-25 feet), would be sufficient to prevent surface fire from igniting the tree crowns subsequently decreasing the likelihood of torching and crown fire initiation (Appendix J, HFQLG FEIS 1999).
- Decreased potential fire intensity and severity thereby decreasing tree mortality (Appendix J, HFQLG FEIS 1999).
- Connectivity achieved with existing DFPZs (Appendix J, HFQLG FSEIS 1999).

Measures of effective fuels reduction include: canopy base height (feet), surface fuels (tons per acre), flame length (feet), percent mortality (%).

Measures of DFPZ connectivity and design placement: topographic placement, road adjacency placement, tie to landscape features (i.e. roads, current vegetation types, rock outcrops), adjacent to planned or existing DFPZs.

Purpose and Need 2: Improve forest health and fire resiliency

Objective: Improve structural diversity and promote the regeneration of shade intolerant and fire resilient tree species to create a healthy, diverse and fire-resilient forest over the project area.

Need for Action

Relative to early historical forest structures, an absence of a natural fire regime and past management practices have left the Ingalls project area with less structural complexity, a greater uniformity in age-classes and an increase in shade-tolerant tree species, such as white fir and incense cedar. Conifer species composition has shifted to favor shade-tolerant species. Fire exclusion has allowed these species to become considerably more abundant and now grow in larger quantities than they did historically, creating dense even-aged stands. These stand conditions can contribute to an increase in competition for limited water, sunlight, and nutrients. Conifers with limited site resources often suffer from a lack of vigor and growth, which can lead to an increase in susceptibility to infestation from insects and diseases, resulting in higher levels than would occur naturally. Currently, DFPZ and Area Thin stands within the Lake Davis Recreation Area are infested with bark beetles and surrounding stands are at high risk to future bark beetle mortality (Cluck 2008). The increase in tree mortality can lead to increasing surface fuel loads, increasing the risk for stand replacement fire.

Desired Conditions

The desired conditions for forest health and fire resiliency would be:

- Increased growth rates by reducing stand densities of intermediate and suppressed trees, leaving residual stands composed of mostly fire-resilient tree species (i.e. ponderosa, Jeffrey and sugar pine, and Douglas-fir).
- Improved forest health by decreasing stand density (trees/acre), by increasing conifer growth rates and ability to combat insects and disease.
- Increased fire resilient tree species regeneration.
- Increased multilayer-canopy and stand size heterogeneity.

Measurement Indicators: Decreased risk of tree mortality (stand density index (SDI), stand basal area (BA), increased tree growth (tree ring width), tree species composition (FVS modeling and trees per acre (TPA) count), tree stand structure (FVS modeling – quadratic mean diameter (QMD), BA, TPA, and canopy cover), insect and disease risk (FVS modeling of risk).

Purpose and Need 3: Provide for old forest ecosystems and associated wildlife species

Objective: Protect, increase and perpetuate old forest ecosystems, habitat components and their associated wildlife species.

Need for Action

Stands in the Ingalls project area (Area Thin units) are comprised primarily of dense even-aged trees, which do not provide old forest ecosystem habitat components and are at risk of loss to disease/insect infestation. Dense stands have little variation in species composition and size, creating homogenous stand structure across the project area. These stands also lack the ability to produce large diameter fire-resilient trees. Stands that do support old forest ecosystem associated wildlife species, such as Northern goshawk, California spotted owl, and great grey owl, are at risk of loss to wildfire, which would result in further fragmenting old forest ecosystem habitat.

Desired Conditions

The desired conditions for old forest ecosystems and associated wildlife species would be:

- Varied stand structure in size and species composition, creating horizontal heterogeneity (2004 SNFPA ROD, pg 41).
- Vertical heterogeneity as a result of multi-tiered canopies consisting of sizes from seedlings to very large diameter trees (2004 SNFPA ROD, pg 41).
- Improved continuity and distribution of old forest ecosystems and habitats as well as associated wildlife species (2004 SNFPA ROD, pg 41).

Measurement Indicators: Changes in old forest vegetation (acres and % remaining), changes in old forest vegetation with regard to associated wildlife species (acres and % remaining on several scales (wildlife analysis area – nesting/foraging, territory – suitable habitat, home range core area (HRCA) – suitable habitat, nest core – suitable habitat, protected activity center (PAC)).

Purpose and Need 4: Improve aspen and cottonwood growing conditions

Objective: Improve aspen and cottonwood growing conditions by releasing aspen and cottonwood stands from conifer competition, as well as stabilizing an eroding stream channel within one of these stands.

Need for Action

Aspen and cottonwood stands located in the Ingalls project area are low in health and vigor as well as productivity, which may be due to one or more of the following factors: past fire suppression, natural succession that favors conifers in the competition for sunlight and moisture, past grazing practices, or human-caused changes to the local hydrologic regime (e.g. roads). Field evaluation indicates that, regardless of the relative contribution of these various factors, competition by conifers is a major factor in the decline of these stands. Reducing the shading effects from adjacent conifers would allow for aspen and cottonwood stand expansion and sprouting leading to an increase in health, vigor and productivity of the stands.

Aspen and cottonwood stands need to be released from conifer competition to create healthier growing conditions and maintain the individual aspen or cottonwood clones.

Excessive streambed and bank erosion is detrimental to riparian aspen and cottonwood stands due to the loss of water table elevation and the subsequent loss of vegetative community types that are dependent upon a stable riparian system. Stabilizing and re-vegetating an eroding stream channel within one of the aspen and cottonwood stands would improve the health, vigor, and productivity of the stand by providing improved growing conditions for young cottonwoods.

Desired Conditions

The desired conditions for aspen and cottonwood stands would be:

- Expansion of aspen and cottonwood stand.
- Increased aspen and cottonwood sprouting.
- Multi-layered, multi-aged aspen and cottonwood canopies.
- Increased health and vigor of the stands.
- Maintained individual aspen and cottonwood clones.
- Improved stream channel stability in the stand.

Measurement Indicators: Ratio of conifers to aspen and cottonwoods in stands and increase in the number of aspen and cottonwood sprouts per acre.

Purpose and Need 5: Contribute to the economic health and stability of local rural communities

Objective: Provide forest products that contribute both directly and indirectly to the local economy, local forest products industry and infrastructure, and subsequently, local community stability.

Need for Action

There are several rural communities within reasonable distance of the project area. These communities are heavily dependent on the forest products industry for jobs and revenues. These communities are isolated from urban job markets, resulting in their reliance on natural resource-based industries. Since the mid-1980’s, the number of sawmills within the geographic area have dwindled from six to two, with one currently located in the Plumas County seat, Quincy, CA and one in Chester, CA. In addition to these sawmills, there are co-generation plants in Quincy, in Loyalton, CA (which is currently closed) and in Wendel, CA (which only takes biomass for the generation of electricity). Previously the co-generation plant in Loyalton was also a log mill that closed in the late 1990’s. The loss of these sawmills has reduced the number of jobs that provide living wages, as well as negatively affected the tax base of Plumas and Sierra Counties. This downturn has also negatively affected local roads and school districts, which rely on timber receipts generated from Federal timber sales. The 1998 HFQLG FRA was passed, in part, to address these economic concerns.

Desired Conditions

The desired conditions for contributing to the economic health and stability of local rural communities would be:

- A continuous, regulated flow of forest products from National Forest System activities, providing for commercial product removal, that contribute both directly and indirectly to local economies.

Measurement Indicators: total number of direct and indirect jobs, sawlog volume (mmbf), total employee related income and cost of implementation.

Purpose and Need 6: Provide the road access needed to meet project objectives while reducing transportation system effects

Objective: Provide an effective and operable road system to meet project objectives while reducing effects on natural resources.

Need for Action

Roads play a vital role in providing access for resource management, as well as public access for recreation use. However, unneeded and poorly located roads can impair and impact watersheds.

In the Ingalls Project area, some roads are narrow and unimproved, making access difficult for commercial logging trucks and chip vans, while other roads within the Project area contribute to erosion and resultant stream channel sedimentation. Roads located near riparian habitat conservation areas (RHCAs) can produce increased peak flows and decrease channel stability. Both sediment loading and the loss of hydrologic function within RHCAs are causing resource damage in the form of degraded water quality, aquatic habitat, and overall watershed health. For example, roads that are identified for decommissioning and/or obliteration are causing resource damage by adding sediment to RHCAs, are dead-end spurs, and/or are interfering with water flow in stream channels. One of the purposes of the HFQLG Act is a program of riparian management and restoration. This includes use of an interdisciplinary process to evaluate each of the HFQLG project areas for potential resource damage caused by roads. The interdisciplinary process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A – Administration of the Forest Transportation System, 16 U.S.C. 551, 23, U.S.C. 205).

Desired Conditions

The desired conditions for providing the road access needed to meet project objectives while reducing transportation system effects would be:

- Access provided for resource management by Forest Service personnel.
- Public access for recreation purposes.
- Decreased number of roads that are causing resource damage.

Measurement Indicators: Miles of improved road, restored hydrologic function (acres).

Laws, Regulations, and Policy that Influence the Scope of this EA

Herger-Feinstein Quincy Library Group Forest Recovery Act (1998)

On October 21, 1998, the President of the United States signed the *Department of the Interior and Related Agencies Appropriations Act*, including section 401—the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an Environmental Impact Statement (EIS), shall conduct a pilot project for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville Ranger District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would balance good silvicultural practices, economic efficiency with ecosystems, watersheds, and other forest resources protections.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts, (extending the HFQLG FRA Pilot Project), and the Healthy Forest Restoration Act (2003)

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA Forest Service 1999). The Record of Decision amended the land and resource management plans for three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG final supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA Forest Service 2003). In February 2003, the *Department of the Interior and Related Agencies Appropriations Act* was signed and extended the HFQLG Pilot Project legislation for another five years. In December 2007, the *2008 Consolidated Appropriations Act* extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the *Healthy Forest Restoration Act (HFRA)* (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the *Omnibus Appropriations Act* amended this, clarifying that Section 106 of the *Healthy Forest Restoration Act* (related to expedited judicial review) *shall* apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) *may* be applied to HFQLG projects.

Sierra Nevada Forest Plan Amendment (SNFPA) ROD and Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA final supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA final supplemental EIS.

The 2004 Record of Decision on the SNFPA final supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These activities are needed in order to limit the potential size of high-intensity wildfires and loss of resources. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are reduced so that large, destructive canopy fires would lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually strategically located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

Forest Plan Direction (1988)

The 1988 *Plumas National Forest Land and Resource Management Plan* (commonly referred to as the "LRMP"), as amended by the 1999 HFQLG final EIS Record of Decision, the 2003 HFQLG FRA Supplemental EIS and ROD and as amended by the 2004 SNFPA final supplemental EIS Record of Decision, guides the Proposed Action and alternatives. The 2004 SNFPA Record of Decision (page 68) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposed project include Off-base and Deferred Lands, late-successional old-growth forest, California spotted owl Protected Activity Centers, and Spotted Owl Habitat Areas and the NFS lands outside these allocations that are available for vegetation and fuels management activities.

Project Schedule

The responsible official expects to make a decision on this project as early as the summer of 2011. Implementation could begin as early as fall of 2012.

Decision to be Made

The Responsible Official for the Ingalls Project would be the Forest Supervisor for the Plumas National Forest. The Responsible Official would decide whether to implement the Ingalls Project as stated in the Proposed Action, as modified by an alternative, or not to implement the project at this time.

Public Involvement and Scoping Issues

Public Collaboration

The District gave a presentation to the Plumas Fire Safe Council as part of the HFRA collaboration process on June 12, 2008. Written comments were received from the Plumas County Fire Safe Council. Comments were considered in the design of the Ingalls Project Proposed Action.

Notice of the pending action first appeared in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) as the "Ingalls Project" in 2009, and has been on each subsequent SOPA. As required by HFRA, the Beckwourth Ranger District held collaborative public meetings prior to the development of the Proposed Action. An open house was held on November 12, 2009 at the Beckwourth Ranger District. No comments were received. A second public meeting on December 12, 2009 at the Eastern Plumas Health Care Education Center was canceled due to bad weather.

There were two additional collaborative meetings held with members of Sierra Forest Legacy and Quincy Library Group. Based on discussion at these meetings, a recent Technical Report "An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests (PSW-GTR-220 2009)" was used for design features, where they were consistent with direction in the 1988 LRMP as amended.

The District started the HFRA 218 objection process and NEPA scoping process with publication in the Feather River Bulletin (and Portola Reporter) on May 12, 2010. The packet was mailed to Native American entities (including federally recognized tribal governments, tribal groups currently applying for federal recognition and Native American organizations/non-profit groups), that are interested in projects that are located on this portion of the PNF. Eighteen Proposed Action description packets (Proposed Action, figures and maps) were sent to various individuals, organizations and government agencies. The scoping period ended on June 11, 2010 (Table 1).

Table 1. People and organizations that provided comments on the proposed action of the Ingalls Project and the date the comments were received.

Entity	Representative	Date Received
Sierra Forest Legacy	David Edelson and Craig Thomas	March 25, 2010
Sierra Pacific Industries	Brian Wayland	March, 16, 2010

QLG Counties' Forester	Frank Stewart	March 13, 2010
Plumas Fire Safe Council	Brian West	March 11, 2010

The purpose of the objection process/scoping process was to inform the public about the Proposed Action, Purpose and Need in order to seek different points of view on the pending actions and issues to be addressed during the project analysis period.

Representatives from the Quincy Library Group, Sierra Forest Legacy, Sierra Pacific Industries and Natural Resource Conservation Service attended an additional collaborative public field trip to the Ingalls project area on September 22, 2010.

Issues

The interdisciplinary team considered the scoping comments to identify potential issues and any potential effects of the Proposed Action. No issues that would drive new alternatives were identified by the team for the project. However, commenters did request consideration of additional alternatives; these are discussed in Chapter 2 of this EA.

Chapter 2. Alternatives, Including the Proposed Action

Contents of Chapter 2

This chapter provides the reader with a detailed description of the Proposed Action, action alternatives, the No Action Alternative and the Alternatives Considered but Eliminated from Detailed Study. Each section illustrates the differences between the alternatives and the issues to which the alternatives respond. In addition to the action alternatives, a No Action Alternative is analyzed to determine the effects of taking no action.

Chapter 2 is organized as follows:

- Alternatives Considered in Detail
- Project Specific Design Features and Mitigations
- Comparison of Alternatives
- Alternatives Considered but Eliminated from Detailed Study

Chapter 2 follows the CEQ regulations 1502.14 for implementing NEPA, which require the Forest Service to rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives. This process was done with resource specialists in an interdisciplinary team (IDT) setting. The IDT discussed the potential benefits and costs of the action alternatives and Alternatives Considered but Eliminated from Detailed Study.

Alternative 1 - Proposed Action

Minor Corrections/Changes to the Proposed Action

On May 12, 2010, the document titled “Ingalls Project Proposed Action” was mailed to the public. Since that time a few changes have been noted in the Proposed Action due to internal clarifications and additional collaborative meetings with the public. These changes are reflected in the Proposed Action (Alternative 1) as follows:

The Proposed Action stated that Group Selection activities would only occur within Area Thin units for a total of approximately 42 acres. This has changed. Group selection activities could occur within both DFPZ and Area Thin units, but not to exceed a total of 42 acres.

The Proposed Action stated that a total of 4,580 acres would be treated across the project area. Within DFPZ units there were 1,641 acres of mechanical thinning, 306 acres of mechanical fuels treatment, 915 acres of underburn, and 1,024 acres of no treatment. Within Area Thin units, a total of 600 acres would be treated with mechanical thin. Within Aspen and cottonwood units, a total of 94 acres would be treated. This has changed as more site specific field evaluations have occurred. Total treatment proposed has decreased to 4,095 acres. Additionally, mechanical fuels treatment has been split into mastication, grapple pile with hand thin, and hand thin options. Table 2 shows the new summary of actions by treatment type.

The Proposed Action stated that a total of 7 miles of system and non-system roads would be decommissioned/or obliterated. This has changed based upon further collaboration with interested parties. In order to enhance recreation opportunities on the Beckwourth Ranger District, the proposed non-system road 111C, with mitigations, would become a system road (0.59 miles). In addition, system road 25N90, previously proposed for decommissioning, would remain open with mitigations. A non-system portion of this road would still be obliterated due to resource concerns.

Alternative 1- Proposed Action

The Proposed Action was designed to meet the Purpose and Need discussed above: 1) strategically reduce fuel loads, 2) increase forest health and fire resiliency, 3) provide for old forest ecosystems and associated wildlife species, 4) improve aspen and cottonwood growing conditions, 5) contribute to the economic health and stability of local rural communities and 6) provide the road access needed to meet project objectives while reducing transportation system effects on resources in the project area. The Proposed Action treatment for DFPZ units includes mechanical thinning, group selection, grapple piling, mastication, hand thinning, underburning and aspen and cottonwood release (Table 2). In addition, some units within the DFPZ would receive no treatment because they already meet desired conditions for the DFPZ. Treatment for Area Thin units (areas outside of the DFPZ) includes mechanical thinning, group selection, underburning and aspen and cottonwood release (Table 2).

In addition to project specific design features and mitigations described with each alternative, the District would implement standard operating procedures (SOPs). SOPs represent standard mitigations intended to minimize potential for adverse resource effects. Area Thin units fall under the Area Thin Standards and Guidelines, as opposed to DFPZ units, which fall under the DFPZ Standards and Guidelines. Aspen treatments are in Riparian Habitat Conservation Areas (RHCAs) which must meet the Riparian Management Objectives (RMO).

Table 2. Summary of actions proposed in the Ingalls Project area.

Actions	Acres (approximate)
DFPZ	
Mechanical thinning	1,231
Mastication	166
Grapple pile with hand thin	110
Hand thin with underburn	780
Underburn	343
No treatment	771
Total DFPZ	3,401
Area thin	
Mechanical thinning	599
Total area thin	599
Aspen/cottonwood thin	
Mechanical thinning	95
Total aspen/cottonwood thin	95
Grand Total	4,095

Reduce fuel loads, improve forest health and fire resiliency, and provide for old forest ecosystems and associated wildlife species

Mechanical Thinning in DFPZ and Area Thin units

Mechanical thinning treatments would include the use of ground-based logging systems on 1,231 acres within DFPZ units and 599 acres within Area Thin units (Table 2). Ground-based logging equipment can treat up to 35% slope. In general, ground-based logging equipment would remove trees under approximately 20 inches dbh using whole tree yarding. Trees that are greater than 20 to 29.9 inches dbh would be hand felled, bucked to log lengths, limbed, topped, and skidded to the landing. No trees 30 inches dbh or greater would be removed except in unavoidable cases for operability and safety.

Variable Density Thinning

Variable density thinning is a compilation of various thinning treatment elements: a) structural thinning b) radial release of fire-resilient legacy trees and c) wildlife structural diversity patches. Each of these elements is described below in more detail. This combination of activities would promote heterogeneity (a mixture of tree sizes) within a stand and across the landscape, as well as increase structural diversity that provides a variety of wildlife habitat elements, while creating a fire-resilient stand. A percentage of smaller trees would be left for diversity, structure, and to provide for the next generation of forest. The variable density thinning action (structural thinning and radial release) would be applied to all DFPZ and Area Thin units. Canopy cover and basal area would be highly variable across treatment units, but would follow the Standards and Guidelines in the 1988 LRMP, as amended by Table 2, 2004 SNFPA ROD. Within the Area Thin units, wildlife structural diversity patches would be established in control areas where no treatment would occur. Wildlife diversity patches would be located in areas that provide habitat elements for old forest ecosystem wildlife species.

Table 3. Design criteria for mechanical thinning (variable density thinning) actions under the Proposed Action.

Criterion	Design
Structural Thinning Prescription	• Healthy fire-resilient tree species (ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir) within all size classes would be preferentially retained. • Thinning would occur through all size classes up to 29.9" dbh to improve stand level heterogeneity. • Basal area would vary across the stand due to the creation of "clumps" and "gaps." Residual basal area densities would vary by stand designation (DFPZ, Area Thin) and ecosystem type (eastside pine, mixed conifer, true fir). • Removal of trees ≥ 30" dbh would not occur, except in unavoidable cases regarding operability and safety due to Occupational Safety and Health Administration (OSHA) regulations. In such instances Forest Service Representative must approve their removal.

Radial Thinning Prescription	• Selection of fire-resilient legacy trees for retention would include the following attributes:
	  • Species preference in order of importance: Jeffery pine, ponderosa pine, sugar pine, Douglas-fir and incense cedar
	  • Trees over 24" dbh would be selected for retention when available
	• Radial thinning distance would vary depending on physical and site attributes such as slope, aspect and soil moisture holding capacity.
	• Trees retained can be either individual trees and/or clumps of trees.

Wildlife Structural Diversity Patches (Area Thin units only)	• Areas would be retained that have the following characteristics:
	  • multi-layer canopies (greater than 2 layers)
	  • all-aged stand
	  • higher percent canopy cover compared to adjacent areas
	  • snags and large woody debris, where possible
	  • vertical and horizontal structural continuity and diversity
	• Control Areas (areas where no treatment occurs) such as RHCAs, equipment exclusion zones, cultural resource sites and botanical areas, would be evaluated for retention characteristics.
	• Patches would not be located within DFPZ units.

Follow-up Fuel Treatments	• Hand thinning, grapple piling, mastication and/or underburning may follow initial treatment, if needed to meet surface, ladder and canopy fuel-reduction objectives.

Grapple Piling, Mastication, Hand Thinning and Underburning in DFPZ units

Grapple piling, mastication and hand thinning would occur on 1,056 acres. Underburning is the only treatment proposed on 343 acres for DFPZ units only (Table 1, Appendix A-2).

Grapple piling is an effective treatment for high surface fuel loads on steep ground (up to 45% slope using tracked equipment). Grapple piling equipment generally involves a tracked excavator that can physically move dead and downed fuels and live brush. In addition to piling surface fuels, live and dead conifer trees <11.9" dbh would be felled by a sawyer and piled with the excavator. In addition, dead and downed material and live brush may also be piled. The excavator would pile material in the treatment unit, which would receive subsequent burning.

Mastication equipment does not remove the material from the site, but rearranges the fuel configuration from ladder fuels to surface fuels. Mastication is a possible alternative, depending on terrain (up to 45% slope) and the existing fuels situations. Mastication involves the chewing or grinding of vegetation, leaving wood chips, which would not exceed 6” in depth. By leaving chips on site, there are no piles to burn and organic material eventually returns to the soil.

Hand thinning treatments would be required in order to limit tree mortality during underburn prescriptions. Trees <8” dbh that are considered ladder fuels would be felled, lopped and scattered. Units would then be underburned.

Table 4 displays the design elements for mechanical fuels treatments and underburning activities for DFPZ treatments for the Proposed Action.

Table 4. Design elements for mechanical fuel treatments and underburning for DFPZs under the Proposed Action.

Criterion	Design
Grapple Piling with Hand Thinning	• Cut conifer trees <11.9”dbh and pile with mechanical equipment. • Pile dead and downed material and live brush. • Piles would be burned • Slopes up to 45% would be treated.
Mastication	• Brush and trees <11.9” dbh would be treated. • Fuel depths would not exceed 6”. • Slopes up to 45% would be treated.
Hand Thinning	• Conifer trees <8” dbh would be felled, lopped and scattered. • Units would be underburned.
Follow-up Fuel Treatments	• Grapple piles would be burned. • Except where prohibited, fire would be allowed to creep between piles during pile burning to provide for a concurrent understory burn • All units would be evaluated for underburning post-treatment.
Underburn Prescription Only	• Stands that already meet DFPZ desired conditions would be evaluated for underburn only.

Group Selection in DFPZ and Area Thin units

Group selection would occur on a total of approximately 42 acres within DFPZ and/or Area Thin units. Each group selection unit would be 1/2 to 2 acres in size. Group selection is an uneven-aged method of regenerating an area. Groups improve diversity, future fire-resiliency, and forest health by reducing the overabundance of white fir in some areas and allowing the re-growth of pine species. Groups would be located in dense white fir stands that are declining in health due to density related tree mortality. Seed trees would be left when they are available and conditions permit for natural regeneration and to maintain some structural diversity within each group. Ground-based logging equipment can treat up to 35% slope. In general, ground-based logging equipment would remove trees under approximately 20 inches dbh using whole tree yarding. Trees that are between 20 to 29.9 inches dbh would be hand felled, bucked to log lengths, limbed, topped, and skidded to the landing. Table 5 displays the design elements for group selection for DFPZ and Area Thin units under the Proposed Action.

Table 5. Design elements for group selection for the Proposed Action.

Criterion	Design
Group Selection Prescription	• Size 0.5 to 2 acre openings • Remove all trees up to 29.9" dbh, except for potential seed sources of fire resilient tree species to help enhance natural regeneration (sugar pine, ponderosa pine, Jeffery pine). • Removal of trees ≥ 30" dbh would not occur, except in unavoidable cases regarding operability and safety due to Occupational Safety and Health Administration (OSHA) regulations. In such instances Forest Service Representative must approve their removal.
Group Selection Locations	• Soils capable of supporting conifer regeneration. • Groups would be restocked if they have not reforested within 5 years naturally. • Groups would be located within white fir stands or target pockets of pest and/or disease. • Groups would not be located within riparian habitat conservation areas (RHCA). RHCAs are described in the SOPs, consistent with the HFQLG 1999 FEIS.

Improving Aspen and Cottonwood Growing Conditions

The Proposed Action would treat approximately 95 acres within DFPZ and Area Thin units of aspen and cottonwood stands to improve growing conditions. Within the Ingalls Project, there are two types of aspen/cottonwood stands: meadow fringe aspen communities and riparian aspen communities (Sheppard et al. 2006). Conifer removal would occur within the existing stand (i.e. those trees actively suppressing community productivity and function) and include trees 1 to 1 ½ tree heights past the aspen and/or cottonwood root zone, but treatment would vary depending on the type of aspen/cottonwood stand. Table 6 displays the design elements for improving aspen and cottonwood growing conditions under the Proposed Action.

Currently there are a series of head cuts, gullies and areas of streambank instability within Aspen Stand 003. The proposed treatments include armoring the head cuts with rock and filling in the new channel in the streambed with on-site fill material and sloping upward towards the head cut from downstream in order to dissipate energy coming over the head cut. Vertical banks may be re-contoured to expedite the natural process of vertical banks eroding until they reach the natural angle of repose. In addition, willow and cottonwood plugs could be collected from the surrounding area in channel and adjacent to the channel and transplanted into denuded re-sloped streambanks. Where needed, banks would be seeded and mulched with weed-free straw or covered with erosion cloth blankets.

Table 6. Design elements for aspen and cottonwood treatments under the Proposed Action.

Criterion	Design
General Aspen/Cottonwood Prescription	• Conifers up to 20" dbh may be removed using whole tree yarding. Conifers 20-29.9" dbh may be hand felled, bucked and endlined. • Follow-up hand thinning could occur. • Canopy cover restrictions would not apply. • Conifers (<11.9" dbh) located with RHCA/SMZ equipment exclusion zones would be hand thinned, piled and burned. • Cottonwood plugs could be planted following thinning work.
Meadow Fringe Aspen/Cottonwood Type (units 37, 38 and 39)	• Conifers could be removed within the stand and within the extended treatment zone extending up to 1 to 1 ½ aspen tree heights past the root zone. The root zone would be determined by locating the furthest location of suckers.
Riparian Aspen/Cottonwood Type (Units 3, 5, 8, 9, 12,19 and 41)	• Conifers could be removed within the stand and within the extended treatment zone extending up to 1 to 1 ½ aspen tree heights from existing aspen trees within the stand.
RHCA/SMZ Constraints	• A no-equipment exclusion zone (15 feet wide) would be established along each side of the stream channel to ensure no disturbance to bank stability. Equipment may be positioned outside of the buffer and harvest/gather material via an extendable harvest arm attachment. • Conifers providing bank stability would not be removed regardless of species. • Crossing stream channels with mechanical equipment would be allowed under special circumstances and with coordination between the hydrologist and Forest Service Representative. If a stream channel is crossed, the contractor would be required to return the channel banks back to their natural contour. • Landings would be located outside of the stand perimeter and RHCAs whenever possible.
Follow-up Fuel Treatments	• Aspen and cottonwood units would not be underburned or subsoiled unless agreed to by a silviculturist in conjunction with a hydrologist and a fuels specialist.

Provide the road access needed to meet project objectives while reducing transportation system effects in the project area

The road-related work proposed with this project has been coordinated with the on-going Plumas National Forest Public Motorized Travel Management Plan. In summary a total of approximately 5-miles of system and non-system roads would be decommissioned, closed and/or obliterated, 14 miles of reconstruction would facilitate fuels and silviculture activities and improve drainage features, and approximately 8 miles of temporary road would be constructed or reconstructed and subsequently restored. For specific information on specific roads that would receive decommissioning, refer to Appendix D.

Forest access needs and new temporary road location must follow the Riparian Management Objectives (RMO), as directed by the 1999 HFQLG EIS/ROD Appendix B. The non-system road 111C was originally proposed for obliteration due to resource concerns. Upon further collaboration with interested parties this non-system road would be added to the system once the resource concerns had been mitigated. Table 7 displays the design elements for road access under the Proposed Action.

Table 7. Design elements for road access under the Proposed Action.

Criterion	Design
Decommission/Obliteration	• Decommissioning/Obliteration may involve recontouring, subsoiling or abandonment. Abandonment is appropriate where the road has become completely overgrown with vegetation. Decommissioning/Obliteration may also involve removing drainage structures, restoring vegetative cover, blocking access or some combination of these treatments.
Maintenance	• Maintenance would consist of brushing, blading the road surface, improving drainage.
Reconstruction	• Reconstruction may involve the removal of all trees from within the road prism as well as brushing, blading the road surface, improving drainage and replacing/upgrading culverts where needed.
New Temporary Roads	• Temporary roads would be constructed for project work and subsequently restored when the fuels and vegetation management work is complete.

Alternative 2 – No Action Alternative

This alternative serves as a baseline for comparison among the alternatives, and is required by the implementing regulations of the National Environmental Policy Act (NEPA). This alternative takes no action at this time to implement provisions of the 1998 HFQLG Act on this part of the Plumas National Forest. Current, on-going activities such as routine road maintenance, fire suppression and recreation would still occur in this area. However, treatments designed to help firefighters reduce the spread of crown fires through strategic placement of DFPZs, reduce hazardous fuels, improve forest health, promote old forest ecosystems and associated species, support the local economy or reduce the impacts of roads would not occur. Since forest ecosystems are not static, they would still continue to change as a result of naturally occurring dynamic forces such as forest succession and wildfires. The current existing condition of high fuel loading, diseased and overstocked stands and road impacts would not be addressed under the No Action Alternative.

Alternative 3 – Non-Commercial Funding Alternative

Developing Alternative 3

A recent court ruling requires all projects with a singular purpose and need for fuels reduction, or with multiple purposes and needs that include fuel reduction, must have a non-commercial funding alterantive. A non-commercial funding alterantive is an alterantive where the sole purpose is to achieve the fuels reduction element of the purpose and need and where all the proposed treatments are soley directed at reducing hazardous fuels. In a non-commercial funding alterantive, there can be no additional timber harvesting beyond that need to meet the fuels reduction purpose and need (*Sierra Forest Legacy v. Mark Rey,* Case 2:05-cv-00205-MCE-GGH, Morrison C. England, Jr, United States District Court Judge, United States District Court, Eastern District of California, November 4, 2009).

Alternative 3 includes DFPZ treatments, which would be implemented to accomplish the purpose and need for modifying fire behavior only (Appendix E-3). No other treatments proposed under Alterantive 1 would be proposed under this alterantive.

Design features for Alternative 3

Strict Thin from Below in DFPZ

This alternative would solely meet the fuels reduction purpose and need. There would be no additional timber harvesting beyond that needed to meet the fuel reduction purpose and need. This alternative would limit timber harvest by restricting the removal of trees that meet any other objective such as fire resiliency, stand health, aspen or cottonwood restoration, or economic returns to the local community beyond that needed to meet the fuel reduction purpose and need. In order to meet the purpose and need for fuels reduction, this alternative would reduce surface, ladder and canopy density. Surface fuels would be addressed through underburning and whole tree yarding. Ladder fuels would be addressed by removing understory and intermediate trees to achieve the reduction in stand density necessary to achieve DFPZ standards. Canopy density would be addressed by removing trees in the upper canopy when needed for a reduction in overall canopy bulk density up to the upper diameter limits. Units would be treated with a thin from below silvicultural prescription using upper diameter limits that range from 8 to 16 inches (based on modeling, see Fire and Fuels section in Chapter 3). This alternative would utilize a strict thin from below, limiting the effectiveness in creating a desired species composition (Table 8).

Table 8. Design elements for actions under Alternative 3.

Criterion	Design
Mechanical Thin using Thin from Below	• Strict thin from below with no preference for species. • Variation in the remaining stand would be incidental. • Units would be treated with a thin from below silvicultural prescription using upper diameter limits that range from 8 to 16 inches.

Reduce fuel loads, improve forest health and fire resiliency, and provide for old forest ecosystems and associated wildlife species

Unlike the Proposed Action, this alternative would only treat fuels located in the DFPZ as a strict thin from below prescription, no treatment would occur in the area thin units. This alternative would not provide for old forest ecosystems and associated wildlife species.

Improving Growing Conditions for Aspen and Cottonwood Stands

Unlike the Proposed Action, this alternative proposes no aspen or cottonwood treatment. The reason is that the sole focus of the alternative is to reduce fuels.

Provide the access needed to meet project objectives while reducing transportation system effects in the project area

Alternative 3 would not decommission any roads or implement watershed restoration actions. Table 9 displays proposed activities that would occur with Alternative 3. For specific details regarding which roads would receive road treatments, see Appendix D, Table D.3. Table 9 displays the design features for road treatments under this alternative.

Table 9. Design elements for road treatments under Alternative 3.

Criterion	Design
Maintenance	• Maintenance would consist of brushing, blading the road surface, improving drainage.
Reconstruction	• Reconstruction may involve the removal of all trees from within the road prism as well as brushing, blading the road surface, improving drainage and replacing/upgrading culverts where needed.
New Temporary Roads	• Temporary roads would be constructed for project work and subsequently restored when the fuels and vegetation management work is complete.

Project Specific Design Features and Mitigations

In addition to the SOPs (Appendix B), the following design features have been developed for the Ingalls Project. The mitigation measures listed below are common to all action alternatives.

Air Quality

Specific air quality mitigations for pile burning and broadcast burning would include number of acres burned daily, preferred wind directions for smoke travel and weather conditions, which would allow for smoke dispersal. This would allow for piles to dry before ignition and ceasing ignitions if smoke dispersion conditions degrade. Monitoring of smoke transport is required by National Smoke Air Quality Management District (NSAQMD). These mitigations would be agreed upon with the NSAQMD and addressed in the Smoke Management portion of those burn plans developed for the Ingalls Project.

Botany

To protect sensitive and special interest plant species, as well as unique and unusual botanical habitats the following control areas would be established. Control areas would be flagged prior to project implemention; they would not be disturbed by project activities.

Noxious Weeds

In order to prevent and/or reduce the spread of noxious weeds, SOPs would be applied such as requiring that all off-road equipment and vehicles be weed free, use of weed free seed sources and avoiding areas of known weed occurrences including outside the units and project area. Control areas would be flagged prior to project implemention. Control areas would not be disturbed by project activities.

Cultural Resources

Detailed cultural resource information about the location, character, or ownership of a historic resource is withheld from disclosure here because sharing this information may cause an invasion of privacy, may risk harm to the historic resources or may impede the use of a traditional religious site by practitioners [Section 304 of National Historic Preservation Act, 16 U.S.C. 470w-3(b)]. Therefore specific mitigations for cultural resources are not publicly documented.

Soil and Watershed

Treatment would be implemented so that effective post treatment ground cover would meet cover values. Where vegetation removal is proposed within RHCAs outside of apsen and cottonwood treatment units, post treatment canopy cover in RHCAs would be preserved at greater than 40 percent.

Wildlife

- **Wildlife Trees:** These trees would be 24" dbh or greater and provide structure beneficial for wildlife use. Suitable trees can be identified by certain desirable characteristics such as teakettle branches, large diameter broken tops, and large cavities located within the tree's bole.
- **Hardwoods:** Hardwoods will be favored for leave status and left standing. This includes species such as black oak, aspen and cottonwood. Retain oaks to enhance species composition, age diversity and structural heterogeneity. Gaps can focus on clumps of smaller younger oaks. This would potentially enhance the expansion of oak by encouraging growth in areas of lower conifer shading.
- **Large woody debris:** Large woody debris (LWD) shall be retained at 2004 SNFPA FSEIS ROD standard and guidelin levels, where available (10-15 tons/acre ≥12 inches diameter).
    - In areas considered deficient in large woody debris, cull logs would be left at the stump, where possible.
    - During mastication and grapple piling operations: Large woody debris should be left scattered across landscape.
    - In unit 4 the 5-6 existing down logs would be left in place during mechanical activities and lined prior to underburning.
- **Limited Operating Periods (LOPs):** The action alternatives would have the appropriate LOP applied as identified in .
- Table 10.

Table 10. Wildlife Limited Operating Periods for the Ingalls Project area. Operations would be limited during these periods over portions of the project area.

Unit or Road Number	Species	Limited Operating Period
Unit 1	California Spotted Owl	March 1st thru August 15th
Road 25N49, 25N99 NW of unit	California Spotted Owl	March 1st thru August 15th
Unit 2, 18, 19, 34	Northern Goshawk	February 15th thru September 15th

Units 10, 11, 12, 17 (possible)	Northern Goshawk	February 15th thru September 15th
Underburn Unit 45	Northern Goshawk	February 15th thru September 15th

- **Snags/Dead Trees:** Snags and dead trees shall be left, unless the tree poses a risk to personnel during operations, or is a risk to the public. Residual snags should be 15 inches and greater in diameter and 20 feet or more in height. Snag/dead trees classified as "hazard" will be marked for removal.
- **Structural Thinning:** Structural thin areas that are at the higher basal area range (clumps) may contain snags and leaning trees to favor wildlife retention. Lower basal area ranges (gaps) may contain "wolf" and "broom" trees.
- **Wildlife habitation and nest trees:** Trees that show signs of current habitation, including nesting activity shall be left standing and not removed.

Comparison of the Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 11 is focused on activities and on effects where different levels of effects or outputs can be distinguished quantitatively, or qualitatively, between the alternatives.

Table 11. The Ingalls Project Purpose and Need comparing each Alternative.

	Alternative 1	Alternative 2	Alternative 3
Purpose and Need 1: Strategically Reduce Fuel Loads			
Measures of effective fuels reduction include:			
Average canopy base height (feet)	16.6	6.7	13
Average surface fuels (tons per acre)	5.5	20	5.28
Average flame length (feet)	0.8	9.9	0.7
Average percent mortality (%)	10	98	6.3
Measures of DFPZ connectivity and design placement:			
Topographic placement	Yes	No	Yes
Road adjacency placement	Yes	No	Yes
Tie to landscape features (i.e. roads, current vegetation types, rock outcrops)	Yes	No	Yes
Adjacent to planned or existing DFPZs	Yes	No	Yes
Purpose and Need 2: Improve Forest Health and Fire Resiliency			
Measures of forest health and fire resiliency include:			
Decreased risk of tree mortality (stand density index (SDI), stand basal area (BA),	Improved for most stand types	Continued increase overtime	Improved for some stand types, less benefit than Alternative 1.
Increased tree growth (tree ring width),	Yes	No	Yes
Tree species composition (FVS modeling and trees per acre (TPA) count),	Encourages	Discourages	Discourages
Tree stand structure (FVS modeling – quadratic mean diameter (QMD), BA, TPA, and canopy cover),	Multi-Storied	Multi-Storied	Single-Storied
Insect and disease risk (FVS modeling of risk).	Lowest	Highest	Reduced
Purpose and Need 3: Provide for Old Forest Ecosystems and Associated Wildlife Species			
Measures of old forest ecosystems include:			
Changes in old forest vegetation (acres and % remaining), immediate effects	-2 acres -0.12%	0	0
Changes in old forest vegetation with regard to California spotted owl (acres and % remaining	Nesting – 2 acres removed 99.8% of	100% of Nesting and Foraging	Nesting – 100% retained

(wildlife analysis area – nesting/foraging, territory – suitable habitat)	suitable habitat retained Foraging – 101 acres removed 99% of suitable habitat retained.	habitat retained. Higher long-term risk of loss.	Foraging – 267 acres removed. 98% of suitable habitat retained.
Changes in old forest vegetation with regard to associated wildlife species (acres and % remaining for home range core area (HRCA) – suitable habitat, nest core – suitable habitat,	33 acres reduced 99% of suitable habitat retained.	100% of HRCA habitat retained. Higher long-term risk of loss.	23 acres reduced. 99% of suitable habitat retained.
Changes in old forest vegetation with regard to Northern goshawk (acres and % remaining (wildlife analysis area – nesting/foraging, territory – suitable habitat)	Nesting – 103 acres removed 99% of suitable habitat retained Foraging – 131 acres removed 98% of suitable habitat retained.	100% of Nesting and Foraging habitat retained. Higher long-term risk of loss.	Nesting – 267 acres removed 98% of suitable habitat retained Foraging – increases by185 acres. 102% of suitable habitat retained.
Purpose and Need 4: Improve Aspen and Cottonwood Growing Conditions			
Measures of improved aspen and cottonwood growing conditions include::			
Ratio of conifers to aspen and cottonwoods	Improved	Reduced	Reduced
Increase in the number of aspen and cottonwood sprouts per acre	Improved/Increased	Decreased	Decreased
Purpose and Need 5: Contribute to the Economic Health and Stablility of Local Rural Communities			
Measures of economic health include:			
Total number of full-time jobs	165	0	117
Sawlog volume (mmbf)	7.4	0	1.1
Total employee related income	$6,591,000	$0	$4690,000
Total Project Value	($53,222)	$0	($890,490)
Purpose and Need 6: Provide the Road Access to Meet Project Objectives while Reducing Transportation Effects			
Measures of access include:			
Miles of improved road,	14	0	<13.3
Restored hydrologic function (acres)	0.6	0	0

Table 12. A summary of the number of acres of each silvicultural treatment occurring in each zone for the Ingalls Project area.

Action	Alternative 1	Alternative 2	Alternative 3
DFPZ			
Mechanical Thinning	1231	0	1231
Mastication	166	0	166
Grapple Pile with hand thin	110	0	110
Hand thin with underburn	780	0	780
Underburn	343	0	343
No Treatment	771	0	771
Total DFPZ	**3,401**	**0**	**3,401**
Area Thin			
Mechanical Thinning	599	0	0
Total Area Thin	**599**	**0**	**0**
Aspen/Cottonwood Thin			
Aspen/Cottonwood Thin	95	0	0
Total Aspen/Cottonwood Thin	**95**	**0**	**0**
Grand Total	**4,095**	**0**	**3,401**

Note: Acres may vary slightly during the final layout due to topography, stand condition, and rounding, etc.

Table 13. A summary of the number of miles of road treatment occurring in the Ingalls Project area.

Action	Alternative 1	Alternative 2	Alternative 3
Decommission/Obliteration of Roads	4.8	0	0
System Reconstruct	14	0	13.3
New Temporary Road Construction/Obliteration	8.4	0	3.9

Note: Mileages may vary slightly at the time of final road package development.

Other Affected Resources

Table 14: Other affected resources in the Ingalls Project area.

Other Resource Indicators	Alternative 1 (Proposed Action)	Alternative 2 (No Action)	Alternative 3
Cultural Resources			
Cultural Resources	No effect through use of SOPs	No effect	No effect through use of SOPs
Botany			
Sensitive Species – Lens-pod milk-vetch	May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability	No effect	Same as Alternative 1
Wildlife			
California Spotted Owl Nesting Habitat Loss (acres) (% remain)	2(99.8%)	0(100%)	0(100%)
California Spotted Owl Foraging Habitat Loss (acres) (% remain)	101(99%)	0(100%)	267(98%)
Northern Goshawk Nesting Habitat Loss (acres) (% remain)	103(99%)	0(100%)	267(98%)
Northern Goshawk Foraging Habitat Loss (acres) (%remain)	131(98%)	0(100%)	Increase by 185 acres (102%)
Great Grey Owl Nesting Habitat Loss (acres) (% remain)	50(92.3%)	0(100%)	45(93%)
Mesocarnivore Denning Habitat Loss (acres) (% remain)	300(91.6%)	0(100%)	132(96.3%)
Mesocarnivore Foraging Habitat Loss (acres) (% remain)	Increase by 197 acres (102%)	0(100%)	-135(99%)
Risk of Cumulative Watershed Effects – Equivalent Roaded Acre (ERA) values			
Number of watersheds with a Very High level of ERA (exceeds the Threshold of Concern (TOC) of 12% of watershed upland areas)	1	0	1

Number of watersheds with a Very High level of ERA (exceeds the Threshold of Concern (TOC) of 8% of watershed sensitive areas)	10	5	7
Number of upland areas of subwatersheds with a High level of ERA (9-12%)	3	0	3
Number of upland areas of subwatersheds with a Moderate level of ERA (6%-9%)	6	1	3
Number of upland areas of subwatersheds with a Low level of ERA (<6%)	6	12	11
Maximum sensitive area ERA value for any project watershed (as % of watershed area)	13.5	12.3	13.2
Maximum upland area ERA value for any project watershed (as % of watershed area)	14.5	13.9	13.4

Alternatives Eliminated from Detailed Study

Alternative 4 - 2001 SNFPA Alternative

One of the major components of the 2001 SNFPA was the 20" upper diameter limit over the majority of the forest, with higher limits in places like Urban Wildland Intermix Defense Zones and lower diameters in places such as Old Forest Emphasis areas (<12" dbh and do not reduce canopy in dominant and co-dominant by more than 10%). It also includes a number of other requirements such as higher canopy cover in certain areas, and no mechanical treatment in 25% of each stand to enhance heterogeneity. This alternative was eliminated from detailed study for the following reasons:

This alternative would not be able to incorporate the concepts of PSW GTR-220 (2009) or fulfill the majority of the project's purpose and need. Treatments would not be effective at meeting the purpose and need due to 2001 SNFPA restrictions. Within the Ingalls Project, approximately 64% (2,936 treatment acres) is old forest emphasis. The 2001 SNFPA guidelines would require areas that would receive mechanical treatment to have a 12" upper diameter limit, leave 25% of the area untreated, and not reduce the existing canopy cover by more than 10%. Of that 64%, 1,353 acres are not available for mechanical treatment because they are no treat areas (barren rocky areas) or are underburn only. That leaves 1,583 acres available for mechanical treatment with the 12" dbh limit and 25% (or 395 acres) receiving no treatment.

These restrictions would result in a thin from below prescription, which does not create the vertical and horizontal heterogeneity across the landscape that the Proposed Action would accomplish. The remaining acreage within Ingalls would follow the general forest standards and guidelines. An upper diameter limit of 20" dbh would be imposed with 25% of the stands receiving no treatment. Canopy cover would not be reduced by more than 20%.

Based on past experience, these treatments would not reduce the fuels adequately to meet the purpose and need for fuel reduction in the DFPZ. The Crystal Adams project (USFS BRD 2001) and Humbug Project (USFS BRD 2003), both on the Beckwourth Ranger District, were planned and implemented under the 2001 SNFPA. While the NEPA fuels modeling showed that many of the DFPZ fuels objectives could be met, field observations of these implemented projects have shown that the treatments yielded poor results in many areas (Crystal Adams HFQLG Project Evaluation Form, August 2006). Canopy cover was not reduced to the desired 40% and many ladder fuels remain, making the areas ineffective as DFPZs. In addition, the denser canopy cover and fuel ladders have resulted in higher mortality rates (20-50%) to the residual overstory during subsequent underburning and pile burning. The higher mortality rates required a third entry to remove trees that burned during the prescription. The requirement to leave 25% of each stand without mechanical treatment has resulted in some illogical gaps in the DFPZ network and patches of heavy fuel loading, not meeting the Purpose and Need for fuel reduction in the DFPZ.

Alternative 5 – HFQLG FRA fully implemented project with max acres of group selection

The commenter suggests that a fully implemented HFWLG FRA project with groups would be 504 acres for this project. This alternative was eliminated from detailed study because the project area has large areas that are not available for treatment or do not need treatment, and the remaining landscape has numerous openings. The available land base for Ingalls is significantly less than the total treatment acreage of 4,095 acres because of no treatment areas that meet desired conditions. The majority of the project area is hand thin with underburn or underburn only because it already meets DFPZ desired conditions, in addition to a large amount of no treat areas, mastication and grapple pile units. This leaves 1,832 acres available for group selection. If we maximize the number of groups for the 1,832 acres, it would amount to approximately 201 acres of groups (approximately 100 separate group selection units). However, not all of the 1,832 acres would be suitable for group selection. Within the Ingalls project area, the landscape is already highly fragmented due to past harvesting projects, natural land barriers such as rocky outcrops and poor growing site conditions. This would lead to further fragmentation thus not meeting our wildlife emphasis purpose and need or our forest health purpose and need.

Chapter 3: Affected Environment and Environmental Consequences

Introduction

This chapter summarizes the social, economic, physical, and biological environments that are affected by the Proposed Action, and the effects on the environment that would result from implementation of any of the alternatives. This chapter also presents the scientific and analytical basis for comparison of the alternatives presented in Chapter 2: Alternatives.

The “Affected Environment” section under each resource topic describes the existing, or baseline, condition against which environmental effects were evaluated, from which progress toward the desired condition can be measured. Environmental consequences form the scientific and analytical bases for comparison of alternatives through compliance with standards set forth in the Forest Plan. The environmental consequences discussion centers on direct, indirect, and cumulative effects. Effects can be neutral, beneficial, or adverse.

Direct and Indirect Effects

Direct effects are caused by the action and occur at the same place and time as the action. Indirect effects are caused by the action but occur later in time or further removed in distance, but are still reasonably foreseeable.

The environmental consequences presented in Chapter 3 address the impacts of actions proposed under each alternative. This effects analysis was done at the project level. Resource specialists reviewed each affected unit or road proposed in the alternatives.

As described in Chapter 2, for ease of documentation and understanding, the effects of the alternatives are described separately for distinct actions. The combination of these distinct actions is then added to the on-going and reasonably foreseeable actions in the cumulative effects analysis. The distinct actions analyzed for each alternative are mechanical thinning, mechanical fuels treatments, hand thinning and burning to strategically reduce fuel loads, increase forest health and fire resiliency, provide for old forest ecosystems and associated wildlife species, improve aspen and cottonwood stand growing conditions and provide access while reducing transportation system effects.

Cumulative Effects

According to the Council on Environmental Quality (CEQ) NEPA regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

The cumulative effects analysis area varies according to the resource being analyzed. Past activities are considered part of the existing condition and are discussed in the “Affected

Environment" and "Environmental Consequences" sections under each resource. Appendix C provides a list of present, on-going and reasonably foreseeable future actions that could potentially contribute to cumulative effects.

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

The cumulative effects analysis, for each specialist's cumulative effects section, with the exception of the Water and Soil Resource Effects Assessment, does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the Proposed Action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Furthermore, focusing on the impacts of past human actions risks ignores the important residual effects of past natural events. These important past events may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions".

Most of the specialists use the aforementioned cumulative effects analysis rationale, with the exception of the Water and Soil Resource Effects Assessment, where past actions over a 30-year period are used as an input to the Equivalent Roaded Acre analysis model. A list of past treatment types, year and acres are provided in a separate table.

Specialist Reports

Each section in this chapter provides a summary of project specific reports, assessments, and/or input prepared by Forest Service specialists, which are incorporated by reference into this EA. The following reports or memoranda are incorporated by reference: Ingalls Project Fire and Fuels

Report, Ingalls Project Air Quality Report, Ingalls Project Vegetation Management Report, Ingalls Project Economics Report, Ingalls Project Biological Assessment/Biological Evaluation (BA/BE) Terrestrial and Aquatic Wildlife, Ingalls Project Management Indicator Species (MIS) Report, Ingalls Project Migratory Bird Species Report, Ingalls Project Water and Soil Resource Effects Assessment, Ingalls Project Biological Evaluation for Threatened, Endangered, or Sensitive Plant Species, Ingalls Human Health and Safety Analysis, and Cultural Resource Compliance for the Environmental Analysis of the Ingalls Treatment Area Report. These reports or memoranda are part of the project record on file at the Beckwourth Ranger District at 23 Mohawk Rd, Blairsden, CA 96103. Copies of these reports are available upon request by contacting the Beckwourth Ranger District at (530) 836-2575.

Fire and Fuels

Introduction

The wildland fuel profile is comprised of accumulated live and dead plant matter arranged in terms of surface fuels, ladder fuels, and canopy fuels. Wildland fuels are characterized by quantity (loading), size and shape, compactness (packing ratio), horizontal continuity and vertical arrangement. These characteristics of wildland fuels can be manipulated to achieve defined modifications of future fire behavior and effects (Pyne & Andrews, 1996; Stephens & Ruth, 2005). This report uses four metrics to gauge the impacts of potential fire behavior and fire effects within the Ingalls Project area. These metrics fall into three main categories:

1. Surface Fuels
   a) Surface Fuel Loading (tons per acre)
   b) Surface /Critical Flame Length (feet)
2. Ladder Fuels
   a) Crown Base Height (ft)
3. Canopy Fuels
   a) Mortality (%)

Specific Methodology

Forest Vegetation Simulator-Fire and Fuels Extension (FVS-FFE) (Reinhardt & Crookson, 2003) as well as Fuels Management Analyst (FMA) software (Carlton, 2005) were used to quantify the effects of proposed vegetation treatments on potential fire behavior and predicted effects. FVS-FFE utilizes previously incorporated fire and fuels methodologies and is a well-established tree and stand growth model that is supported and maintained by the Forest Service. Fuels Management Analyst (FMA) incorporates previously established methodologies and fire models to produce fuel inputs, outputs of potential fire behavior such as fire type, crown fire potential, crown scorch and mortality based on field collected data (Carlton, 2005). The FMA can incorporate field-collected data and import tree list data from the Forest Vegetation Simulator (FVS, 1997); therefore, temporal analysis over time (years or decades) can be done. Common Stand Exam data used for fire modeling were taken directly from the Forest Vegetation Simulator modeling outputs used to assess effects of treatments on forest vegetation (see “Forest Vegetation” section) and imported into FMA.

Affected Environment/Environmental Consequences

Affected Environment

Background

Fire and its periodic occurrence in the Northern Sierra have shaped the succession paths of nearly all terrestrial ecosystems within the Sierra Nevada bioregion. Forests in the Sierra Nevada have been dramatically altered by Euro-American land use practices. Forestlands were logged, grazed, and burned beginning in the mid to late 19th century (Vankat & Major, 1978; McKelvey & Johnston, 1992). A century or more of fire exclusion then followed these activities and a policy of suppressing fire was implemented on lands within the National Forest System. Excluding fire had a profound influence on the structure, function and composition of forest stands and forest landscapes in the most fire-prone forests. Reduced fire frequency in ponderosa pine and mixed conifer forests has created unprecedented accumulations of surface and ladder fuels (Weatherspoon et al. 1996). Higher fuel loads and increased horizontal and vertical continuity of fuels has increased the risk of high intensity fire, including crown fire (Scott & Reinhardt, 2001; Fule, Crouse, & Cocke, 231-248). The accumulation of fuels caused by fire suppression is one of the major causes of the recent increase in the extent and severity of wildfires in the western United States (Arno, 2002). Several recent fires (Boulder Complex 2006, Antelope Complex and Moonlight Fire 2007) north of the project area, where large areas burned at high severity that most likely would not have burned at high severity before the fire suppression period, reflect the increase in fuel accumulation during the last 100 years on the Plumas National Forest. Fuel accumulation associated with past fire suppression within the project area translates to a high fire risk. Additionally, there exist in the project area potential ignition sources including natural causes such as lightning or man-caused sources from highly traveled forest roads to dispersed recreation.

Topography

The Ingalls Project is located along the northwest shore of Lake Davis then continues along the shore of Lake Davis into Grizzly Valley tying into the Freeman DFPZ. It also follows Turner Ridge, which is a prominent ridge that ties into an existing DFPZ (Grizz) and extends into Red Clover Valley connecting to the Red Clover DFPZ. Elevation throughout the Ingalls Project ranges from approximately 5800’ to over 7000’, with proposed treatment occurring primarily on south-southwest facing slopes.

Pre Historic Fire History by Dominant Vegetation Types

Background

This following Section provides a brief description of the past and recent fire history, surface fuels, and fire regimes, as they relate to the Ingalls Project. Fire has been one of the most ecologically important processes in the development of terrestrial ecosystems throughout the northern Sierra Nevada mountain complex (Skinner & Chang, 1996). The direct role of a fire regime in an ecosystem is described in terms of frequency, return interval, spatial extent, magnitude, and seasonality. The spatial patterns and temporal bounds of fire regimes across the landscape are highly variable and are influenced by, but not limited to, climatic oscillations, topography and existing vegetative composition and structure (Moody et al, 2006; Agee J. , 1993, Fites-Kaufman, 1997, Beaty & Taylor 2001, Skinner & Chang, 1996). Proposed vegetation and road treatments would occur primarily within the following vegetation types: eastside pine, Sierra mixed conifer, and white fir forests.

Eastside Pine

There are a limited number of fire history studies that have been under taken in the northern Sierra specifically in the eastside pine vegetation type. Stephens (2001) observed a mean fire return interval of 9 years for a Jeffery pine dominant site east of Yosemite National Park. In addition, Taylor (2004) found an average fire return interval of 11.4 years in mixed Jeffery pine/white fir stands southeast of Lake Tahoe. The most site-specific study done for eastside pine was done approximately 5 air miles from the project area by Moody, Fites-Kaufman & Stephens (2006); this study reported a mean fire return interval of 8 years. Fires in these areas have been characterized as burning with low fire intensity and they perpetuated late seral stages of forest stand development. These studies imply that fire, despite the cause, was a regular and recurring phenomenon into the twentieth century.

Sierra Mixed Conifer

Prior to the twentieth century, the mean fire return interval for the Sierra mixed conifer forest type has been reported as 7 years (range is 1 to 53 years) for the "East Quincy" study plot near the project area (Moody et al, 2006). Other studies have reported fire return intervals in mixed conifer forests in the Sierras as 11.5 years (the range is 1 to 25 years for south-facing slopes) (Beaty & Taylor, 2001) and 4.7 years (the range is 4 to 28 years) (Stephens & Collins, 2004). These studies indicate that low to moderate severity fires, whether human or lightning caused, were a common occurrence in the analysis area into the early 20th century.

White Fir

Successful fire exclusion in the 20th century has created not only a severe fire problem across the West, but has aided in changing species composition over much of the landscape. "Dense thickets of white fir have developed in many sites apparently due to a decreased fire frequency" (Fites-Kaufman et al. 2007). A species composition of shade-tolerant white fir has established on sites that were previously dominated by pine or a more diverse Sierra mixed conifer. Studies have shown the fire-return interval in a white fir forest in the Sierras from 3 to 35 years with an average of 8 years (Skinner & Chang, 1996). This study implies that fire in a white fir site occurred frequently and at a low severity.

Recent Fire History

Historic fires in the Ingalls Project area have been recorded since approximately the 1920's. One large fire, 447 acres in 1937, was recorded within the project area since that time. Human ignition sources exist in the area, these include: highly traveled forest roads, dispersed recreation, and lighting. Fire activity peaks in July through September, with the large fires historically driven northeast from a general southwest wind.

Adjacent Fuels Treatments

Several completed fuels treatments are immediately adjacent to the project area. These projects include the Freeman, Grizz, and Red Clover DFPZ projects.

Environmental Consequences

Alternative 2 – No Action

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Measurement Indicator 1: Effective Fuels Reduction

Fuel Model Metrics: crown base height and mortality

Surface fuels, ladder fuels and canopy fuels would not be modified over the short term. Stand characteristics and predicted potential fire behaviors showed similar trends by CWHR vegetation type over time (Table 15). The predicted density based mortality of suppressed and intermediate size class trees, shedding of lower limbs and needles, and tree growth over time slowly contribute to an increasing live crown base, leading to a slow decrese in canopy fire potential. The predicted direct mortality from scorch and cambial damage does not account for post-fire mortality to fire-damaged trees due to insect and disease activity. Flame lengths remain greater than the desired 4 feet making direct suppression actions likely to be unsuccessful under 90th percentile weather conditions (Table 15). Surface fuel loading remains high thus decreasing efficient productive human and mechanical line construction rates and decreasing the effectiveness of aerial retardant applications. At the landscape level, increased potential for short and long range spotting and the fire's influence on local weather tend to increase erratic fire behavior, resulting in increased fire size with higher tree mortality (Schroeder & Buck, 1970). The above factors would decrease the effectiveness of initial attack by firefighters and extended fire suppression operations, leading to a greater potential for large, high-severity fires.

Table 15. Modeled potential fire behavior outputs for the No-action Alternative (Alt 2).

CWHR Vegetation Type	Treatment Stage	Crown Base Height (ft)	Surface/Critical Flame Length (ft)	Surface Fuel Loading* (tons/ac)	Mortality (%)
Eastside Pine	No Treatment	10	9.9/4.0	20	97
	10 years	11	9.9/4.2	20+	95
Sierra Mixed Conifer	No Treatment	5	9.9/2.5	20	95
	10 years	6	9.9/2.8	20+	93
White Fir	No Treatment	5	9.9/2.5	20	90
	10 years	6	9.9/2.8	20+	90

*Surface fuels greater than 3 inches contribute towards intensity and spotting but are not part of the fire behavior model.

Firefighting Operations and Public Safety

The No-Action Alternative would result in no improvement in fire management's ability to safely suppress and contain fires, both in initial attack and extended fire suppression operations. Fire behavior conditions would not be improved and would continue to decline over time due to continued increases in stand densities and continued surface fuel buildup. Under 90th percentile weather conditions, flame lengths would generally be at least 9 feet (Table 15). The fireline handbook (NWCG, 2004) notes that with 4-8 foot flame lengths "Fires are too intense for direct attack on the head by persons with hand tools. Handline cannot be relied on to hold fire." 8+ foot flame lengths, "Fire may present serious control problems: torching, crowning, and spotting; control efforts at the head will probably be ineffective." (NWCG 2004) (Table 15). Under current heavy surface fuel loadings and high stand densities, the rates of line construction are relatively slow for both hand crews and tractors when compared with the post-treatment desired conditions (Chapter 2). The above factors result in a negative effect on the overall ability of fire managers to safely suppress and contain fires, leading to increased suppression intensity and cost. This increased suppression intensity can lead to a greater potential for resource damage during the fire and higher Burned Area Emergency Response (BAER) Rehabilitation costs after the fire is out. Fire condition classes 2 and 3 would not be modified in the short term. Modifications over the long-term would be primarily caused by high-mortality fires and drought and insect-related mortality.

Measurement Indicator 2: DFPZ Connectivity and Design Placement

Overall, implementation of Alternative 2 would not provide continuity between existing fuel treatments. Under Alternative 2 no connectivity with adjacent DFPZs would occur, reducing their intended effectiveness and leaving a gap in the DFPZ network. Strategic placement of fuel treatments in relation to fire resistant landscape features would also not occur. The road infrastructure allowing access for fire suppression resources would continue to degrade, impacting their ability to efficiently perform suppression activities.

Direct and Indirect Effects of Improving Aspen and Cottonwood Growing Conditions (Alternative 2)

Measurement Indicator 3: Change in Fire Behavior

Aspen regeneration, growth, and development would continue to be suppressed due to shading from conifers. Aspens are fire adapted in the sense that they can regenerate after fire but the individual trees are not fire tolerant. The No-Action Alternative would leave aspen stands susceptible to increased fire severity creating a higher risk of thermal girdling and scorch related mortality. However, in the event of a low or moderate fire there may be a beneficial effect on aspen regeneration, growth, and development by creating open light conditions and disturbed soil post fire.

Direct and Indirect Effects of Providing the Road Access Needed to Meet Project Objectives while Reducing Transportation System Effects (Alternative 2)

Measurement Indicator 4: Changes in access and response time

The current roads in the Ingalls Project area allow for sufficient response times for fire suppression resources.

Cumulative Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

By taking no action, adverse fire behavior is expected to continue resulting in high intensity fires, leading to higher tree mortalities. Over the long term, mortality occurring in high-density stands would continue to increase surface fuel load through deadfall of standing dead trees. This increase in mortality and related deadfall has been witnessed in the Sierra Nevada range as a result of region-wide drought in the late 1980s (Guarin & Taylor, 2005). These increased surface fuels, combined with continuous ladder and canopy fuels, would continue to obstruct suppression effectiveness and would likely maintain stands susceptible to high-mortality fires such as the Moonlight Fire. Increased flame lengths during a wildfire could lead to high mortality in forested areas, RHCAs, PACs, and HRCAs in the project area. In turn, this may result in continued high fire suppression and rehabilitation costs for the indefinite future in the Ingalls Project area. The No-action Alternative would not improve firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events. The No-action Alternative would also not reduce potential tree mortality or protect rare species and associated habitat from the major adverse effects of severe wildfire (Stephens & Moghaddas, 2005; Agee, 2002). Reasonably foreseeable future projects (Appendix C of the EA) include two active range allotments, a Great Gray Owl habitat treatment unit, Lake Davis Trail Phase 2, Red Clover Poco watershed project, Red Clover Prop 50 watershed restoration project, Blakeless Underburn, Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement, fuel wood and Christmas tree gathering and recreational use. The No-action Alternative would allow stands to continue to develop under the influence of the legacy of past management practices and fire suppression (Agee & Skinner, 2005). Overall, the No-action Alternative would trend conditions for fire behavior and predicted mortality away from the desired conditions described in Chapter 2 of the Ingalls EA.

Under the No-action Alternative no connectivity with existing and future foreseeable adjacent DFPZs would occur, reducing their intended effectiveness and leaving gaps in the DFPZ network. Strategic placement of fuel treatments in relation to fire resistant landscape features would also not occur. The road infrastructure allowing access for fire suppression resources would continue to degrade impacting firefighter ability to efficiently perform suppression activities.

Alternative 1–Proposed Action

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 1)

Measurement Indicator 1: Effective Fuels Reduction

Fuel Model Metrics: crown base height andmortality

Alternative 1 implements fuel reduction treatments reducing surface, ladder and canopy fuels through the use of mechanical thinning, hand thinning and pile burning, grapple piling and pile burning, and underburning. The Alternative 1 tactic of "variable density thinning" with design elements of "structural thinning" in a "clump" and "gap" pattern and "radial thinning" of fire-resilient legacy trees would incorporate silvicultural techniques that are designed to achieve effective fuel reduction and incorporate ecologically important stand and landscape level spatial heterogeneity common in frequent fire adapted forests in the project area (North et al 2009).

Predicted fire behavior and model outputs showed similar trends across all CWHR vegetation types (Table 16). The "variable density thin" treatment targeting the majority of the suppressed and intermediate fire intolerant tree species and "radial thinning" of fire-resilient legacy trees (i.e. Jeffery pine, ponderosa pine, sugar pine and Douglas-fir) in the stand would increase vertical separation and average stand crown base height from 5-10 feet pre-treatment to 13-20 feet post-treatment. The prescribed retention of isolated small diameter trees could be susceptible to scorch related mortality under 90th percentile weather conditions (Stephens & Moghaddas, 2005) even so the overall predicted mortality is considerably decreased following treatments. Damage can be minimized through the use of favorable prescribed fire burning conditions and/or mechanical fuel reduction methods. The proposed treatments show a decrease in the percent of potential mortality from fire related damage that can be expected in the treatment units from a percent probability of 97%-98% mortality to 8%-12% mortality. Horizontal canopy fuel continuity and crown fire spread potential is further decreased due to a clumped tree distribution, where groups of trees are separated by gaps (North, 2009).

Alternative 1 would reduce the surface, ladder, and canopy fuels which in turn increases canopy base height and reduces flame length, resistance to control and the potential for a fire to transition into crown fires. Decreasing crown density may increase surface winds (less canopy to reduce winds before they reach the ground) and surface fuels may be drier (more sunlight reaching the ground) but not noticeably more than under current fuel conditions (Agee & Skinner 2005). It is estimated that Alternative 1 will not open canopies to the extent needed to realize these concerns. It is estimated that in most areas, canopy cover will remain above 30% in the pine types and above 40% in the Sierra mixed conifer and 40 % in white fir in the overstory even after treatment. This change would not be sufficient to change the amount of wind reaching the surface. If full fire suppression continues as the management strategy for unplanned ignitions within the project area, fire suppression resources will have an improved ability to control fires during initial attack with minimized risk to their safety (and the public) and increased ability to keep fires small with the use of direct attack tactics versus indirect tactics. Fires entering the treated stands would typically drop from the crowns to the forest floor, notably changing fire behavior. Aerial firefighting resources would be better able to penetrate the canopy to aid ground resources due to reduced canopy density.

Table 16: Alternative 1 measurement indicators utilized to identify effects and to gauge effective fuels reduction.

CWHR Vegetation Type	Treatment Stage	Crown Base Height (ft)	Surface/Critical Flame Length(ft)	Surface Fuel Loading*(tons/ac)	Mortality (%BA)
Eastside Pine	Pre-Treatment	10	9.9/4.0	20	97
	Post-treatment	20	0.8/6.4	5.5	8
	10 years	26	1.5/7.7	6.8	7
Sierra Mixed Conifer	Pre-Treatment	5	9.9/2.5	20	97
	Post-treatment	13	0.8/4.8	5.5	10
	10 years	21	3.0/6.6	6.8	9
White fir	Pre-Treatment	5	9.9/2.5	20	98
	Post-treatment	17	0.8/5.7	5.5	12
	10 years	23	3.0/7.0	6.8	11

*Surface fuels greater than 3 inches contribute towards intensity and spotting but are not part of the fire behavior model.

Design features used to minimize fire effects and/or retain habitat structures preferred by wildlife species such as; grouping of larger trees, juniper retention, and structural diversity patches will have lower potential for loss since they would not be continuous and would allow for more effective fire suppression. This would be similar to the variability in forest conditions produced by frequent fire (North et al, 2009).

In utilizing mechanical treatments, stand structures are modified quickly and more precisely than with prescribed fire alone (North et al, 2009). Under this alternative, treatments are effective in breaking up the horizontal and vertical continuity of live fuels in the lower canopy layers and/or in effect pre-treating the stands to more readily allow prescribed fire to be re-introduced. Silvicultural cuttings can only partially substitute for fire (Weatherspoon, 1996). This alternative allows increased potential to utilize prescribed fire as either a maintenance treatment and/or in conjunction with mechanical treatments as a follow-up process to achieve forest resilience. Prescribed fire could mimic the natural ecosystem functions of frequent low-to-moderate severity fire (Weatherspoon, 1996).

Underburning is the proposed treatment method for units under several conditions. Certain units meet the desired condition from the standpoint of tree density and therefore do not need thinning and can safely be burned. Other units are primarily on steeper slopes with low tree density and not available for mechanical harvest, but can safely be underburned to reduce surface fuels to meet desired condition. Follow up surface fuels treatments would substantially diminish existing and activity generated surface fuels and potential fire behavior compared to current conditions.

Units meeting desired conditions would not be burned, thereby decreasing total burned acres and emissions. Due to operational constraints underburning and pile burning would be conducted over a 5- to 10-year period. During this lag time of treatment, surface fuels could increase to higher than pre-treatment levels, however this potential increase is not expected to increase fire behavior and risk beyond what would occur under current conditions.

The project proposes the use of whole tree harvesting which does not add significant amounts of activity generated fuels and minimizes additional fuel accumulations in the treatment areas. This modification to the surface fuel loading was accounted for in the fuel model selection assigned to the pre-treatment, post-treatment, and 10-year post-treatment environments. Surface fuel loading decreased significantly across all vegetation types to an average of approximately 5 to 8 tons an acre. The reductions in surface fuels may be achieved through a variety of treatments including grapple piling, mastication, hand piling, underburning and pile burning. It is estimated that surface fuel loading would directly influence the potential flame lengths and fireline intensity in the post-treatment environment by more than half allowing for increased line production rates for fire suppression personnel.

Mastication, Grapple Pile and Hand Thinning

Grapple piling of shrubs is more effective than mastication as it pulls the shrubs up by the roots, decreasing the amount of shrub regeneration in an area. Once the piles have been burned, grapple piling removes fuel from the area, thus lowering fire effects and decreasing the time it takes fire personnel to suppress and control fire in the treatment area.

While mastication does not actually remove fuel from the area, it does rearrange the structure from a vertically oriented fuel structure (ladder fuel) to a horizontal fuel structure thus lowering fire effects and decreasing the time it takes fire personnel to suppress and control fire in the treatment area. Mastication would be used where feasible to effectively reduce surface and ladder fuels, by rearranging the vertical and horizontal structure of the fuel on the landscape.

Firefighting Operations and Public Safety

The proposed modifications under this alternative to the surface, ladder and canopy fuel portions of the Ingalls Project fuel profile would enhance the ability of firefighting personnel to safely manage and engage in suppression actions in the event of a wildfire. This is particularly true of fires that start in areas receiving fuel treatment or in areas where fires have the potential to initiate in fuel treatments. Due to the strategic placement of the treatment units and National Forest System roads, conditions would allow for safe ingress and egress for fire personnel, equipment and public land users should a wildfire affect these areas. Greater amounts of aerial retardant would penetrate the dominant overstory canopy and reach the surface fuels slowing the forward combustion of fuels in the treatment areas. The proposed mechanical thinning, hand thinning, mastication, and grapple piling units would result in a marked improvement to potential fire behavior and effects related to firefighting operations and public safety.

Measurement Indicator 2: DFPZ Connectivity and Design Placement

This alternative would provide connectivity with existing adjacent DFPZs (Grizz, Freeman, and Red Clover), increasing their intended effectiveness and tying together existing gaps in the DFPZ network. Strategic placement of fuel treatments in relation to fire resistant landscape features, such as rock outcrops, would further increase the effectiveness of the fuel treatment. The proposed improvements to road infrastructure would allow efficient access for fire suppression resources increasing their ability to efficiently perform suppressive actions.

Direct and Indirect Effects of Improving Aspen and Cottonwood Growing Conditions (Alternative 1)

Measurement Indicator 3: Change in Fire Behavior

Fire exclusion has permitted conifers to encroach into aspen stands, thereby competing with existing aspen and creating shade conditions unfavorable for aspen regeneration, growth, and development. Conifer in-growth has also contributed to fuel ladders within aspen stands, increasing susceptibility to severe fire. The majority of conifers less than 30 inches in diameter would be removed to eliminate conifer encroachment. This would have a beneficial effect on aspen regeneration, growth, and development by creating disturbed soil and open light conditions, as well as reducing potential fire severity and aspen mortality in the event of a fire. Aspens are fire adapted in the sense that they can regenerate after fire but they are susceptible to thermal girdling and scorch related mortality. However, healthy aspen habitats are highly mesic sites, producing higher fuel moisture content than adjacent habitat, which can reduce adverse fire behavior.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects (Alternative 1)

Measurement Indicator 4: Changes in access and response time

The proposed improvements to road infrastructure would allow efficient access for fire suppression resources increasing their ability to efficiently perform suppression activities. Additionally, the road improvements will aid in faster response times for fire suppression resources.

Cumulative Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 1)

The activities listed in Appendix C of the EA, that can be expected to be implemented include two active range allotments, a Great Gray Owl habitat treatment unit, Lake Davis Trail Phase 2, Red Clover Poco watershed project, Red Clover Prop 50 watershed restoration project, Blakeless Underburn, Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement, fuel wood and Christmas tree gathering and recreational use. Recreational activities near the project area include the Lake Davis Lighting Tree Campground and dispersed camping, hunting, fishing, hiking, mining and OHV use. All of these activities are likely to contribute to possible future ignition sources in the project area. The trend of increased human ignitions is predicted to increase in the Ingalls Project area (Stephens, 2005). The implementation of Alternative 1 would minimize the potential for these ignitions to grow into large-scale destructive wildfire and would enhance fire management's ability to contain, control and suppress wildfires in the Ingalls Project area.

Cumulatively the implementation of Alternative 1 will provide more fuel reduction treated acres that can perform as an anchor point for further future treatments enhancing and increasing the connectivity of treatments across the landscape. Previously thinned DFPZ' s including Grizz, Freeman, and Red Clover will continue to be evaluated for required surface fuel work either done in the form of mastication, grapple piling, pile burning or underburning to meet the surface fuel desired conditions set in the environmental analysis associated with each project. These treatments will continue to be adjacent to NFS road infrastructure and will connect to fire resistant landscape features.

DFPZ Maintenance within the Ingalls Project

In July of 2003, a ROD was signed for the HFQLG FSEIS. It documented the results of an environmental analysis of the effects of alternative management strategies for maintenance of DFPZs within the HFQLG Pilot Project area. The HFQLG FSEIS and ROD, in combination with the original HFQLG Act FEIS and ROD, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG Pilot Project area. The HFQLG FSEIS ROD calls for consideration of all practicable methods of vegetation control for site-specific projects.

If hand thinning, grapple pile or mastication option is implemented and does not achieve DFPZ objectives for desired condition in all treatment units; an underburn would be used as a follow-up treatment to meet short-term objectives. In the long term, the foreseeable maintenance of the DFPZ would consist of prescribed fire, mechanical or hand treatments. Specific maintenance treatments would be determined based on site-specific analysis of land allocations, slope, vegetation types, and previous underburn treatments.

The Forest Service would assess the need for DFPZ maintenance treatments approximately five to ten years after the completion of the initial mechanical and fire activities proposed in the Ingalls Project. It is expected that maintenance activities would take place as described in the HFQLG FSEIS and further refined by on-site information available at the time that maintenance would be proposed. Specific decisions about maintenance for particular DFPZ (timing of entry and treatment method) would be made at the time DFPZ maintenance is deemed necessary (HFQLG FSEIS, page 3).

Climate Change Considerations

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon. Complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives. However, based on climate change science, the relative effects of these treatments on the ecosystem carbon cycle are recognized. The positive long-term effects on the carbon cycle of proposed fuel reduction treatments are a good example of this. Given the anticipated increase in large wildfires in California (Calif. Climate Action Team 2009), the action alternatives propose beneficial fuel reduction treatments which could contribute to reducing or limiting emissions, size, and intensity of potential future wildfires.

In addition, action alternatives that implement treatments which meet desired conditions for forest health would enhance growth of large residual trees, reduce stand densities, and improve stand and landscape resiliency to forest disturbances such as insect outbreaks greater than endemic levels and large scale high severity fire, thereby enhancing the potential for carbon sequestration within the project area. These treatments would have long-term beneficial indirect effects which would contribute to beneficial cumulative effects on air quality.

Alternative 3 – Non-commercial Funding

Direct and Indirect Effects of DFPZ Fuels Reduction Treatments (Alternative 3)

Measurement Indicator 1: Effective Fuels Reduction

Alternative 3 the Non-commercial Funding Alternative, implements fuels treatment focused on reducing surface, ladder and canopy fuels through the use of mechanical thinning, hand thinning and pile burning, grapple piling and burning, and underburning. Under this alternative, thinning from below, through biomass, pre-commercial and/or commercial means, would focus first on the smaller trees for removal and moving through the lower canopy levels until an upper diameter limit (UDL) (Table 17) is reached. Predicted fire activity would be reduced to a low severity fire due to the treatment's reduction of surface, ladder, and crown fuels.

Table 17 Upper Diamerter Limits for stands under the Non-Commercial Funding Alternative

Stand Type	Upper Diameter Limit (UDL) inches	Stand Type	Upper Diameter Limit (UDL) inches
EPN3D	8	SMC3M	14
EPN3M	10	SMC3P	8
EPN3P	8	SMC3S	16
EPN3S	8	SMC4D	14
EPN4D	8	SMC4M	16
EPN4M	8	SMC4P	8
EPN4P	8	WFR3D	12
EPN4S	8	WFR3M	12
EPN5P	8	WFR3P	8
SMC2M	10	WFR4M	12
SMC3D	14	WFR4P	8

Treatments would result in stands that are typically uniform with trees evenly spaced and possibly an undesired species composition. Treatments in Alternative 3 would increase canopy base height and decrease crown density. Predicted fire behavior and model outputs showed similar trends across all CWHR vegetation types (Table 18). "Thinning from below" substantially increases average stand crown base height (CBH) from an average of about 7 feet pre-treatment to 13 feet in the post-treatment environment,decreasing the likelihood of transition of surface fire to crown fire behavior under a 90th percentile or greater weather event. The proposed treatments show a decrease in the percent of potential mortality from fire related damage that can be expected in the treatment units.

The project proposes the use of whole tree harvesting which does not add significant amounts of activity generated surface fuels and minimizes additional fuel accumulations in the treatment areas. The modification to the surface fuel loading was accounted for in the fuel model selection assigned to the pre-treatment and post-treatment environments, and was decreased across all vegetation types to approximately 5 tons an acre. The reductions in surface fuels can be achieved through a variety of treatments including grapple piling and burning, mastication and underburning. Surface fuel loading directly influenced the potential surface and critical flame lengths that would be expected to be experienced in the post-treatment environment. The reductions in surface fuel loading also decreased surface fire flame lengths by more than half allowing for increased line production rate for fire suppression personnel and equipment.

The proposed modifications to the surface, ladder and canopy fuel portions of the Ingalls Project fuel profile in this alternative would enhance the ability of fire fighting personnel to safely manage and engage in suppression actions in the event of a wildfire in the project area. This is particularly true of fires that start in areas receiving fuel treatment or in places where fires would impact the fuel treatments. Due to the strategic placement of the treatment units, evacuation and movement corridors would increase safe ingress and egress for fire personnel, equipment and public land users should a wildfire impact these areas. Greater amounts of aerial retardant would penetrate the over story canopy and reach the surface fuels slowing the forward combustion of fuels in the treatment areas.

Table 18 Alternative 3 measurement indicators utilized to identify effects and to gauge effective fuels reduction.

Dominant Vegetation Type	Treatment Stage	Crown Base Height (ft)	Surface/Critical Flame Length (ft)	Surface Fuel Loading* (tons/ac)	Mortality (%)
Eastside Pine	Pre-Treatment	10	9.9/4.0	20	97
	Post-treatment	15	0.7/5.2	2.71	6
	10 years	18	1.3/5.9	5.5	5
Sierra Mixed Conifer	Pre-Treatment	5	9.9/2.5	20	98
	Post-treatment	14	0.7/5.0	7.63	6
	10 years	17	1.3/5.7	5.5	5
White Fir	Pre-Treatment	5	9.9/2.5	20	98
	Post-treatment	10	0.8/4.0	5.5	7
	10 years	16	1.5/5.2	5.5	5

*Surface fuels greater than 3 inches contribute towards intensity and spotting but are not part of the fire behavior model.

Measurement Indicator 2: DFPZ Connectivity and Design Placement

Under the Non-commercial Alternative connectivity with adjacent DFPZs would occur, increasing their intended effectiveness and tie together existing gaps in the DFPZ network. The proposed improvements of road infrastructure would allow efficient access for fire suppression resources increasing their ability to efficiently perform suppression activites.

Direct and Indirect Effects of Improving Aspen and Cottonwood Growing Conditions (Alternative 3)

Measurement Indicator 3: Change in Fire Behavior

There would be no treatment done to aspen stands in this alternative and would thus have the same effect as Alternative 2.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects (Alternative 3)

Measurement Indicator 4: Changes in access and response time

Alternative 3 proposes no change to the current road infrastructure. The current roads in the Ingalls Project area allow for sufficient response times for fire suppression resources.

Cumulative Effects of DFPZ Fuels Reduction Treatments (Alternative 3)

The implementation of Alternative 3 would enhance fire management's ability to contain, control and suppress wildfires spreading from private lands onto public land especially where they impact fuel treatment units thus decreasing the potential for a large scale high severity fire in the Ingalls Project area. Recreational activities in the project area include the daily recreational use of OHV's, hiking, camping, mining and hunting which are likely to contribute as possible future ignition sources in the project area. The potential for human ignitions is predicted to increase in the Ingalls Project Area (Stephens, 2005). The implementation of Alternative 3 minimizes the potential for fire ignitions to grow into large scale destructive wildfire in areas of the proposed fuel treatments.

Surface Fuels

Surface fuel treatments would have the same effect as Alternative 1.

Mastication, Grapple Pile and Hand Thinning

Mastication, grapple piling and hand thinning Surface fuel treatments would have the same effect as Alternative 1.

Firefighting Operations and Public Safety

Firefighting operations and public safety would receive the same benefits as Alternative 1.

Air Quality

Introduction

The Ingalls Project area is located in Plumas County, California. Nearby towns, communities, and highways are shown in Table 19. Prescribed fire is one of the primary activities proposed for the Ingalls Project that would have a direct impact on air quality. Underburning would be conducted during fall, spring, or winter—the most favorable times in terms of smoke dispersion. The entire project area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin. Air quality in the context of this document refers to the amount and type of emissions contained in smoke produced by prescribed burning and wildfires. Particulate matter is of the greatest concern as particulate emissions in smoke can affect both visibility and human health.

Air quality can be severely impacted by particulate matter and other pollutants during large wildfire events. Impacts from the 1992 Pendola fire on the Plumas and Tahoe National Forests affected air quality 60 miles away in Sacramento, California. Fugitive dust caused by construction and use of unpaved roads can produce PM_{10} in quantities great enough to impair the visual quality of the air. These effects are localized and can be mitigated by effective dust abatement methods. Dust generated by skidding, loading, and site preparation activities also contributes to fugitive dust; however, the level contributed by these activities is unknown.

Table 19. Towns, communities and highways in the vicinity of Ingalls Project

Town or Feature	Distance and Direction from Ingalls Project Boundary
Blairsden	10 miles south
Graeagle	11 miles south
Mabie	9 miles south
Clio	13 miles south
Quincy	16 miles west
Portola	8 miles south
Highway 89	10 miles south
Highway 395	16 miles East
Highway 70	8 miles south

Specific Methodology

The predicted emissions from wildfire, prescribe fire and harvest activities in the proposed project area have been estimated using emission factors from EPA Document 42 and from the National Environmental Policy Act Air Quality Desk Reference Guide (CH2M Hill 1995; table 3.3.2-1 for timber harvest operations). Prescribe fire would be done over a period of five years; the amount of particulates is based on ~3,300 acres proposed for treatment. The prescribed fire would be done in the spring, fall, or winter months because these are the best times of year for dispersion.

Each year the burning would take place over a period of months, with treated areas spread throughout the project area.

Affected Environment/Environmental Consequences

Affected Environment

The air quality attainment status for ozone, carbon monoxide, sulfur dioxide, and other compounds is listed in Table 20. The attainment status was derived directly from the NSAQMD "Annual Air Monitoring Report" (2005).

Table 20. Attainment designations for Plumas County.

Compound	National Attainment Status	State Attainment Status
Ozone (1 hour)	Attainment	Unclassified
Ozone (8 hour)	Attainment	Not applicable
Carbon monoxide	Attainment	Attainment
Nitrogen dioxide	Attainment	Attainment
Sulfur dioxide	Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Unclassified	Nonattainment – only the Portola Valley is in non-attainment for the state $PM_{2.5}$ annual standard

Source: NSAQMD (2004)

Currently, Plumas County is in nonattainment status for particulate matter $(PM)_{10}$ (county wide) and $PM_{2.5}$ (Portola only). The Project Area is less than 8 miles northwest of Portola at its closest point. According to the NSAQMD 2005 report, the major contributors to both PM_{10} and $PM_{2.5}$ levels include forestry management burns, woodstoves, residential open burning, vehicle traffic, and windblown dust. These problems can be relieved or made worse by local meteorology, winds, and temperature inversions. In addition, large areas in and adjacent to local communities can be heavily impacted by smoke for extensive summer periods (several weeks) due to wildfire such as in the 3,500-acre Stream fire, 3,000 acre Boulder fire, and the Antelope Complex and Moonlight fires. The main community of Portola is subject to strong inversions and stagnant conditions in the wintertime. Those conditions, coupled with intensive residential wood burning, can result in very high episodic $PM_{2.5}$ levels (NSAQMD 2005). Levels of PM_{10} have been greatly decreased due to a reduction of non-EPA (Environmental Protection Agency) approved woodstoves in existing residences.

Current sources of particulate matter from the project area include smoke from large wildfires, smoke from underburning and pile burning, emissions and dust from standard and off-highway vehicles, dust and emissions from harvest activities occurring on private lands, smoke from campfires, and wind-generated dust. The amount and duration of these emissions vary by season, with most emissions from wildfires, timber harvest, and recreational activities occurring between

May and late August, and emissions from prescribed burning occurring from late October through mid-April.

Environmental Consequences

Alternative 2–No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Under this alternative, no increase in ozone precursors or PM_{10} emission levels would be produced from prescribed burning of activity-generated fuels, harvest operations, or understory burning. Alternative 2 would not result in a reduction of surface fuels, so the potential for substantial degradation of air quality from future wildfire would not be reduced. Air quality can be severely impacted by particulate matter and other pollutants during large wildfire events. Impacts from the 2007 Moonlight fire on the Plumas National Forests affected air quality over 100 miles away. The No Action Alternative would not provide any opportunities for reducing existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a stand-replacing wildfire, air quality degradation can exceed federal and state standards hundreds of miles downwind. The potential ozone precursors from a wildfire are shown in Table 21.

Table 21 Potential ozone precursors and PM10 from wildfire emissions.

	Acres (range)	CO (tons)	Nitrogen Oxides (tons)	Volatile Organic Compounds (tons)	PM10 (tons)
Wildfire	1,000-5,000	1050-5250	30.0-150.0	179.1-895.50	127.50-637.50

Cumulative Effects

Under Alternative 2, the project area would be subjected to long-term deposition of surface fuels. Forest fuels would continue to increase with biomass production and would out-produce the decomposition rates in this climate. The long-term chronic effects of wildfires would be higher PM_{10} emissions, mostly due to large areas of exposed soil and ash in the aftermath of a high-intensity wildfire. Without considering the possibility of future wildfires, the No Action Alternative would have no cumulative effects on particulate matter and visibility.

Alternative 1 – Proposed Action

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction, Aspen and Cottonwood and Road Treatments (Action Alternatives)

The predicted criteria pollutant totals for timber operations (emissions from trucks and other equipment) would vary according to the acres of treatments performed each year. Table 22 presents the total criteria pollutants for prescribed burning, timber operations, and roadwork activities.

Table 22 Criteria pollutant totals for timber operations and prescribed burning combined for Alternative 1.

	Acres	CO (tons)	Nitrogen Oxides (tons)	Volatile Organic Compounds (tons)	PM10(tons)
Underburning only or Hand thin/underburn	1123	1126.32	8.98	50.95	116.21
Mechanical equipment for fuels reduction and road work	2201	7.72	13.89	1.04	1.03
Pile burning	2035	749.19	20.35	36.45	80.99
Criteria pollutant totals	3323	1883.23	43.22	88.44	198.23

In the event of a wildfire, the stands in the Ingalls Project area that are treated would have less material to burn producing less particulate matter emissions than untreated areas outside the project area.

Pile burning could produce more particulate matter per acre than understory burning because the standing biomass would be cut and piled, producing higher surface fuel loads. However, piled material is allowed to cure and can be ignited with lower fuel moistures, which ensures complete and efficient consumption and less particulate matter being produced. If fuel loading does not meet the desired condition after the biomass reduction is complete than an understory burn is prescribed, this is predicted to produce fewer emissions because of the lighter fuel load.

The release of particulate matter into the air during prescribed burning can have adverse effects on visibility and public health. As described above, the volume of particulate matter is related to which burning method is used and the extent of the burning. Particulate concentrations in the Mountain Counties air basin are influenced by climatic conditions and other emission-generating activities carried out in the air basin. Particulate concentrations are regulated through compliance with the California Air Resources Board and Northern Sierra Air Quality Management District.

The prescribed burning proposed in the action alternatives would be used to reduce fuel loadings to an acceptable level. Under favorable smoke-dispersal conditions, the smoke would likely affect air quality during ignition and for approximately three days following ignition. Another impact of the action alternatives would be the emissions and dust caused by project activities. Fugitive dust caused by the use of unpaved roads can produce PM_{10} in quantities great enough to impair the visual quality of the air. These effects are localized and would be mitigated by adherence to dust abatement standard operating procedures. Emissions from burning and equipment used for other project activities (such as thinning) may be occurring at the same time, which would elevate particulate matter. By following the burn plan and Air Quality Management District requirements for burning and managing other project activities, it is unlikely that emissions caused by the project would exceed California Air Quality Standards for the Air Quality Management District.

Cumulative Effects (Proposed Action)

The VOC, NO_x, and PM_{10} emissions from the action alternatives would contribute to particulate matter loading locally. Local effects include cumulative emissions from prescribed burning resulting from past practices, natural surface fuel buildup, and activities on federal, state, and private lands near the Ingalls Project area. The $PM_{2.5}$ atmospheric concentrations currently do not exceed national standards; however, emissions could exceed California Air Resources Board (CARB) standards if (1) weather conditions predicted by CARB meteorologists do not prevail, or (2) emissions do not disperse as predicted, and/or (3) emissions from other Air Quality Management District's adversely impact air quality in local districts. Forest Service and CARB smoke-dispersal forecasting would be used as part of the burn plan to mitigate effects within the regulatory framework.

The cumulative effects analysis for Air Quality considers ongoing, proposed and reasonably foreseeable future actions. Impacts to air quality from prescribed underburning and machine pile burning in the project and adjacent areas, during the last five years have been minimal and no Notice of Violation of air quality standards has been issued to the Plumas National Forest during this period. The action alternatives would not increase the amount of prescribed fire activities in the area above what has been implemented for the last five years, and would not impact the air quality of the area when combined with ongoing and reasonably foreseeable future actions. The action alternatives would have cumulative effects on air quality in the project area and local air basin (Northern Sierra), but the effects would be managed to be within the regulatory standards of the California Air Resources Board. The dust and emissions from project activities would be mitigated by requiring that Standard Operating Procedures be included with timber sale or service contract packages.

Alternative 3 (Non-commercial)

Direct and Indirect Effects of DFPZ fuels and Road Treatments (Action Alternatives)

The predicted criteria pollutant totals for timber operations (emissions from trucks and other equipment) would vary according to the acres of treatments performed each year. Table 23 presents the total criteria pollutants for prescribed burning, timber operations, and roadwork activities with Alternative 3.

Table 23 Criteria pollutant totals for timber operations and prescribed burning combined for Alternative 3.

	Acres	CO (tons)	Nitrogen Oxides (tons)	Volatile Organic Compounds (tons)	PM10(tons)
Underburning only or Hand thin/underburn	1123	1126.32	8.98	50.95	116.21
Mechanical equipment for fuels reduction and road work	1507	1.63	3.53	0.29	0.27
Pile burning	1341	493.69	13.41	24.02	53.37

Criteria pollutant totals	2630	1621.64	25.92	75.26	169.85

In the event of a wildfire, the stands in the Ingalls Project area that are treated would have less material to burn producing less particulate matter emissions than untreated areas outside the project area, when compared to Alternative 2. However because more material would be left than with the Proposed Action, and because less acres would be treated, if a wildfire were to occur after the implementation of Alternative 3 it would likely produce higher emissions than the same fire under Alternative 1.

Cumulative Effects

Cumulative effects would be similar to those described for Alternative 1.

Forest Vegetation

Introduction

This assessment addresses how the different alternatives impact forest vegetation, as measured by stand density (basal area or stand density index, and indirectly crown canopy cover), stand composition (trees per acre by species), and stand structure (trees per acre by diameter class,). These measurements are correlated to appropriate stocking levels, and stand conditions to maintain stand growth and health, including resistance to epidemic levels of insects and disease. This document also addresses current and desired stand conditions and the silvicultural treatment options for improvement of aspen habitat found in the project area.

Analysis Methodology

This analysis used five primary sources for the fundamental vegetative analysis and assessment; a 2008 digital ortho-photographic layer associated with the Geographic Information System (GIS), a 2010 digital California Wildlife Habitat Relationship (CWHR) vegetation layer, field reconnaissance of the project area, stand exam sampling of random stands stratified by vegetation type, and the previous fire history of the area.

Field reconnaissance and common stand exam (CSE) data was collected by Beckwourth staff. CSE data collected was based on stands identified and digitized using the 2008 digital orthographic-photographic layer. Also used in this process was the CWHR vegetation digital layer, which subdivides the forest's vegetation into CWHR vegetation types. CWHR vegetation types are discussed further in this report under the "Affected Environment" Section, as well as in the Silviculture Specialist Report. Vegetative stands within the project area were randomly sampled to determine forest vegetative characteristics for each sampled stand. These sampled stands were post-stratified into corresponding CWHR vegetation types for analysis of the Ingalls Project. Not all CWHR types were sampled, but were stratified into common sampling types. This was done because of the number of stands within the vegetation types not sampled were minor or did not exist within the treatment designated DFPZ classifications. CWHR types not sampled were assigned to similar types that were sampled for this project. Collected stand level and tree measurement inventory data was processed for input into a computerized forest growth model named the Forest Vegetation Simulator (FVS). Once data was input, existing stand conditions could be modeled into the future using this software tool. For more details concerning methodology, see Silviculture Specialist Report.

Aspen Surveys

Aspen stand surveys on more than 550 stands, totaling approximately 1,100 acres were conducted in 2004. The Region 5 Aspen Stand Assessment protocol developed for the Aspen Delineation Project (ADP 2002) was used as the sampling procedure. Based on these assessments, each aspen stand was assigned a stand loss risk factor rating of none, low, moderate, high or highest (ADP 2004). To enhance the ADP surveys a sampling of aspen stands was part of the CSE vegetation sampling within the Ingalls project. Because the aspen stands have started a conversion to SMC vegetation types,these stands are currently classified as CWHR type SMC2M under the Ingalls sampling stratification.

Affected Environment/Environmental Consequences

Affected Environment

Description of the Vegetative Landscape

The Ingalls Project area has been delineated into habitat types as classified by the California Wildlife Habitat Relationships (CWHR) guidelines (Mayer and Laudenslayer 1988). CWHR habitat types have been developed for the State of California to classify vegetation throughout the state. This classification system has been adopted by the Plumas National Forest to classify its vegetation. While 27 habitat types are found within the Ingalls Project area, only 12 vegetation habitats are represented within areas proposed for treatment. Table 24 shows the acres associated with the entire project area, as well as a cross sectional look at the potential DFPZ and Area Thin acres proposed for treatment under the Proposed Action alternative. This should give the reader a representation of overall project CWHR acres to those potentially being treated.

Table 24: Acres of habitat type within the Ingalls Project Area

California Wildlife Habitat Relationship (CWHR Type) (Grouped)	Ingalls Project Area		DFPZ/Area Thin	
	Acres	Percent	Acres	Percent
Sierra Mix Conife (SMC)r	7,945	44.5%	1,341	32.7%
Eastside Pine (EPN)	5,148	28.8%	1,725	42.1%
Fir Types (White/Red Fir)	2,105	11.8%	61	1.5%
Montane Hardwood/Riparian	128	0.7%	40	1.0%
Montane Chaparral/Shrub	1,438	8.1%	577	14.1%
Grassland	628	3.5%	151	3.7%
Wet Meadow/Wetland	337	1.9%	179	4.4%
Miscellaneous	129	0.7%	21	0.5%
Total	**17,858**	**100%**	4,095	100%

As the table displays, there is a large shift in percentages between overall acres to those potentially being treated (i.e. eastside pine from 29% to 42%). DFPZ units would primarily be at locations that support defensive positions in fighting wildland fire, which includes primarily ridge tops and south slopes with non-forested vegetation, or comprise of EPN or SMC vegetation types. This explains the percentage shift in the CWHR acres being treated.

A majority of the project’s forest vegetation can be described as mid-mature to late-mature (CWHR size class 4) forest with moderately dense or dense over-story layers (CWHR crown class of M or D). Jeffery pine, ponderosa pine, sugar pine, lodgepole pine, white fir, and incense cedar dominate the over-story. White fir, ponderosa pine and Jeffrey pine dominate the understory, except in SMC vegetation types where incense cedar is also prevalent. The mix of these species varies from stand to stand. The presence of pine and incense cedar suggests a natural fire regime, which consists of frequent low intensity spreading fires. Several 15-20-year-old plantations from previous projects are scattered throughout the project area. Shrub layer density varies in intensity from a moderate to light cover. Moderate density levels are in younger, open, north aspect stands where as light densities are scattered throughout heavily stocked, south facing stands. Past wildfire has not had an influence on the brush component, except in isolated areas where small fields of brush containing primarily manzanita and/or snowbrush exist in proximity or within openings of forested stands. Plantations at higher elevations have tree species growing up through brush, but this varies widely. Lower elevation plantations do not have a large brush component, mainly due to past treatment or growth limiting resources. The herb layer is comprised of scattered dry and moderate site indicator species. The vegetation is primarily heterogeneous, with existing stand structures and tree species composition reflecting past harvest activities, stand replacing wildfires and fire exclusion.

Current tree mortality can be attributable to insects and disease and has been found to be patchy within the project area. Most of the mortality is at endemic levels and is present throughout all species. Aerial surveys (USFS, PSW 2010) of the project area have detected increases in mortality over the past several years. This increase in mortality is strongly associated to a period of below normal precipitation and high stand densities in the project area (FHP Report 2010).

Stand Density and Structure Composition

Species Composition

Ingalls CSE plot data was stratified into vegetative types within this analysis area, east-side pine (EPN), Sierra mixed conifer (SMC) and white fir (WFR). Figure 2, Figure 3, and Figure 4 show the results of this analysis. Each figure contains two separate pie charts one showing species composition by basal area (BA) and the other by trees per acre (TPA). The data indicates that shade-tolerant species are invading shade-intolerant stand types. For example, looking at Figure 2 we see an increase in the percentage of white fir within the TPA graph versus the BA graph. This indicates that white fir is showing up as smaller diameter trees, therefore an understory invader. If the white fir component had been larger in diameter, the percentage under the TPA graph would have been retained. Since basal area is influenced more by larger trees, the small white fir are not well represented in overall basal area; however, under the trees per acre chart the small trees are represented indicating regeneration of white fir within the vegetation type.

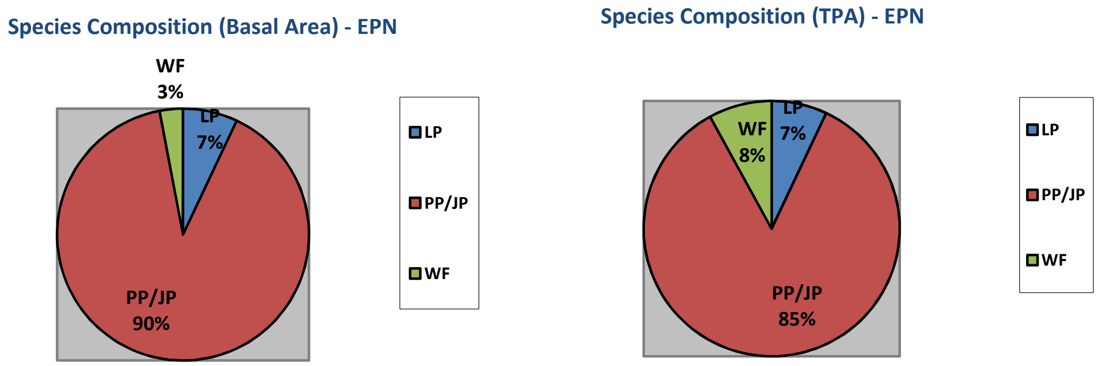

Figure 2: Species Composition – Eastside Pine

In Figure 3, species composition for the SMC vegetation type, this phenomenon is happening for incense cedar as well as white fir. This is even more dramatic than the EPN vegetation types. The incense cedar percentages differ from 24% to 15% for TPA versus BA, while white fir differs from 50% to 35% respectively.

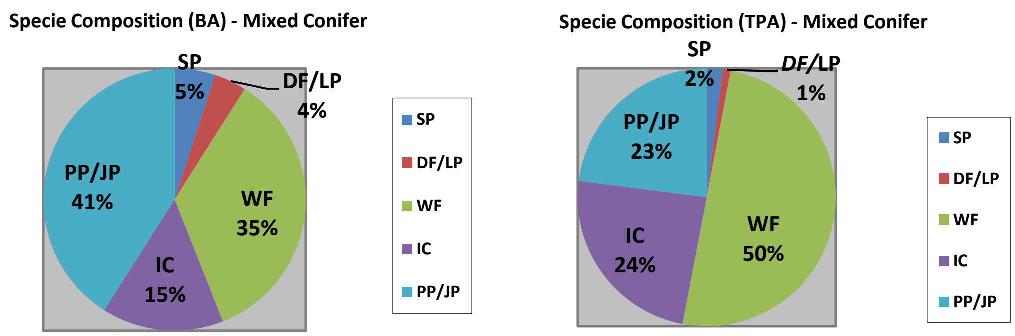

Figure 3: Species Composition – Sierran Mixed Conifer

Looking at the fir vegetation type (Figure 4), this change does occur slightly within the white fir, but only because lodgepole is being represented by a very large tree diameter component. White fir is such a large composition of the stand that any big differences in species represented as a small percentage will alter the species with a large representation. In this case, only 12 of every 100 trees is represented by a species which is not white fir, however the 12 trees, represented by both ponderosa pine and lodgepole pine, on average are much larger than the fir, thus they have a large influence on overall stand basal area. This indicates that the pine species have a significant influence on basal area composition within the fir types, thus must be a major consideration in assessment of treatment options.

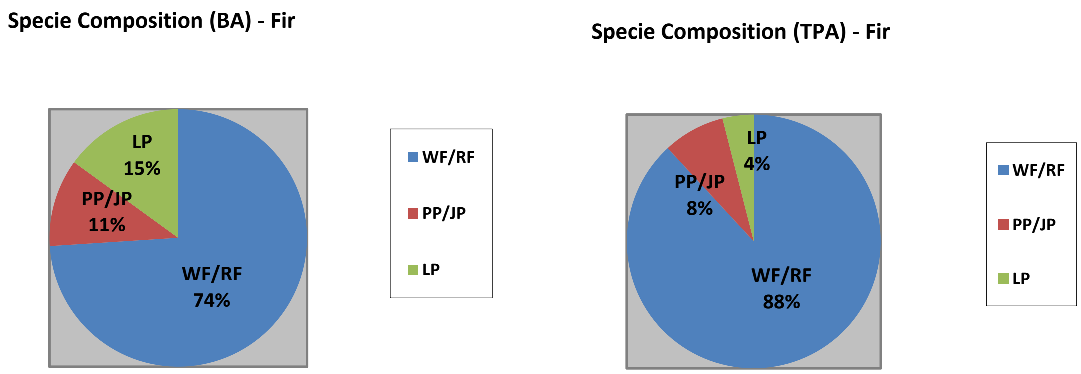

Figure 4: Species Composition – Fir

Vegetation Size and Distribution

The predominant size class within the Ingalls Project area, under the CWHR typing system, is size class 4. Approximately 55% of the timber stands being treated fall within the 11 to 24 inch diameter class, as compared to an overall percentage of 68% within the project area. Fifteen percent of the landscape within the Ingalls project area contains vegetation, which is not forested (i.e. grassland, meadow, chaparral habitats) or is classed as non-vegetative, (i.e., rock). This percentage almost doubles when considering the land considered for treatment. This reflects the objectives and strategies behind the DFPZ land allocations, limited fuels and defensible geography. The strategic location of non-forested lands on ridgelines in combination of treating forestlands adds to the defensible characteristics needed for defensible fire protection zones.

Table 25: Stand Composition by Size Class within the Ingalls Project area

Size Class Code	Description of Size Classes	Ingalls Project Area		DFPZ/Area Thin (Proposed Action)	
		Acres	Percent	Acres	Percent
______	Non-forest	2,661	14.9%	1,181	28.8%
1, 2	Seedling, Sapling (0 to 6 inches DBH)	191	1.1%	13	0.3%
3	Pole (6 to 11 inches DBH)	2,037	11.4%	578	14.1%
4	Small Tree (11 to 24 inches DBH)	12,092	67.7%	2,264	55.3%
5, 6	Large Tree (> than 24 inches DBH)	878	4.9%	58	1.5%

Figure 5 shows the current diameter distributions for vegetation types that the project is considering activities in. The graph shows the typical J-shape curve that is represented by most untreated forest stands. A common attribute of J-shaped curves is that there are large numbers of younger, smaller diameter trees and as the stand grows these trees die. This process is evident lower numbers of trees as the diameter size increases.

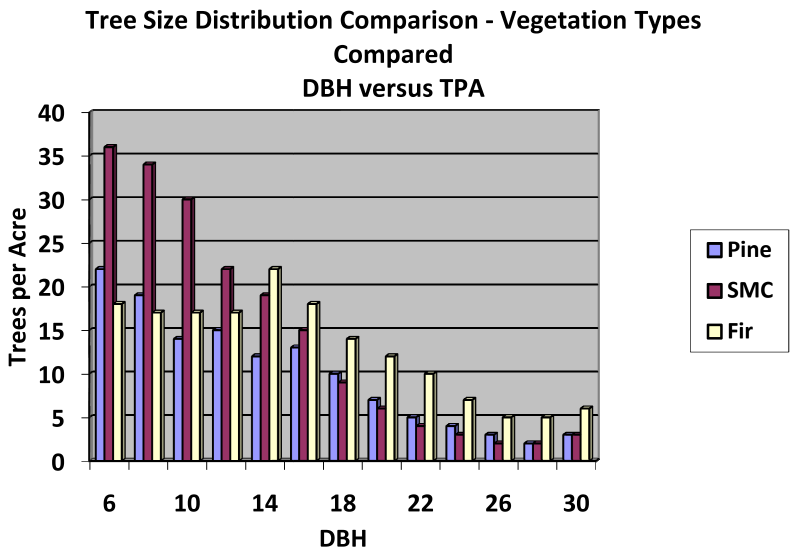

Figure 5: Current Diameter Distributions by Vegetation Type

Canopy Cover

Canopy cover is another component of the CWHR system. It is the amount of measured crown cover as a percent cast by trees greater than 5 inches diameter at breast height (Mayer and Laudenslayer 1988). As Table 26 indicates, the largest percentage of the vegetation is within the moderate crown canopy class, 40% to 59% closure. If we include the dense class, 60% and greater closure, this would include almost 50% of the entire acres we plan to treat within the DFPZ and Area Thin designations. The number of acres of higher canopy cover indicate that Ingalls stands show a propensity for growing shade-tolerant species, such as white fir. We can conclude from the number of acres within the higher canopy cover classes that the current probability for fire hazard and unpredictable fire behavior is likely higher then would be preferred or will become unacceptable within a short time period.

Table 26: Stand Composition by Canopy Cover within the Ingalls Project area

Canopy Cover Code	Canopy Cover	Ingalls Project Area		DFPZ/Area Thin	
		Acres	Percent	Acres	Percent
———	Non-forest	2,661	14.9%	969	23.5%
S	Sparse (10% - 24%)	1,698	9.5%	215	5.3%
P	Open (25% - 39%)	3,873	21.7%	917	22.4%
M	Moderate (40% - 59%)	7,506	42.0%	1,480	36.2%
D	Dense (> or = 60%)	2,120	11.9%	514	12.6%

Aspen Habitat

Of the aspen stands mapped and surveyed in 2004 on the Beckwourth Ranger District, the majority, 53 percent, were given a stand loss risk rating of highest or high, indicating that the stand was being hindered from overstory competition and/or not being replaced from below by regenerating sprouts. Stand assessments revealed that 63 percent of the aspen stands show aspen being competitively excluded by conifers, while an additional 19 percent are exhibiting less than optimal sprouting densities. This means that over 80% of the district's aspen habitats that were mapped and surveyed are in some risk status.

This risk assessment is supported by the fact that roughly 80 percent of the District's aspen stands were categorized as California Wildlife Habitat Relationship (CWHR) conifer cover types and not aspen cover types; including aspen stands within the Ingalls project area. Based on the CSE sampling within the Ingalls project, the averaged CWHR type for the aspens stands was a mixed conifer cover type, SMC2M.

The aspen/cottonwood stands of concern within the Ingalls Project shows these stands dominated by conifers in the overstory with canopy composition ratios of conifer to aspen as high as 10 to 0 or 8 to 2. Overstory conifers, 11" DBH and greater, within the project area are predominately white fir, ponderosa pine, Jeffrey pine or incense cedar.

Currently there is aspen regeneration occurring within these stands however, lodgepole pine has established itself and is beginning to compete with the aspen sprouts. This means over time the lodgepole pine will eventually shade out the aspen. The average conifer basal area calculated for the aspen stands in Ingalls is 79 square feet, or 85% of the total basal area with the majority of trees larger than 11" DBH.

Forest Vegetative Health

Insects and disease are important components of a normal healthy forested ecosystem, however could pose forest health problems if accurances are allowed to grow to large infestation or epidenmic levels. Due to fire exclusion, tree densities within the project area are much higher than a forest with a natural fire regime. The risk of insect and disease outbreaks are positively associated with higher densities (Fettig et. al. 2008; Powell 1999; Ferrell 1996). Therfore as stands become denser competition increases among trees for growing space (Reineke 1933), there is an increasing susceptibility to bark beetles and other forest insects and disease. Insects and disease left uncontained can potentially increase mortality, creating contributing to heavier fuel conditions over the project area. .

Pine forests support a variety of forest damaging insect species. These include both bark beetle (Dendroctonus sp.) and woood boring insects (Ips sp.). The most prevalent species within pine is the western pine beetle (Dendroctonus brevicomus). Other conifers, including white fir are hosts to other insect species. One speices of concern found in white fir is the fir engraver beetle. Forest damaging insects exist within the project area in endemic populations, but high tree densities place forest stands within the project area at high risk for epidemic beetle attacks.

In 2010, a Forest Entomologist/Pathologist with the Forest Service's Pacific Southwest Regional Office evaluated the project area (Cluck 2010). The Forest Entomologist noted several insects and diseases of concern within the Ingalls Project. The insects of most concern were the fir engraver beetle (*Scolytus ventralis*) and the flatheaded fir borer (*Melanophila drummondi*) which are attacking and killing white fir throughout the project area. Effects from these beetles are contributing to mortality within the project area. The specialist concluded that heavy stand densities combined with droughty weather conditions and stress from pathogenic diseases has contributed to an increase in insect infestations and eventually mortality in the project area.

Pathogenic diseases contributing to insect infestations include dwarf mistletoe (*spp. Arceuthobium abietinum, Archeuthobium campylopodum, Archeuthobium douglasii*) and annosus root disease (*sp. Hetrobasidion annosum*). Dwarf mistletoe infections are of greatest concern, because of the high infection levels within the project area. Most of the infections are in Jeffrey pine stands growing on shallow soils. These mistletoe infections are severe enough that there is an additional concern that the mistletoe infections are contributing to the increase of insect infestation from secondary attacks. Annosus root disease occurs in small pockets throughout the Ingalls project area, but currently does not have a major impact in the pine or mixed conifer vegetation types and has a moderate impact within fir stands. Throughout northern California, this pathogen is of concern, so the standard guidance from the USFS Regional office (R5) is to treat the disease after cutting activities with a borate compound registered by the State of California EPA for prevention of annosus root disease (see SOPs in appendix X).

White pine blister rust (*Cronartium ribicola)* is also present within the Ingalls project area. The disease occurs at very small levels in the project area, but is of high concern to the USFS Regional Specialists and Silviculturists. USDA-FS Region 5 has mandated protection for sugar pine to protect regional genetic resistance to this pathogen. Individual summaries of key insects and diseases pertinent to the Ingalls Project area are presented within the Ingalls Silviculturist Report.

Aspen Vegetative Health

Successful aspen sucker initiation relies on three key interacting components: hormonal stimulation, a proper growth environment, and protection of the resulting suckers. Hormonal stimulation causes suckers to grow from the roots of existing trees. This occurs when trees are stressed in some way through natural disturbances such as insect defoliation, disease, fire, climatic events, or when a parent tree dies. Aspen also need a proper growing environment to survive. This includes full sunlight to the forest floor and warm soil temperatures. Removing any conifers encroaching on the aspen stand may allow enough sunlight in to regenerate the stand and stimulate suckering. Mechanical harvesting of conifers can act as a sufficient disturbance mechanism by providing both minor hormonal stimulation, as well as create the proper growth environment required for successful aspen regeneration (Jones et al., 2005). Removal of competing conifers can also enhance any natural sucker production already occurring in declining clones (Shepperd et al, 2006). Protection from browsing is necessary for successful establishment of suckers and mitigation accomplished by constructing physical barriers or controlling animal movement. Any manipulation of aspen for successful regeneration must satisfy all three of these requirements. Techniques used to initiate aspen suckering and provide a favorable growth environment include removal of encroaching conifers through harvest and prescribed burning.

The effects of removing competing vegetation can result in dramatic changes in aspen regeneration and survival.

Since aspen is a fire-adapted species, prescribed fire potentially provides two of the three essential elements necessary for aspen regeneration. When used appropriately, prescribed fire is very effective in regenerating aspen. Killing overstory stems and injuring lateral roots provides the essential hormonal stimulation to initiate sucker production while removal of competing vegetation and blackening the soil surface (allowing it to be warmed by the sun) creates ideal growing conditions for suckers (Shepperd et al. 2006). Burning also releases nutrients that contribute to the growth of suckers. Although there is some application risk using prescribed fire, fire is probably what maintained many Sierra Nevada aspen/conifer forests in pre-settlement times. A combination of mechanical treatment and prescribed fire is usually the best course of action to regenerate aspen in mixed aspen-conifer stands. A combined treatment can provide a means of emulating natural fire regimes by providing maximum hormonal stimulation and optimal growth environments for aspen suckers as well as eliminating or reducing competing conifers (Shepperd, 2001).

Environmental Consequences

Alternative 2 – No Action

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Under the No Action Alternative, there would be no direct treatment of forest and other vegetative stands. There would be no implementation of management treatments to address the objectives or purpose and need of the Ingalls Project. This alternative allows stands to grow and develop according to normal successional processes and perpetuates the legacy of past management practices and fire suppression (Agee and Skinner 2005).

Measurement Indicator 1 – Stand Density

Existing stand conditions would change only through natural environmental processes. Stands would grow over time, influenced only by the environment in which they are developing. Current stocking levels for stands with moderate to dense crown canopy levels fall into a basal area range of 150 to 420 square feet. Open and sparse density stands average in the 50 to 160 square foot range. Without treatment, stocking densities will continue to rise over time resulting in a competitive increase between individual trees for moisture, nutrients and space. This leads to a loss of growth, diameter and height. Moderate and dense stands, show that over the thirty years of growth, basal areas will increase approximately 60 to 90 square feet. These denser stands are currently either overstocked or at or just below threshold (see Silviculture Specialist Report) for insect and disease risks. Stands with open and sparse crown canopy closures (<40%), have basal areas falling below the risk levels at which insect infestation may not be an immediate concern;

however the regenerative growth of younger trees is prevalent in these stands, which increases fire and insect risk based on tree spacing and clumpy stand conditions. .

For example, the average basal area of an EPN stand is 162 square feet, above the desired levels of 90 to 110 square feet. Because basal areas are at levels where serious health issues start to develop, there is an immediate concern about the health of pine stands. If left untreated for 30 years these pine stands are projected to grow to 276 square feet of basal area. This would place the average pine stand within the "critical" mortality range, risking potential epidemic insect infestations, thereby increasing the risk for ecological stand failure. If no treatment is implemented all stands show their basal areas and SDI levels increasing over the next 20 to 30 years. Therfore stands are growing larger and/or the numbers of stems are accumulating faster than natural mortality, increasing the potential of unhealthy stands which increases insect and fire hazard risks.

By breaking the "average" CWHR types into different density and size classes, differences in stand attributes between CWHR types can be shown.. First, the growth in the dense fir types (WFR) is not as dramatic because these stands have the presence of large diameter trees, which makes them densely overstoried. These conditions limit future regeneration and the effect diameter growth has on the increase in basal area. The basal area growth is smaller for the dense (D) fir versus the other CWHR types. The effect on diameter growth within the fir types is more evident using a QMD limited to measuring trees > 5". A second example can be seen with EPN4P (eastside pine, size 11-24", with crown closure from 20 to 40%), with an average basal area of 137. This basal area would not be of immediate concern because the basal area would fall in the "normal stocking" range of the pine stands. However, over the next 20 years the stand projection for basal area grows to 184 square feet with the quadratic mean diameter (QMD) falling 2" in diameter, indicating a rapid increase in smaller diameters that contribute to overstocking of the stand.

All stands except EPN4D show their basal areas and SDI levels increasing over the next 20 years. In EPN4D, basal area is stagnant and SDI has actually started to decline. This indicates that 4D eastside pine stands are over the 70% normality levels and are now in decline (mortality is larger than growth).

Measurement Indicator 2 – Stand Composition

The increase of basal area conditions would continue to favor tree species that are physiologically adept at growing under shaded conditions. These species would include white fir, red fir and incense cedar. Species such as ponderosa pine, Jeffrey pine and, to some extent, Douglas-fir would gradually be replaced by the shade-tolerant species. Over time, there would be a reduction of the overall percentage of pine within the overstocked stands. Pine stands would slowly convert to mixed conifer conditions, while mixed conifer slowly converts to white fir vegetation types.

Currently within the EPN stands, white fire and lodgepole pine are minor components of the stand, consisting of only 15% of the stand composition based on TPA (Figure 2). However, over time, both white fir and lodgepole pine will begin to invade the stand and the composition percentage of stems will increase. White fir is considered intolerant of fire, while lodgepole pine is more fire tolerant, but is considered a high-risk fire hazard species because of its ecological postion as a fire species and the species ability to contribute to undesirable fire behavior. Lodgepole pine is considered a fire speices because it ecologically uses fire to maintain its existence on the landscape. The species has the ability to use serotinous cones to regenerate after higher severity fires. Serotinous cones are specialized cones that release seed after fire. In the mixed conifer vegetation type, there is an observable transformation to a white fir type compared to the pine conversion to mixed conifer. Currently the stand type, based on TPA, has a stand composition that contains 50% white fir (Figure 3). Comparing this to the graph based on basal area we can see that white fir is regenerating into the mixed conifer, the percentage by TPA graph is greater than the basal area graph. This indicates younger white fir trees are invading into the SMC vegetation. This is also the case for incense cedar, even though it makes up a smaller part of the overall composition. Without any treatment (No Action Alternative) this invasion by white fir and incense cedar will continue, until the vegetation type converts to white fir or a disturbance by nature/man alters the ecological process.

The white fir vegetation types contain some remnant trees of ponderosa pine, Jeffrey pine and lodgepole pine (Figure 4). However, a lack of treatment activities will promote successional processes, and overtime these remnant trees species will die out of the stand until 100% of the composition is white or red fir. This will continue until either the stand ecologically collapses due to stand conditions and health or natural/man alter the ecological process.

Measurement Indicator 3 – Stand Structure

Stand structures, which are primarily single story now or those staging to multistory structures, will gradually convert to a multi-storied structure with a large number of understory trees. As the forest regenerates and younger shade-tolerant trees grow under the older mature overstory a crowding effect will develop. Without treatment, stand structures would be vulnerable to high severity wildfire, which potentially can be stand replacing, and would drastically alter the composition and structure of the forest vegetation within the project area. Figure 5 shows that on the average untreated stands in the Ingalls Project have started this development into a multi-storied status with large numbers of small diameter trees crowding the understory. However, ecologically over time the mature older trees will convert to the younger trees, returning the stand to a single story structure. Young trees will strongly influence average stand diameters keeping QMDs lower than treated stands. Stand growth rates would decline due to overly dense stands, while stand mortality would continue to increase. The result will be stands with overall stand and tree sizes much smaller than treated stands, with mortality levels eventually creating stand replacement conditions. Tree regeneration will continue to be shade-tolerant, fire prone species such as white fir.

Group Selection

There would be no direct effect on stand structures. However, an indirect effect is an immediate forgone opportunity of improving regeneration of fire resistant species and growing a healthier future forest.

Post Treatment Prescriptions

Under this alternative, no implementation of post activity treatments would occur. Small trees, shrubs, brush and other ground vegetation will continue to grow and accumulate on certain sites. Both ground and canopy fuel levels will increase over time as stands continue to grow, risking vegetation to stand replacing fire events. Stand basal area and crown density levels will increase to levels that potentially risk stands to insect infestation epidemics across wide landscapes.

Understory Vegetation

Since there would be no management activities, change in understory vegetation would be variable depending on the current stand conditions. Brush/shrubs in the short-term would continue to occupy their sites and either deter natural regeneration or slow the growth of currently established tree species. Sunlight environment preferred by brush and shrubs would become limiting over time as trees grow within forested stands. Tree canopies would shade sunlight out and brush/shrubs would slowly die-back over time. Regeneration of young fire resistant tree species would also decline as stands increase in tree density. Vegetation, which is shade intolerant, would be replaced by shade-tolerant species if seed source is available or the site currently contains and supports these species. . Eventually, even the regeneration of shade-tolerant species would decline when stand densities get to levels of full occupancy. Under Alternative 2, stand with denser canopies would have a consistent cover that would favor and be preferred by shade-tolerant species.

Direct and Indirect Effects of Improving Aspen Growing Conditions (Alternative 2)

Under Alternative 2, the treatment of aspen stands would not occur. Aspen stands would probably continue normal ecological progression, with no positive effects from management activity. However, there would most likely be negative effects from inactivity, including a decline in the stocking and regeneration levels of the aspen species and a loss of overall aspen health. Negative effects would likely occur over time because dense conifer forests would naturally replace aspen stands, raising the stand loss risk factor and increasing the perpetual loss risk of aspen clones from stand replacement fire in the future.

Measurement Indicator 1&2 – Aspen Stand Health and Condition

Tree health and vigor of individual aspen trees would probably continue to deteriorate. Old age, lack of quality sprouting conditions, and encroachment of conifers would be factors contributing to this deterioration. An ecological progression of conifers would take place; first shade intolerant then shade-tolerant conifer species would slowly invade the stand leading to a change of micro-site conditions that decrease aspen health. The current high stand loss rating of 4/5 (high category) would increase over time into the very high category. Insect and disease, which currently is not a serious problem, would be expected to increase over time as the stand ages and is not replaced by young healthy aspen trees. The combination of risk loss, increase in insect and disease and conifer encroachment would likely lead to higher mortality rates within all diameter classes. Large aspen would slowly die out and replacement through suckering and sprouting would not be sufficient in replacing the current stand.

Health and stand conditions that favor aspen regeneration through sprouting is likely to decline. The number of aspen sprouts per acre probably will decline as the stand ages and conifer invade the stand. As conifer species invade, canopy cover would increase, shading out the current aspen and future sprouts. Conifers most likely would become a higher percentage of the stand's composition and the ratio of conifers to aspen wouldchange from a low ratio to a high ratio. These stand conditions would decrease sprouting and regeneration, because sunlight would not reach the forest floor stimulating sprouting. This lack of regeneration would lessen the chances of aspen clones maintaining their current conditions. Conifer regeneration would continue and species composition should slowly convert from aspen to conifer. The number of aspen stems will likely continue to decline as conifer density increases over time. This ecological transformation is likely to threaten the existence of these aspen stands over the long-term.

Cumulative Effects of DFPZ, and Area Thin Treatments (Alternative 2)

Because there are no vegetative treatments proposed under this alternative, there would be no cumulative effect from treatment acitivites, but there would most likely be cumulative effects from no action. No action would perpetuate forest structures that are vulnerable to widespread change from fire, drought, insects and disease and climate change. Alternative 2 would not contribute to improving forest health and growth. Stand susceptibility to insect and disease infestations would potentially increase over time, especially during drought periods, leading to an increase of mortality levels. Other present and foreseeable activities such as fuelwood collection, Christmas tree cutting, and recreation would not have a positive cumulative effect on improving forest health; however, these activities have some potential for minor negative cumulative effects. These activities at current levels, if monitored, would have negligible cumulative effect on the project area. Fuelwood collection and Christmas tree cutting potentially have a negative cumulative effect on forest vegetation and regeneration if not monitored or the activities reach levels that may contribute to a higher cumulative effect. Fuelwood collection could potentially spread insect and disease to areas currently showing no infection. Fuelwood collection is also likely to have a cumulative effect on the number of snags present on the landscape, especially within reach of transportation system roads. Christmas tree cutting can also have a negative effect on areas in which regeneration is limited or an effort to regenerate lands is taking place, by removing established saplings. However, both would be limited to specific areas of the project where access by the public is frequent. Negative effects of climate change from the lack of management activites could potentially occur. Because there are no management activities, species that are suceptable to changes in climate (water availability, temperature) may become more prevelant on the landscape threating stand health and increasing fire hazard levels. Through management these negative effects could be mitigated, thus assisting the landscape during the climate's change.

Cumulative Effects of Improving Aspen Growing Conditions (Alternative 2)

There would be no positive contribution to cumulative effect on forest health or diversity from implemented activites. Alternative 2 would not contribute to improving aspen stand health or stand conditions. Application of no action most likely would create a negative cumulative effect on both growing and health conditions of aspen stands overtime. Aspen stands across the landscape are likely to decline over time, becoming a smaller percentage of the overall vegetation mosaic.

Alternative 1 – Proposed Action

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 1)

Under the Proposed Action Alternative (Alternative 1), existing stand conditions would change within DFPZ, Area Thin, and Aspen designated stands through harvest and fuel treatment activities. This alternative would treat designated lands using a "variable density thin" (VDT), group selection (GS), or an aspen prescription treatment. VDT would be the primary silvicultural treatment; however, implementation of GS prescriptions would happen in stand conditions where stand structure favors GS prescriptions. Implementation of aspen treatments would take place only in stands designated for aspen or cottonwood recovery. Removal of trees above 29.9" diameter would not be allowed under any of the prescriptions, unless the removal is for operability or under the Forest's hazard/ safety guidelines. In the VDT and GS prescriptions, preferential removal would be given to fire intolerant species, white fir and incense cedar, while ponderosa pine, Jeffrey pine and Douglas-fir would be left where feasible. This preferential treatment creates a stand condition that has a higher fire resistance.

Measurement Indicator 1 – Stand Density

The proposed prescriptions in Alternative 1 would alter both basal area densities (BA) and stand density indexes (SDI) for treated stands. In DFPZ designated areas EPN vegetation types were modeled to a square foot basal area level of 80 to 90 square feet for size classes in the 11" to 29.9" diameter group. The result is residual stand basal areas that range from 90 to 115 square feet of tree density; leaving an average basal area of 96 square feet for all EPN stands. Stands with higher CWHR densities, dense (D) and moderate (M), were treated much heavier than the lower density stands of open (P) and sparse (S). Because low density stands do not exceed the basal area objectives, implementation of VDT concepts will most likely be inconsistent across the landscape. In these low density stands, VDT concepts may be redefined to meet specific objectives needed under special circumstances. Example would be defining juniper species as legacies to meet special wildlife objectives. In the EPN stands, the modeling indicates that we can meet basal area density objectives of less than 120 square feet, a key preliminary point of insect/disease risk. Modeling also shows that on the average the VDT treatments would maintain forest health and insect risk for the next 20 to 30 years, based on the average basal area of 121 square feet in year 2041.

In the mixed conifer vegetation types, DFPZ modeled silviculture treatments lowered the basal area densities to the 120 to 130 square feet range in the size class group of 11" to 29.9". The resulting "total" basal area for the mixed conifer was 130 to 140 square feet for residual stands in the 3D, 3M, 4D, and 4M stands. These basal area levels met the stocking objectives as discussed in the Silviculutral Report for meeting forest health. The underlying reason for this result was the ability to meet crown canopy cover objectives of 40% in this vegetation type after treatment. As with the pine vegetation type, the addition and mix of smaller diameters allowed for more trees per acre being retained, thus leading to a higher canopy cover. The average residual stand in the mixed conifer would have 120 square feet of basal area after treatment. Modeling results indicate that VDT treatments to the square footage proposed would likely allow future stand conditions to maintain acceptable stand basal area levels for a period of 20-30 years.

In the DFPZ stands, fir vegetation types did not always meet the forest health basal area objectives. The intent was to model residual basal areas down to the 140 to 150 square feet of basal area in the size class diameter of 11" to 29.9". However, because of crown canopy objectives, the amount of basal area capable of being removed was restricted, for the 3D and 4M stands. To meet the minimum canopy objective in these two cases, modeled residual basal area had to be increased to 180 and 160 square feet respectively. In the 3M stands, the modeling at 150 square feet fell just below the canopy objective of 40%, but because of statistical variation, an assumption was made that this represented the defined objective. The resulting post-treatment basal areas of 202, 168, and 186 for the heavier stocked stands were above the residual basal area of 150 to 160 for normal forest health conditions following thinning. This result occurred because the current fir vegetation types (4M) has structures with larger diameter trees and does not have the tree per acre number within the smaller diameters. Thus, when we pattern the variable density across all diameters we end up taking some larger diameters needed to maintain canopy cover. Secondly, stands that currently are small in QMD (3D), have a large TPA number of much smaller diameters with very few larger trees. These small trees do not cast a crown as significant as the larger trees. However, these stand are so populated and dense with smaller trees that the VDT treatment cannot remove enough of the trees yet maintain crown canopy levels. Therefore, to meet canopy standards an increase in the residual basal area was needed to compensate for the low crown levels.

The modeled VDT prescriptions met SDI objectives for forest health with only a few exceptions. The exceptions were within the same WFR stands that could not meet basal area objectives. In the EPN stands, after treatment SDI levels were modeled to an average acceptable level of 156, with the denser stands carrying SDI levels of 165 to 185, just below the preferred thinning levels. Mixed conifer vegetation types show a similar result as the EPN vegetation types. Variable density thinning would lower levels to an appropriate SDI thinning level of 230 to 240. SDI levels under the WFR vegetation types demonstrates that the VDT silvicultural prescription would not get the SDI levels to the preferred post-treatment level of at least 280 for three of the specific vegetation types. However, under the DFPZ designation all three would get down to the "55% of normal" SDI competition level, but under the Area Thin designation SDI levels would remain marginally high for forest health expectations. Post-treatment outcomes indicate overall average SDI levels of 156, 211 and 267 for the three base vegetation types, EPN, SMC, and WFR. Therefore, on a landscape basis these SDI stocking values are well within the levels to maintain forest health and limit insect risk over the landscape, however individual stands may continue to see some problems with forest health, especially over the long-term without treatment sooner than the 20 – 30 year expected reentry cycle. The modeling results at the thirty-year mark indicate that the majority of VDT treatments would meet average requirements for forest health concerns.

Another objective under this alternative was to maintain a minimum level of crown canopy cover, therefore the VDT prescriptions were constrained by objectives for crown canopy cover. Crown canopy objectives were defined as average stand minimums; either a 30% crown canopy closure for eastside pine (EPN) vegetation types or a 40% crown canopy closure for the Sierra mixed conifer (SMC) and white fir (WFR) vegetation types that fell in DFPZ designated lands. Within Area Thin designated lands, crown canopy minimums were raised to 40% in the EPN types, and 50% in the SMC and WFR vegetation types. In modeling vegetation stands in this project area, crown canopy closure was considered a main objective that needed to be met; thus measures for forest health such as basal area, were considered secondary to crown canopy closure.

The Proposed Action Alternative was able to meet the crown canopy constraints in the vegetation types of concern within the project area. Stands of concern were the dense and moderate canopy covered vegetation types. In most instances, the open and sparse canopy covered stands were either at or below threshold, so treatment activity would be limited in these types. In the EPN stands, crown canopy closure averaged 33% after treatment. Dense and moderate pine stands were able to meet the basal area objectives and carry higher canopy cover than required. Open stands were either slightly higher or at the threshold of 30%, so treatment was limited due to the fact that basal area needs were met, and heavier treatments would lower crown threshold even more. Sparse stands were under crown canopy thresholds, and are projected to remain there through the next 20 to 30 years, even without any treatment activity.

To accommodate Area Thin designated acres a canopy cover objective of 40% cover was modeled in the EPN4D and 4M stands. Modeling indicates that both EPN stand types can achieve the 40% canopy threshold; however, basal area objectives would likely become a minor concern, since residual basal areas could only be lowered to 125 to 130 square feet. This indicates that forest health risk would be an issue in the short-term rather than the long-term. Results indicate that EPN stands classified as dense or moderate under CWHR would convert to either a moderate or open stand condition after treatment. Open and sparse designated stands would remain within these density classifications.

Sierra mixed conifer stands showed a similar result as the pine stands, with a couple of exceptions. First, the dense and moderate stands would likely not meet both basal area and canopy objectives. Any silvicultural treatment that significantly removed basal area would most likely just marginally meet threshold of 50%. Secondly, the open and sparse stands do not initially meet threshold (31%). In these stands, limited tree removal lowered the average crown density slightly to 28%. Only one SMC vegetation type under Area Thin clearly achieved the canopy constraints prior to any harvest treatment. This was SMC4D. However, after treatment to the 50% objective forest health risk would become a major concern within this vegetation type, because the residual basal area remaining, at 187 square feet, is well above the 130-140 desired. This stand type would also quickly grow to basal area levels above the desired maximums of approximately 200 square feet. Modeling indicates a square footage of 250 within the next thirty years. A second vegetation type of concern under SMC is SMC4M, which does not initially meet the 50% crown canopy threshold objective. CWHR results indicate that SMC, as well as WFR stands classified as dense under the CWHR classification, would convert to moderate stand condition after treatment. Moderate, Open and sparse designated stand would remain within these density classifications.

The fir vegetation types showed that only the 3M stand could meet both the basal area and canopy objectives. However, the other white fir types could only meet one of the two objectives, BA or CC but not both. The remaining white fir types would meet basal area objectives but prior to thinning do not meet the crown canopy threshold. The modeled average crown canopy cover under the fir vegetation type showed a crown cover of 37%. Only one white fir type was a concern under the Area Thin treatment, WFR4M. Results indicate that this type can achieve the 50% objective for the fir type, but forest health is expected to be critically compromised with a residual basal of 250 square feet. A residual basal area at this level is clearly above the desired maximum even after treatment. This means there would be a minimal gain to forest health from treatment. Even if the VDT prescription is applied, the treatment would be a short-lived and the need to return for future treatment would be high. Support of this assessment is a modeling result showing 313 square feet of basal area in the next 20-30 years.

Measurement Indicator 2 – Stand Composition

Stand composition by species changes under the Proposed Action Alternative. The change observed is a reduction in the percentage of white fir and an increase in percentage of fire resistant species (pine). The changes in percentages are a direct result of the preference removal of fire intolerant species, such as white fir, incense cedar and lodgepole pine. Comparing results from this alternative to Alternative 3 (Non-Commercial Funding Alternative), we should see a higher percentage of fire intolerant species removed. However, this would be dependent on the current species composition and stand structure of the stands prior to treatment.

Eastside pine showed a small loss of shade-tolerant species, because modeling targeted these species for removal to improve fire resilience of the stands. This means that stands designated as eastside pine (EPN) vegetation stayed classified EPN post-treatment. Post-treatment the EPN vegetation type still contained a percentage of fire intolerant species of white fir and lodgepole pine. These species remain because of the size diversity objective in the VDT treatment. In this prescription, the objective was to thin across the diameter classes, therefore to leave some smaller diameters the prescription was required to spatially leave some non-preferred species.

Mixed conifer had the most significant change. As the VDT prescription outlined white fir and incense cedar were preferred species for removal under the prescription. The targeting of these species for removal alters the vegetation type's average species composition. In Alternative 1, the modeled VDT treatment changed the percentage of white fir composition from 50% for initial stand to a 35% composition for the residual stand. Also shown is a decrease in the composition percentage of incense cedar from 24% to 14%. Compensating for the loss of these species, the vegetation type's composition of ponderosa pine, sugar pine and Douglas-fir all increased, from 23% to 40%, 2% to 5% and 1% to 6% respectively. Removal of fire intolerant species is controlled during the implementation phase of the silviculture prescription by attempting to remove as many stems of the fire intolerant species as feasible under the prescription.

For the SMC vegetation types, the CWHR classification of SMC would most likely remain SMC after treatment. However, there is potential in some instances where the type may change to an EPN vegetation designation. This would most likely occur in instances where the classification is marginally SMC under current conditions, and removal of fire intolerant species would alter the percentages so ponderosa and Jeffrey pine are the most prevalent species.

Stand species composition in white fir CWHR vegetation types most likely will not change from application of silvicultural treatments. WFR types will remain WFR post-treatment. Species composition under current WFR vegetation types contains a large percentage of white/red fir, 74%. Post treatment the average percentage for the white fir increases slightly however, ponderosa /Jeffrey pine percentages increase as well due to the removal of lodgepole pine, a species designated for preferred removal. Because of the large percentage of true fir species making up the current composition, converting these stands to SMC or EPN types would be difficult under a thinning prescription. Therefore, group selection treatments were considered within these ecological types for reducing forest health concerns and fire hazard/risk.

Measurement Indicator 3 – Stand Structure

VDT treatment would increase the quadratic mean diameter for the average vegetative types, however the overall residual QMDs for EPN, SMC and WFR will only increase slightly from current sizes. For example, the average quadratic mean diameter increases from 13.4 to 13.7 inches in the average EPN vegetation type. QMD also increases in SMC and WFR vegetation types, but the difference is slightly larger in these two types. The respective average change is from 9.9" to 11.2" in the SMC stands and 12.9" to 13.5" in the WFR vegetation type. The QMDs increase for all individual vegetation types except EPN4D, EPN4M and SMC2M. This indicates removal of more trees below than above the mean diameter in all vegetation types but three. In the EPN4D, 4M and SMC2M the opposite occurs, more trees above the mean removed, lowering the QMD in these stands. Within the EPN4D and 4M stands, this indicates stands were single storied with larger trees and fewer trees under the mean QMD. In order to meet the basal area objective, implemention of the VDT prescription required a larger number of trees removed in the 11" to 29.9" diameter group , thereby lowering the QMD. Since SMC2M represents the aspen vegetation type, there is an application of a conifer removal prescription and therefore the change in QMD does not reflect the VDT proposed in the other vegetation types. The treatment in SMC2M would be a complete removal of all conifers smaller than 30", resulting in a much lower QMD in the residual stand (please reference sections on aspen treatment contained in this document and the Silviculture Report).

Since the VDT prescription thins across diameters the CWHR size classifications would not be altered from application of this silviculture treatment. Change in CWHR size classification would only take place post treatment as stands grow over time. Stand QMDs will grow about 30% or 3 to 4 inches over the next 20 to 30 years. This would not be enough to alter the average CWHR size classes for EPN, SMC, of WFR, but potentially would change individual types from 3 to 4, or 4 to 5, depending on the current condition, the resulting residual stand and future growth on individual stands or vegetation types.

The small quadratic mean diameter changes are a result of the variable density thinning prescription, which removes trees across all diameters. By spreading removal over the diameter classes within the variable density thin prescription the stand maintains some multi-story function, and moderates the increase in average diameter size. **Error! Reference source not found.**, **Error! Reference source not found.**, and **Error! Reference source not found.** shows the effect of the variable density thinning harvest on the average EPN, SMC and WFR stands respectively. The stand will balance size classes maintaining some smaller size structures within the residual stand as compared to Alternative 3. The attempt is to have an equal number of stems per acre spread across all diameters. As the figures shows this will only partially happened in this entry cycle, but after several management entries, the achievement of the desired future diameter spread is accomplished. The current condition of the stand influences the resulting diameter distribution after treatment, so the number of entires to achieve the desired diameter spread will be dependent on the current stand diameter conditions. However, if we compared the residual diameter distribution of the "strict from below thin" (Alternative 3) to the variable density thin, there is a distinctive structure of trees in the lower diameters, which is not present under thinning from below. While the inclusion of these smaller diameter trees may not decrease the potential fire hazard to the maximum or optimum levels desired the prescription does maintain some vertical structure desired for future silvicultural options and wildlife.

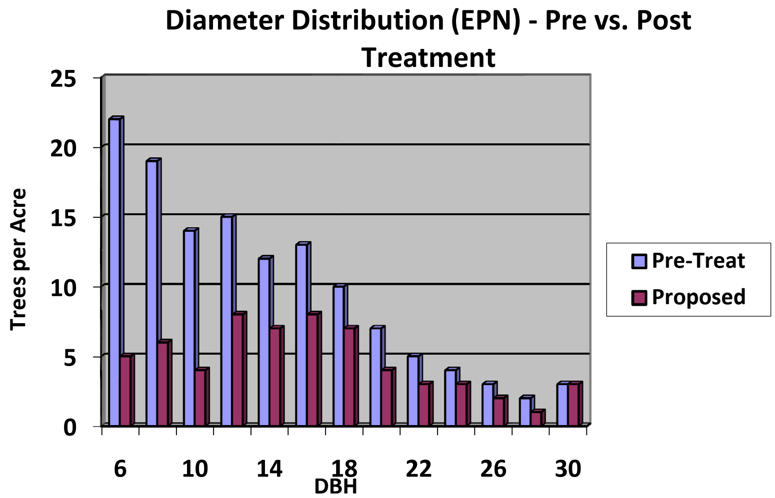

Figure 6: Average Residual Diameter Distribution of Eastside Pine

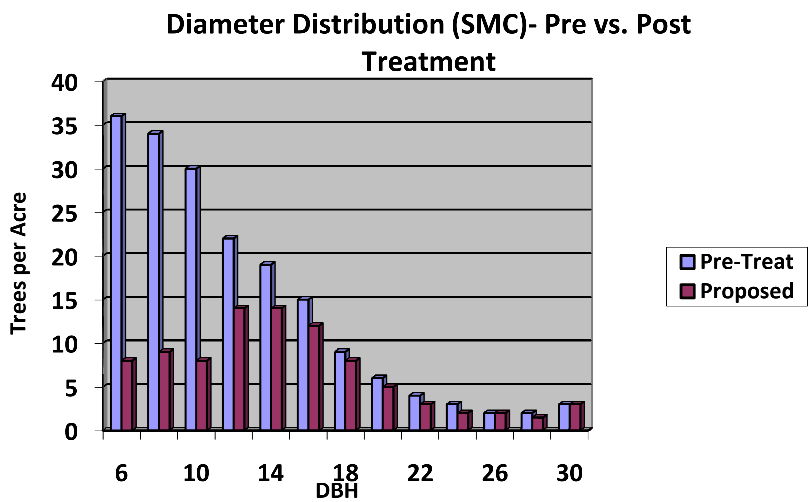

Figure 7: Average Residual Diameter Distribution of Mixed Conifer

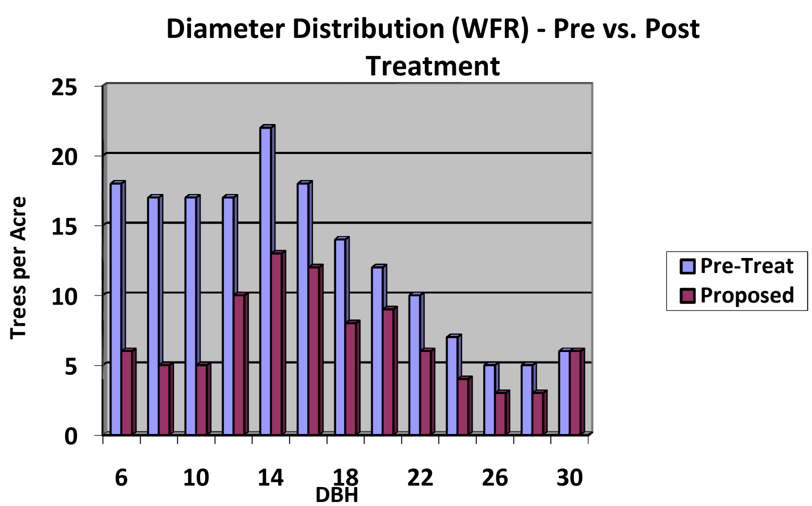

Figure 8: Average Residual Diameter Distribution of White Fir

Special Stand Conditions and Silvicultural Treatment

Certain vegetation types create a dilemma in the implementation of variable density thinning as defined within this document. The GTR 230 notes that VDT concepts pertain to sierra mixed conifer and do not completely fit with every stand type or appropriate for every stand (enter source). Some stands and stand types do not "classically" fit VDT concepts due to their current stand structure or stand condition. Therefore, under special circumstances prescriptions could potentially be altered to improve silvicultural outcomes. .

A modification of VDT would enhance and promote objectives under these special situations. Example, juniper tree species are valuable species for wildlife habitat and diversity, hence it is essential to manage this species under special rules. This species primarily occurs in open and sparse vegetative conditions, therefore in these stands, variable density thinning is not a perfect fit, but an adjustment in the VDT prescription would improve the stand's conditions and structure and move it to toward the desired future condition. This adjusted prescription would be limited and not change current stand conditions significantly. Crown canopy, basal area or trees per acre levels would not be altered an adequate amount to change CWHR habitat classification.

Group Selection (GS)

Group selection is an uneven-aged regeneration method and is an intermediate treatment to address short-term objectives of stands.One specific objective of this prescriptive treatment restoratively treats specific stands where variable density thinning practices have limited effectiveness because regeneration and young trees are a missing component of the stand. Generally, these stands would be single storied, larger diameter stands where the trees are spaced on an equally spaced grid. The intent of the prescription is to break-up the homogeneity of these stands, initiate the ability of stands to become structurally multistoried, multi-aged and vertically structured over time and improve forest health. Under group selection, forest health is likely to be improved by selecting groups or trees with the highest risk from insect and disease.

Group selection would alter total stand structure by creating small openings of less than 2 acres within designated stands. Basal area would be non-existent in the openings, except when residual trees over 30" remain or when selected residuals are retained to provide a seed source for future regeneration. The resulting residual stand structure and conditions would vary depending on the needs of the group and current stand conditions. Residual structures within the openings could potentially be any structural pattern from a few seedling/saplings to a pattern that has a few scattered trees of various diameters, generally not exceeding 10 trees per acre. Basal area growth would occur over the ecological rotation of the stand; for most vegetation types in this project area this would be from 70 to 150 years.

A large reduction in canopy cover and stand density occurs in order to create a favorable environment for promoting and establishing shade-intolerant conifer species such as ponderosa pine. Group selection would convert small areas of large CWHR size class structures to CWHR size class 1 structure with a few large remnant trees however, these openings would not alter the overall stand CWHR. Residual stand over-story structure in the openings would be comprised of less than 10 trees per acre, in which the size will vary from 11" to over 30 inches in diameter. Groups would have an open stand structure with sparse canopies, generally less than 10% cover. Diameter distributions within the openings would be representative of a one to two stage stand depending on the number of larger over-story trees retained.

Regeneration of approximately 170 to 240 trees per acre within the group openings would establish a desirable forest stand in the future. The ability of group selection to promote establishment and development of shade-intolerant conifer regeneration is largely dependent on the size of opening (York et al. 2004). Establishment and development of shrubs and other vegetation is expected. However, group selection could be used as a silvicultural technique in reducing and controlling competing brush species for regeneration (McDonald 1999). They observed that within smaller units, "normally aggressive shrub species were never really competitive"; however, they also noted that shade-intolerant species were less successful in their growth development. Shrubs and brush are recognized as part of the vegetation and stand component and removal treatments would take place only if brush is considered a hindrance to regeneration, or treatment is needed to lower fire risk, and the stand has been designated for post-treament.

Post Treatment Prescriptions

Direct and indirect effects of these prescriptions would be the same. However, the type of treatment as a post-treatment to thinning may differ from unit to unit. Several fuel treatment prescriptions will be implemented within this alternative. Hand thinning would take place primarily in Riparian Habitat Conservation Areas, on stands where slope exceeds operational SOPs, and within specified stands where tree densities do not warrant mechanical operations. The treatment would affect structural diversity because most trees under 8" would be removed. The amount of structural change would depend on the initial stand structure and the number of smaller trees within the initial stand. Crown canopies would only have a minimal change because most crown cover is cast by the larger trees structures within the stand. Effects from hand thinning on stand change is expected to be equal or less than the strict thinning from below (Alternative 3) because the 8" limit is either equal or lower than the UDL proposed under Alternative 3. Change of CWHR classification would be nominal, but we expect QMD to increase for the stand, and basal area and TPA to decline. Stands that are marginally between size and density classifications may be altered. Stand size may jump from 3 to 4, in some instances density may fall from D to M or M to P. It is anticipated that vegetation classification of the CWHR would not change thus, EPN, SMC or WFR classifications would remain the same.

Hand thinning, under most circumstances, will improve forest health conditions by reducing the small tree structure, lowering basal area, and making nutrient and water available to the larger tree component. However, if the stand only contains a small component of small trees, hand thinning may not improve forest health if the upper structure still has a high stand density. Under these conditions, removing the lower structure would marginally improve forest health and insect risk, but leave density levels and fire risk higher than preferred levels. Thus, hand thinning may only have a minimal effect on forest health, and probably would require future silvicultural activity entries sooner than units treated with mechanical thinning.

Mechanical fuel treatments such as grapple piling and mastication may or may not affect structural conditions. In certain situations, pre-commercial thinning by either hand thinning or mechanically of trees less than 12 inches may occur. The result would be the same as for hand thinning except additional trees smaller than 12 inches may remain as residuals. Grapple piling would primarily proceed in stands where large woody debris, brush and small trees are the objective for removal. Grapple piling would remove a portion of the woody debris, shrubs, brush and unwanted trees under 12 inches. Treated material would be piled, and then burned, after a period of curing. Hand pile burning can scorch nearby residual trees and has the potential of inducing additional thinning through mortality loss. By keeping piles small, and burning under prescribed conditions, the mortality results of pile burning should be negligible.

Mastication treatments would occur primarily in areas that are open to montane chaparral and in conifer stands where mechanical treatment (grapple piling) or underburning is not viable. This decision is made based on current fuels levels or fuel levels left by the mastication treatment. Mastication treatments alter the vertical arrangement of brush fuels by converting live aerial fuels to dead surface fuels. Conifer saplings and larger trees would be avoided during treatment to encourage establishment of forest vegetation cover. Mastication treatment would contribute to the duff and litter layer, which may inhibit vegetation growth as well as forest regeneration. Over time, the duff and litter layer will decompose, eventually allowing growth of immature brush species and tree regeneration.

Underburn by prescribed fire would reduce fuel loading by consuming down woody debris, litter and duff. The treatment would likely scorch smaller lower canopy trees which could result in mortality of individual or isolated pockets of residual trees; however, this effect is expected to be minor on the stand level. Underburning would have a minimal effect on forest vegetation and structure. The treatment would create a mosaic of ground conditions, leaving bare mineral soils in some areas and vegetation intact in others. In areas where bare mineral soil has been exposed, sprouting of brush and tree regeneration would re-establish themselves in a short time period. Underburn activities will avoid stands where ground fuel levels risk heavy scorch on fire-intolerant species, unless another post treatment activity is used prior to the underburn.

Understory Vegetation and Regeneration

The clump and gap ideology of variable density thinning would create openings and lower tree densities, which would encourage regeneration of shade-intolerant species such as ponderosa pine. By lowering basal area and crown canopy cover, sunlight would be available to the forest floor encouraging shade-intolerant species, and slowing shade-tolerant species from regenerating.

VDT will also maintain small diameter trees that would not be present under Alternative 3. Understory vegetation would potentially increase immediately after tree removal in stands treated under either variable density thinning or group selection. With the addition of more sunlight, brush, shrubs and grasses would increase within lower density areas of residual stands. Post-activity DFPZ fuel treatments would initially decrease the amount of brush and shrubs; however, over time they will return from sprouting and regeneration. Grapple piling either as a post-treatment or as the only treatment would decrease ground vegetation. Future establishment would depend on the quality of the treatment, the retained vegetation, and future seed source of the vegetation. Mastication activities would also decrease the ground vegetation, but re-establishment of the vegetation would probably occur quickly through sprouting of existing remnants.

Direct and Indirect Effects of Improving Aspen Growing Conditions (Alternative 1)

There are numerous aspen vegetation stands found within the Ingalls project area. The removal of conifers would create suitable habitat for the aspen species to increase in number, diameter size, and productivity. A report by Jones et al. (2005) indicates that conifer removal was effective in the regeneration of aspen stands. Four years after silvicultural treatment, an increase in aspen density was shown across all age classes as compared to stands not treated. It is expected that short-term negative impacts may occur but natural ecological recovery should reinvigorate the stand's growth; therefore these impacts should be short-lived with favorable long-term results to aspen vegetation and conditions.

Measurement Indicator 1&2 – Aspen Stand Health and Conditions

Tree health and vigor of individual aspen trees would increase with stand treatment. The stand loss risk rating, which is currently high, lowers after treatment. Aspen risk loss would remain stable for a period then over time start to increase again with coniferous evasion. Insect and disease levels, which are not considered a current problem, would be maintained at the same level. Aspen improvement activities under this alternative would be preventative against future infestations. Mortality levels in the all diameter classes should be improved. Larger older trees should become more vigorous, because stocking of conifers would be decreased, increasing nutrient/water availability and growing space for these larger aspen. Sprouting would be encouraged consequently increasing the number of young aspen. Newer, younger trees with better growth and lower mortality rates would be prevalent in the improved stand. Conifer species competition would be reduced , thus the aspens would be "free" to grow. Both older and younger trees would see an increase in growth vitality over time due to an increase in sunlight availability. Older tree health would improve, but ecologically this health would be transmitted to younger trees instead of invading conifer species.

Under Alternative 1, conifer species would be removed creating canopy cover conditions that promote and support aspen sprouting. The removal of conifer species would open the stand canopy to sunlight, a factor essential to the regeneration of quaking aspen. This sunlight would create microclimatic conditions such as a rise in soil temperatures, which leads to increase in aspen clones sprouting. Sheppard et al (2006) showed that this removal of conifer competition and increasing the composition percentage of established aspen within a stand, lead to an increase of sprouts within five years after the harvest activity. This author also showed that light soil disturbance from silvicultural activity also promotes additional sprouting, increasing regeneration, and the chances of aspen clones maintaining or improving their current stand conditions.

Cumulative Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 1)

Forest health and growth cumulative effects analysis considered past, present, and foreseeable projects within the Ingalls project area boundary. Forest activities over the past 20 years, which would affect forest health and growth, have been limited both within and immediately outside of the project boundary. Several vegetation projects are currently being implemented nearby the Ingalls project boundaries. Two specifically are the Grizz and Freeman EA projects. Both projects include both DFPZ and forest health guided objectives. Foreseeable future projects within the Ingalls project area that affect vegetation include future DFPZ treatments, recreation, fuelwood cutting (firewood), and Christmas tree cutting. These activities are expected to have negligible effects on forest densities, species composition and stand structures and therefore forest health. Another consideration is the cumulative effect of climate change on forest landscapes over time.

Past forest management activities have been limited in this project area; however natural activities such as wildfire have taken place. These fires have remained small and have been suppressed when they have occurred. In relation to forest health, these fires have had both positive and negative contribution to the health of the forest. These fires have replaced primarily overstocked stands that would have contributed to insect infestations but suppression has limited the effectiveness of these fires on a landscape scale. Because of this, the cumulative effects from vegetation treatments would improve the health of the stands and vegetation within the project area, and tree removal for forest health and growth would have short-lived and minor cumulative effects over the landscape.

Of projects previously mentioned, DFPZ treatments potentially have the greatest impact on cumulative effect. However, given that this type of activity would be follow-up to management activities proposed, the timeframe of those treatments is probably 10-15 years into the future. Based on this timeframe, the only affect future DFPZ treatments could potentially have in combination with alternatives proposed would be potential negative cumulative effects on regeneration establishment in stands treated. However based on previous DFPZ activities and research studies this seems to be insignificant to forest development, structures, and forest health/growth. None of the other activities would add significantly to the cumulative effect on forest structure, composition or health/growth.

Numerous forest activities have been identified adjacent to the project area. These activities would have no or only a minor effect the forest health and growth within this project area, and therefore have a limited cumulative effect on forest health and growth. Treatment of vegetative stands adjacent to the project would reduce risk of epidemic spread of insect populations into this project area however, because the number of acres being treated next to this area and treatment of nearby private ownership is minor the directly cumulate effect to the Forest Service landbase would be small.

Personal and commercial use fuelwood programs are ongoing, as is the DFPZ treatment program on the district. Fuelwood cutters remove approximately 1,000 to 1,500 cords of firewood yearly, primarily in the form of snags and large woody debris. This activity is limited to within 100 feet of the forest's road system. The firewood cutting program would have a limited cumulative effect on forest health. Trees removed may assist in controlling insect populations by removing potentially infected trees, but also have the potential to spread insect and disease from isolated areas. However, most trees harvested would be beyond their infectious stage, thus this activity would only have a minor positive or negative cumulative effect. Removal of fuelwood would not have a cumulative effect on overall stand conditions to effectively manage forest health or growth. Christmas tree cutting activities could potentially have a negative cumulative effect on stand regeneration and management for fire resistant species, especially in areas that are easily accessed during the seasonal permit. However, this probably is not a major concern since white fir and red fir are the species of preference over pine when selecting Christmas tree stock. Therefore this activity would have no or limited overall cumulative effect on forest health/growth. Recreational activities would have no cumulative effect on forest health or stand growth.

The treatment activities proprosed now and in the future potentially have the cumulative effect of mitigating effects from climate changes over time. By altering and favoring fire resistant species in future stands, changes from a potentially warming climate will mitigate fire hazards, and increase the survivability of species under warming and droughty conditions.

Cumulative Effects of Improving Aspen Growing Conditions (Alternative 1)

Measurement Indicators 1&2 – Aspen Health and Stocking

The effects of past activities are built into this analysis, since these activities were largely responsible for the current landscape. Management and natural activities have cumulatively affected aspen communities and include; timber harvest, wildfire, fire suppression, prescribed fire, road construction, domestic grazing and activities that have changed water flow patterns. Previous historical fire suppression, wildfire, and other activities have had a potential negative cumulative effect on aspen communities. The absence of natural fire regimes has contributed to the decline in aspen ecosystems across landscapes. Wildfire at severe levels risks damage to aspen clones and replacement by other habitats, such as brush fields, which develop naturally adjacent to these aspen ecosystems. Overtime brush habitats will grow and increase the future fire risk from severe wildfire. By treating aspen stands, removing conifer and promoting aspen a buffer is against potential wildfire in the future. Under Alternative 1 the treatment of aspen stands and removal of conifer would have a positive cumulative effect on the establishment, stocking and growth of aspen within the stands treated.

Other activities such as watershed restoration projects, fuelwood collection, and recreation do currently occur directly and indirectly within aspen vegetation types. Watershed restoration projects have taken place in the past and will occur in the future within the Ingalls project area. These projects can affect aspen habitats; however, these projects are designed to help restore the natural hydrological regime and should have a positive cumulative effect on aspen in these projects. Fuelwood collection and recreation would have marginal to no effect on the aspen habitats being treated under this alternative.

Cumulative Effects of Forest Access and Transportation Management

The small amount of transportation management activities would have negligible impact on the overall forest health and growth of the forest within the Ingalls Project. Road obliteration would not alter any vegetation, but would encourage reforestation of non-forested acres. Over time, vegetation would encroach and establish within the old road profiles. Temporary road construction would remove all forest vegetation within the road profile; however obliteration of these temporarily constructed roads would mitigate the vegetative effects. In addition, the road activity would be less than 0.1% of the total acres being treated through other activities, a very low impact on the forest vegetation overall.

Alternative 3 – Non-Commercial Funding

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 3)

Alternative 3 (Non-Commercial Funding Action) would treat only acres designated as DFPZ. Treaments would be implemented under a single objective of reducing fire risk to a predetermined level. Units would be treated by mechanical thinning using a “strict thin from below” prescription to an upper diameter limit (UDL) that would meet the fire and fuel objectives. These UDLs would remove understory trees through a strict application of an upper DBH limit without other silvicultural considerations. Trees removal would occur without consideration to commercial status, species preference, desired silvicultural stocking or current insect/disease infection. This means that there would be limited preference for conifer tree removal or harvest based on species, tree vigor or tree health. Tree diameter would be the primary discretionary selection point.

The upper diameter limits to meet the fire and fuel objectives would range from 8” to 16” depending on the CWHR vegetation type. In eastside pine (EPN), UDLs would be either 8” or 10”; in mixed conifer (SMC) they would vary from 8” to 16” and in white fir (WFR) the range would be 8” to 12” respectively.

Measurement Indicator 1 – Stand Density

Treatment under this alternative would remove understory and depending on the UDL some mid-storied trees, leaving only an over-story of residual trees. Stocking, tree size, crown canopy and other silvicultural conditions of each residual stand will vary depending on the initial vegetation type.

Since basal area density is not a prescriptive objective under this alternative, the resulting basal area density is an indirect effect of the silvicultural treatment for fire hazard. The basal area stocking levels within stands treated would be lowered due to the removal of trees. In both eastside pine and mixed conifer the resulting basal area densities for the open and sparse crowned stands fall within acceptable forest health levels for the long-term. Eastside pine basal area levels would be at levels below 110 square feet per acre, and would be acceptable 20 to 30 years out in time. The “thin from below” treatment under this alternative would not meet the desired forest health objectives for basal area under moderate or dense EPN stands. Basal area levels above 130 would continue applying stress to EPN stands leaving them at higher risk for insect infestation. This was extreme under the dense stands with basal area levels in the 190s for the both the 3M and 3D vegetation types. These basal area levels would be at values where insect and disease becomes a serious problem and tree mortality potentially is quite heavy. Basal area remains at levels where additional thinning should occur.

Modeling of the mixed conifer vegetation types showed all stand types meet the basal area objectives and forest health needs of Alternative 1, except for SMC4D, which would be treated to 190 square feet. Therefore, SMC4D stands would remain at risk to insect and disease. SMC vegetation types were able to achieve the forest health objective due to a higher UDL than those of the EPN types. In the white fir types, only one vegetation type was able to meet the basal area objective, 160 square feet for this type. The other WFR types are above the forest health threshold after treatment and WFR3D stands are very high and close to levels were additional treatment would be needed sooner than later to alleviate forest health risks.

Under Alternative 3 the majority of pine, Sierra mixed conifer and true fir vegetation types would meet the preferred stocking levels after thinning under a SDI evaluation. Post-treatment data indicates that three pine, one mixed conifer and two fir vegetation types do not meet the preferred SDI thinning levels. The six vegetation types fall in an initial canopy cover level of dense or moderate. The lack of adequate thinning and the heavy crown cover indicates these stands had high initial SDI levels. This is the case with all stands having an initial SDI level falling at or above the “health issue” range.

The average EPN type under the “strict-thin from below” prescription did not meet the preferred thinning SDI level of 210, achieving only a 218 SDI level. This indicates that the three vegetation types, EPN3D, EPN4D and EPN4M, have a big influence on the whether the overall pine landscape meets forest health objectives. With post-treatment SDI levels of 299, 326 and 264 these three vegetation types would need additional treatment in the short-term to avoid potential health risks from insect and disease. The average SDI density level falls below concerns in some stands, but not thinning areas to a desired thinning level would shorten the reentry period needed to maintain landscape forest health in the future. In the SMC classification, only one vegetation type shows some indication of potential forest health risks in the near future. SMC4D data shows a residual SDI level of 272, which is below the “health issue” range, but not thinned to the preferred SDI level that would protect the stand through the next 20 to 30 years. Two WFR vegetation types show the potential health risk after treatment. WFR4M is similar to SMC4D, in that UDL treatment was not to a SDI level that would carry potential forest health risks far enough into the future. WFR3D, with an initial SDI level of 754 is in the critical mortality range. This result means that stands in this vegetation type are at risk of complete ecological collapse, with the potential of becoming small sized/low density stands. The “strict thin from below” treatment left a residual SDI of 521, leaving the SDI in the health issue range, and only providing a minimal improvement in forest health protection.

Canopy cover was not considered a constraining objective for the “strict thin from below” prescription. Since the “strict thin from below” prescription removes smaller and generally lower levels of basal area than the VDT prescription. In Alternative 1, all stand types in the eastside pine, and white fir vegetation types met crown cover threshold goals, when accomplishment was feasible. However, because the prescription calls for a “strict” removal of understory, open and sparse stands, that generally do not meet crown cover thresholds, have crown canopies lowered to levels slightly lower than those in Alternative 1. Example, the residual crown cover percentage for EPN3P under this alternative is 27%, a little lower than Alternative 1’s 29%. The same holds for white fir, WFR3P data shows residual crowns of 21% versus 24%.

Canopy data results for the mixed conifer were opposite those of EPN and WFR vegetation types. The resulting average crown canopy percentage for the SMC vegetation type was 28%, compared to 40% and 44% for EPN and WFR respectively. To achieve the fire risk objective of the prescription, crown levels were lowered below the threshold goals. All but one SMC stand type fell below the canopy thresholds. The only vegetation type to meet our goal was SMC4D with a residual canopy cover percentage of 47%. This indicates that the mixed conifer stands contained many smaller trees that contributed to the crown canopy and needed to be removed to improve fire behavior. Mixed conifer stands at or below threshold prior to treatment showed the same result as EPN and WFR stands. Canopy percentages were lowered to levels slightly below those shown in Alternative 1, showing the inflexibility of the “strict” UDL removal.

Measurement Indicator 2 – Stand Composition

The “strict-thin from below” (Alternative 3) silvicultural treatment may only minimally alter the species composition of the stands. This alternative’s prescription does not have a direct removal preference as to which species warrant removal over others. Instead, diameter size is the method of preference, and therefore selection of intolerant fire species for removal depends on how species fall into diameter classes. Species that are shade-tolerant and generally considered fire risk species (white fir) will not have a higher priority of removal over other species. Shade-tolerant species would have a higher probability of remaining within the stand composition, because shade-tolerant species may be present in diameters that are not allocated under the UDL. If these species are larger than the upper diameter limit (UDL) then they would not be selected for removal, which could potentially happen under Alternative 1. Overtime this will have the effect of encouraging continued growth and regeneration of these shade-tolerant species. Removal of “less desirable” species would occur if they were present within the diameters being harvested. The highest “UDL” for any particular vegetation type is 16”, thus only less desirable trees below 16” would be removed from that specific stand. The result is that the time effectiveness of the fire hazard treatment would be shortened due to remnants present to contribute to regeneration of shade-tolerant species. This is due to the removal requirement of the strict UDL limit, instead of being flexible under the VDT prescription.

The UDL thinning was not a hindrance to removing shade-tolerant, fire prone species in the EPN or SMC vegetation types. The lack of a species preference objective is not a factor in the application of this prescription. In both cases white fir, incense cedar and lodgepole pine composition within these vegetation types declined, while ponderosa pine, sugar pine and Douglas-fir increased. For example, white fir and incense cedar percentages declined from 50% to 35%, and 24% to 13%, while ponderosa pine increased from 23% to 41%. In addition, there are modeled increases in sugar pine and Douglas-fir, which currently occur in low percentages. These slight increases combined with the opening of stand canopies from thinning could potentially encourage future regeneration of these species. An opposite result emerges in the WFR vegetation type, the percentage of white fir increases after treatment, going from 74% to 91% of the vegetation type’s composition. This happens at the cost to ponderosa pine, Jeffrey pine and lodgepole pine, which become smaller percentages of the overall composition. In this case, the shade-intolerant species must have found areas to regenerate and by treating using the UDL prescription these younger trees with smaller diameters were removed.

Measurement Indicator 3 – Stand Structure

The “strict thinning from below” will alter the average QMD of the stands being treated. Overall stand QMD size will be increased. The proposed silvicultural treatment will increase the quadratic mean diameter for all vegetative types. For example the average EPN vegetation type QMD increases from 13.4 to 18.6 inches, the average SMC QMD increases from 9.9 to 20.3, while the average WFR QMD increases from 12.9 to 19.4. This increase significantly shows the stands becoming more single-storied than prior to harvest. This phenomenon is because only lower and mid-storied trees are being removed under this alternative’s prescription. The difference between the Proposed Action and Non-Commercial Funding Alternatives is that residual trees will be present across the lower diameters with the Proposed Action because the VDT prescription does not have a firm UDL at which tree removal must occur.

Group Selection

Under this alternative, group selection would not be implemented; therefore no effects would occur from this silvicultural activity.

Post Treatment Prescriptions

Post fuel treatment prescriptions would remain the same as Alternative 1; however, post-treatments would only be implemented on DFPZ designated lands. The direct and indirect effects of these prescriptions would be the same as Alternative 1 (Proposed Action); however, the difference in the applied silvicultural prescription may alter the post-fuel treatment employed from unit to unit.

Understory Vegetation

Like the No Action Alternative, canopies would tend to have a consistent cover that would limit the amount and growth of brush/shrubs. The brush component of the stand would decline during treatment, but gradually increase after treatment. Under this alternative growth and regeneration would be lower than Alternative 1 because of the overstory canopies left by the silvicultural prescription. Brush would become exposed to additional sunlight and nutrients due to the removal of small diameter trees, but not to the extent of Alternative 1 because a higher percentage of canopy cover would remain in most vegetation types. Exposure to sunlight and additional nutrients would increase growth and presence of brush species. However, since the removal of basal area varies depending on the vegetation type, some types would show less brush growth than other types. Example, under the dense and moderate canopy stands basal area after treatment would be higher than under Alternative 1, therefore the residual canopies, and lower levels of sunlight and available nutrients would minimize growth of the brush. In the higher density stands, basal area will remain high even after treatment, thus the probability of a large quantity of ground vegetation growth is limited due to the canopy shading effect. Ground vegetation that does sprout will die-back more quickly under this prescription. This is due to the number of residual trees remaining and quick restoration of basal area to the stand after treatment.

Brush would be most prevalent in the lower density stands (open and sparse) because the strict thin from below UDL prescription would actually remove more basal area than the Proposed Action Alternative. This would open these lower density stands even further adding to the potential of more brush. The amounts of additional brush would depend on the site and soil conditions of these lower density stands.

Regeneration intensity would be lower and seedlings that establish would have slower growth rates under this alternative compared to Alternative 1. Shade-tolerant species will be favored due to the number of mid to large diameter trees maintained in the residual stand structures. Since residual basal area is higher than under normal thinning practices, white fir and incense cedar will be the favored species in regeneration. Open density (P) stands will have some pine regeneration, which would be preferred, but stand density growth will lower the pine regeneration potential over time. Because stand regeneration will favor shade-tolerant species (white fir, incense cedar), future activities would need to be more frequent, making reentry sooner in an effort to maintain the fire/fuel objectives.

Direct and Indirect Effects of Improving Aspen Growing Conditions (Alternative 3)

Like the No Action (Alternative 2), the Non-Commercial Funding Action (Alternative 3) would not have any treatments within aspen stands. Aspen stands designated for treatment under Alternative 1 would not occur therefore, the direct and indirect effects would be the same as Alternative 2.

Measurement Indicators 1&2 – Aspen Stand Health and Conditions

Effects would be the same as Alternative 2.

Cumulative Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 3)

Alternative 3 is likely to maintain higher canopy levels in general, leaving more dense/medium canopies on the landscape. Measurement indicators in Alternative 3will also be slightly different compared to the other alteratives due to difference in prescriptions implemented. The cumulative effect of these measurement indicators is that reentry may need to be more frequent to address changes in stand conditions contributing to quicker return of insect infestation risks from the prescriptions implemented. Other cumulative effects of this alternative would be the same as Alternative 1.

Cumulative Effects of Improving Aspen Growing Conditions (Alternative 3)

Cumulative effects would be the same as Alternative 2.

Economics

Introduction

Demographic and economic data was analyzed to determine the socioeconomic impacts the Ingalls Project has on Plumas, Lassen, and Sierra counties, and their associated communities. Data was analyzed based on local economic information from these counties.

The wood products industry is a major employer and revenue generator in these counties. The majority of the contractors who bid and work on projects on the Plumas National Forest reside in Plumas, Lassen and Sierra counties. The communities in these counties are dependant on the forest products industry for jobs and revenues. These communities are isolated from urban job markets, resulting in their reliance on natural-resource based industries. Because of their rural location, these counties are also more dependent on natural resources than other counties in California.

The Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG FRA) 1999, Appendix S, and Appendix T describe the direct, indirect, and cumulative socioeconomic impacts of implementing the HFQLG Pilot Project. Therefore, this economic analysis will not revisit the information presented in the HFQLG FRA, but will focus only on those revenues and treatment costs associated with implementing thinning and fuels reduction treatments within the Ingalls Project area.

Affected Environment/Economic Consequences

Affected Environment

Timber Yield Tax

Yield taxes are based on values established by the state for various timber products, as determined by analysis of market transactions in a given area twice each year. On Forest Service land the tax is paid by timber operators or purchasers, based on the amount of timber harvested in a given year. Currently, the 2011 tax rate is 2.9 percent of the State prescribed value of the harvested product. Generally, 80 percent of the yield tax would be returned to the county from where it was collected

Employment

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber or other wood products would have a direct effect on employment opportunities for individuals within Plumas, Lassen and Sierra Counties. Indirect effects account for employment in service industries that serve the lumber or other wood products manufacturer. These industries may include logging, trucking, and fuel suppliers. Induced effects are driven by wages. Wages paid to workers by the primary and service industries are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs, which typically range from 10 to 15 jobs per million board feet of timber harvested.

Receipt Act Payment

Receipt Act payments are distributed pursuant to the National Forest Management Act (Public Law 94-588). Under this law, 25 percent of the National Forest revenues are allocated to the state in which the forest is situated. For the Ingalls Project, the Plumas National Forest is expected to contribute 25 percent of the advertised rate in Receipt Act payments to Plumas County. These payments go back to the county where Receipt Act funds are divided between public schools and public roads. However, through 2011, Plumas County has opted to receive money from the Secure Rural Schools and Community Self-Determination Act instead of the Receipt Act. The amount of money generated by the Receipt Act is still determined because the Secure Rural Schools and Community Self-Determination Act is slated to expire at the end of the 2011 fiscal year. The Secure Rural Schools and Community Self-Determination Act is a "stop gap" measure to provide county public schools with federal funding. This act was created because of the lack of reliable timber receipts due to the current log market and erratic schedule of Forest Service timber sales. Congressional representatives are working to find a replacement of the Secure Rural Schools and Community Self-Determination Act but it is unknown what will come of this effort.

Revenue to the Government

Net revenue is the difference between the revenues generated by an alternative and the costs required to implement the alternative. In this analysis, revenues come from the harvest of saw timber and biomass.

Treatment Costs

Treatment or management costs include those costs associated with timber harvesting, biomass removal, road improvements, fuels treatments, and mitigation requirements, as well as costs of resource enhancement measures not associated with the sale of timber. Costs vary widely depending on the amount of mechanical, manual, or prescribed fire treatments; the board feet of sawlogs or tons of biomass removed per acre; and the accessibility of the treatment units.

Economic Consequences

Each of the action alternatives would create additional employment opportunities in service industries, such as logging supply companies, trucking companies, and fuel suppliers that serve the timber industry. There is also an induced effect that is driven by wages. Wages paid to workers by the primary and service industries would be circulated through the local economy for food, housing, transportation, and other living expenses.

All action alternatives would provide direct employment opportunities including jobs related to timber removal and forest fuel mitigation; and indirect employment opportunities such as fuel suppliers, lodging and local mechanics.

Alternative 2 – No Action

Direct and Indirect Effects of DFPZ and Area Thin Fuel Reduction Treatments, Improving Aspen and Cottonwood Growing Conditions and Providing Road Access to Meet Project Objectives while Reducing Transportation Effects

Implementation of Alternative 2, the No Action Alternative would have a negative effect on the local communities. Alternative 2 would negatively affect the local industries that rely on a steady supply of timber and service contracts to maintain community employment, as well as having a negative effect on Plumas County that would use the timber yield tax to fund county programs.

This alternative would not reduce critical fuel loadings or harvest any timber. No funds would be generated for the U.S. Treasury or returned to local communities (Table 27). Neither additional employment opportunities nor wages paid to primary or service industry employees would be circulated through the local economy. The local communities would not benefit from the 100 plus jobs that would be created and a potential loss in excess of $6 million dollars of employee-related income.

Cumulative Effects of No Action (Alternative 2)

Cumulative Effects DFPZ and Area Thin Fuel Reduction Treatments, Improving Aspen and Cottonwood Growing Conditions and Providing Road Access to Meet Project Objectives while Reducing Transportation Effects

The cumulative impact of the No Action Alternative would negatively affect local industries dependent on Forest Service contract work or a steady supply of timber, as well as communities that use the timber yield taxes to fund county programs. The local communities currently lack opportunities related to fuels reduction, site preparation, and timber harvest activities; the action alternatives would provide those opportunities. The local economy would also not receive benefits from associated employment, such as in food, lodging, and transportation businesses.

Throughout northern California, cumulative years of reduced timber harvesting activities (including those on Federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures, could significantly reduce or eliminate future economic and environmental opportunities from National Forest lands. The continuation of current conditions under Alternative 2 would preclude opportunities for long-term employment and rural community stability because the fuel reduction activities related to the creation and maintenance of DFPZ’s would not occur.

Alternative 1 – Proposed Action

Direct and Indirect Effects of DFPZ and Area Thin Fuel Reduction Treatments, Improving Aspen and Cottonwood Growing Conditions and Providing Road Access to Meet Project Objectives while Reducing Transportation Effects

Alternative 1 would generate approximately 6.6 million dollars in employee-related income, 165 full-time employment opportunities, and contribute 40,830 dollars in yield tax (Table 27). The total forest product value for Alternative 1 is estimate at just over $2 million dollars and calculated at 3 percent below the costs of implementing Alternative 1.

Table 27. Comparison of economic impacts by alternative for the Ingalls Project.

Revenue/ Cost/Employment	Alternative 1	Alternative 2	Alternative 3
Sawlog and biomass harvest revenues	$2,065,138	$0	$574,860
Total Cost	$2,118,360	$0	$1,465,350
Net harvest revenues	$(53,222)	$0	$(890,490)
Percent Above Timber Value	-3%	0%	-61%
Non-harvest costs (DFPZ construction)	$691,750	$0	$691,750
Total Project Value	($53,222)	$0	($890,490)
Timber yield tax	$40,830	0	$4,133
Receipt Act	$9,196	$0	$2,341
Harvest jobs	143	0	96
Service jobs	22	0	21
Total harvest and service jobs	165	0	117
Total employee-related income	$6,591,000	$0	$4,690,000

Alternative 3 – Non-Commercial Funding Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuel Reduction Treatments, Improving Aspen and Cottonwood Growing Conditions and Providing Road Access to Meet Project Objectives while Reducing Transportation Effects (Alternative 3)

Alternative 3 would generate over 4 million dollars in employee-related income, 117 full-time employment opportunities, and contribute 4,133 dollars in yield tax (Table 27). The total forest product value for Alternative 3 is estimated at 575 thousand dollars and calculated at 61 percent below the cost of implementing Alternative 3. Alternative 3 would create fewer jobs and generate less employee-related income than Alternative 1. Alternative 3 would generate $2,341 in Receipt Act payments.

Cumulative Effects of Action Alternatives

Cumulative Effects of DFPZ and Area Thin Fuel Reduction Treatments, Improving Aspen and Cottonwood Growing Conditions and Providing Road Access to Meet Project Objectives whle Reducing Transportation Effects (Action Alternatives)

Alternative 1 generates the most revenue for employees and in a time of economic downturn, the jobs created by the Ingalls Project would allow people to pay for basic expenses and potentially save for future investments. The revenue generated would stimulate local communities, benefit public schools and the local infrastructure for years to come. The other action alternative, Alternative 3, would result in similar cumulative effect by increasing the overall economic activity in the HFQLG Pilot Project area. However, part of the intent of the HFQLG Pilot Project is to create the greatest revenue and highest number jobs for Plumas, Lassen and Sierra counties. Alternative 1 would achieve this.

The amount of yield tax that private timber operators would provide to the State of California is lower in Alternative 3 at $4,133, and higher in Alternative 1 at $40,830. Alternative 2, the No Action Alternative provides no yield tax. Approximately 80 percent of the yield tax would be returned to Plumas County for various programs. The current economic downturn has had a negative effect on the school districts within Plumas County. These counties rely on timber tax receipts generated from Federal timber sales to support school programs.

Though it is not a requirement, it is assumed in the analysis that most forest products from HFQLG projects will be processed locally within Plumas, Lassen and Sierra counties due to high hauling costs to transport products out of the area. Likewise, it is also assumed most employment will be from residents of these counties due to the location of sawmills and cogeneration facilities. The Ingalls Project timber sale revenues and service contract employment would complement all other HFQLG funded projects across the forest. Economic goals for the project as a whole across the Pilot Project Area are discussed in the HFQLG Final Environmental Impact Statement.

Wildlife Biological Assessment/Biological Evaluation

Introduction

The purpose of this Biological Assessment/Biological Evaluation (BA/BE) is to determine whether the action alternatives would result in a trend toward listing or loss of viability for sensitive species, and to document effects on threatened, or endangered species and/or their critical habitat as part of determining whether formal or informal consultation with the United States Department of the Interior Fish and Wildlife Service (USFWS) is needed. This BA/BE is prepared in accordance with legal requirements set forth under Section 7 of the Endangered Species Act [19 U.S.C. 1536 (c), 50 CFR 402] and standards established in Forest Service Manual direction (FSM 2672.42).

Five categories of species are considered in this BA/BE; threatened, endangered, proposed, candidate and Forest Service sensitive species. Species federally listed as endangered by the USFWS are species currently in danger of extinction throughout all or a significant portion of their range. Species listed as threatened are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. A proposed species is any species that is proposed in the Federal Register to be listed as a threatened or endangered species under the Endangered Species Act (ESA) (50 CFR 402.03). A candidate species is a species for which the USFWS has on file enough information to warrant or propose listing as endangered or threatened. Forest Service sensitive species are designated by the Regional Forester and are species that have known or suspected viability problems due to (1) significant current or predicted downward trends in population numbers or density, and/or (2) significant current or predicted downward trends in habitat quantity or quality for these species. The Forest Service considers the long-term conservation needs of sensitive species in order to avoid future population declines and the need for federal listing.

This BA/BE document consists of both a Biological Assessment for federally listed wildlife species potentially occurring on the PNF ("Federal Endangered and Threatened Species that may be affected by projects on the Plumas National Forest" updated April 29, 2010 (USFWS database, Appendix A)), and a Biological Evaluation for Region 5 Sensitive Species (updated October 15, 2007).

Several Threatened and Endangered (T&E) species identified in the list of T&E species provided by the "Federal Endangered and Threatened Species that may be affected by Projects in the Plumas National Forest", updated April 29, 2010, accessed via USFWS web page (http://www.fws.gov/sacramento/es/spp_lists/NFActionPage.cfm) (Appendix A), have been eliminated from further analysis, based on past analysis and concurrence from the USFWS (Rotta 1999, USFWS letter 1-1-99-I-1804 dated August 17, 1999) or due to lack of species distribution and/or lack of designated critical habitat. These species are listed below:

- Winter Run Chinook Salmon (*Oncorhynchus tshawaytsha*)

- Conservancy Fairy Shrimp (*Branchinecta conservatio*)
- Central Valley steelhead (*Oncorhynchus mykiss*)
- Delta Smelt (*Hypomesus transpacificus*)
- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*)
- Central Valley spring-run Chinook salmon (*Oncorhynchus tshawaytsha*)
- Carson wandering skipper (*Pseudocopaeodes eunus obscurus*)
- Critical Habitat for vernal pool invertebrates (Butte County)
- Critical Habitat for California Red-legged frog

In addition, the valley elderberry longhorn beetle, northern leopard frog, and Swainson's hawk, identified as Category 1 above, will not be further discussed because the habitat factors for these species are not in the wildlife analysis area; therefore, the project will not directly or indirectly affect these species or their habitat.

Hardhead minnow, California red-legged frog, northwestern pond turtle, greater sandhill crane and willow flycatcher, identified as Category 2 above, have habitat in the wildlife analysis area but will not be further discussed because the habitat factors for these species would not be either directly or indirectly affected by the project; therefore, the project will not affect these species or their habitat.

The species whose habitat would be either directly or indirectly affected by the Ingalls Project are carried forward in this analysis. This BA/BE report will evaluate the direct, indirect, and cumulative effects of the Proposed Action and alternatives on these species and their habitat.

Effects Analysis Methodology

The wildlife analysis area is defined as the project area (which includes the treatment areas) plus an additional larger land base. The additional larger land base was delineated based on the potential indirect and cumulative effects on California spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. The wildlife analysis area goes out to, and encompasses, the closest PACs/HRCAs to the project area. The wildlife analysis area totals approximately 38,901 acres of which 38,368 acres are on National Forest System lands. This wildlife analysis area is being used for all wildlife species analyzed in this BA/BE since the effects of the project to those species and their habitat would not extend beyond the wildlife analysis area boundary.

All direct, indirect and cumulative effects discussed, occur within this 38,368 acre wildlife analysis area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to TES and TES habitat.

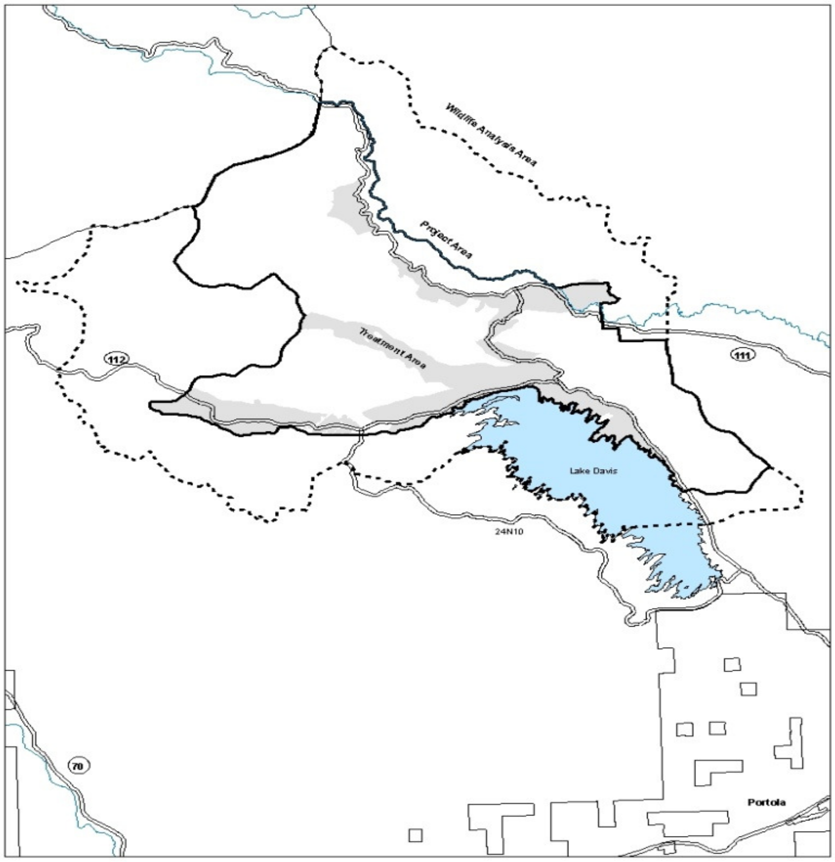

Figure 9 Ingalls Wildlife Analysis Area, Project Area and Treatment Area (solid color).

The Ingalls Project was reviewed on the ground, as well as, using aerial photographs, digital orthophoto quadrangles (DOQs), vegetation layer spatial datasets, species specific spatial datasets and known information to help determine suitable habitat for TES species (i.e. California spotted owls, northern goshawks, etc). In the field, areas identified as suitable habitat were surveyed to the following Region 5 protocols and acceptable standards.

Species nest sites and locations were recorded using Global Positioning System (GPS) and incorporated into spatial datasets. For the analysis of effects, changes to suitable habitat and impacts to protected activity centers (PACs)/territories were determined by using a spatial dataset of the vegetation layer combined with type of treatments.

Affected Environment/Environmental Consequences

Affected – Terrestrial Environment

The analysis of alternatives considers the attributes of structure and heterogeneity values for suitable habitat. Although these characteristics are evaluated, there is no standard for measurement. Therefore, the California Wildlife Habitat Relationships (CWHR) system continues to be used for wildlife habitat analysis for projects under the HFQLG FEIS as amended by the 2004 SNFPA FSEIS as it maintains consistency for monitoring changes in species habitat. This includes the requirement to not cumulatively reduce late seral dependent species habitat (5M, 5D, and 6) more than 10% below 1999 levels (USDA Forest Service 1999). These CWHR types have the highest probability of providing stand structures associated with preferred nesting, roosting and foraging.

For the comparative analysis contained in this BA/BE, the CWHR system is used to evaluate forest conditions and the suitability of wildlife habitat. This document uses CWHR size class 5 to differentiate late seral forest. California WHR size class 4 is considered mid-seral. The predominant CWHR size class of forest stands is 4, which accounts for approximately 81 percent of the wildlife analysis area (NF). California WHR size class 5 constitutes 6 percent of the wildlife analysis area (NF).

General Affected – Aquatic Environment

Within the wildlife analysis area there are 61 miles of perennial, 62 miles of intermittent and 216 miles of ephemeral streams for a total of 339 miles of streams. Of the 61 miles of perennial streams, approximately 44 miles are fish bearing. The main drainages within the wildlife analysis area include: Meadow Creek, Crystal Creek, Coldwater Creek, Poco Creek, Red Clover Creek, Big Grizzly Creek, Oldhouse Creek, Blakeless Creek, Paradise Creek, Love Joy Creek, and Little Grizzly Creek. Many of the small tributaries flowing into Red Clover Creek and Lake Davis originate from springs situated in their headwaters. All drainages in the project area flow into either Lake Davis or Red Clover. Grizzly and Red Clover Creeks are trout fisheries.

Environmental Consequences – Mountain and Foothill Yellow-Legged Frogs

The analysis of effects of the alternatives for these two species has been combined as proposed treatments have similar impacts to the aquatic environments where these species exist.

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

There would be no direct effects on YLF habitat, as no activities would occur that would cause disturbance to individual YLF, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of RHCAs and suitable YLF habitat.

Any acres burned at high intensity could contribute to increased sedimentation, which would adversely affect aquatic habitats and potential breeding habitat for the YLF.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen on the landscape thus potentially reducing habitat diversity in the wildlife analysis area, due to loss of the aspen clones and a cottonwood stand through succession (i.e., lack of stand recruitment and decadence of mature aspen) which would degrade the conditions for aquatic inhabitance.

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to decommission and/or reconstruct roads, or replace or install culverts. Roads causing resource damage would continue fragment the hydrology and aquatic habitat as well as contribute to poorer water quality.

Cumulative Effects for No Action

The No Action Alternative for the Ingalls Project would not protect or enhance YLF habitat. There would be no actions designed to reduce the risk of high intensity wildfire. There is the potential for RHCAs to act like chimneys and carry fire up and down the watershed.

Action Alternatives

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Direct effects include the killing or injuring of individuals from harvest machinery and burning activities. Harassment of individual frogs from thinning activity (e.g. noise disturbance and ground vibration) within or near habitat may also directly affect the species. Underburning could result in direct mortality of individuals if these activities are conducted during the period of time that overland movements may be going on.

Conifers in RHCAs would be treated to reduce the potential for large stand-replacing wildfire and release the remaining vegetation. The objective within the RHCAs (potential habitat for both species of yellow-legged frogs (YLFs)) is to maintain microclimate, protect stream banks from disturbance, and retain key attributes such as riparian vegetation, down logs and LWD recruitment.

To achieve the above objective, RHCAs would be designated on the ground and appropriate fuel treatments prescribed, based on RHCA characteristics and adjacent fuel treatments where slopes are ≤25%. Hardwoods would be retained in all units, except where removal is necessary for operability. Mechanical equipment would not enter the RHCA equipment exclusion zones (25 feet from the center of the stream channel along SMZs, 50 feet from the center of the stream channel along non-fish bearing RHCAs, and 100 feet from the center of the stream channel along fish bearing RHCAs), thus potential for direct impacts is negligible and very low risk. A backing fire would be allowed within RHCAs.

Within all RHCAs, burning intensities would be very light, due to restricted ignition within RHCAs and subsequent back burning, resulting in little consumption of LWD logs >12" dbh to meet the Soil Quality standards and guidelines retaining 10-15 tons per acre of LWD. Backburning would occur during times when there is increased moisture and potentially less consumption of LWD. Also, the "general burn plan" prescription is to consume fine fuels. Short-term sediment movement after burning may occur however; this depends on many factors such as slopes, fuel consumption, etc. A greater long-term benefit is the protection of the RHCAs from large stand-replacing wildfire. Again, applicable BMPs would be implemented.

There is a small potential for the modification of streamside vegetation and loss of duff layer due to prescribed fire in riparian areas. However, any impacts from prescribed fires are expected to be short lived. Fire intensity should be low enough to allow some retention of duff layer and riparian vegetation that would prevent soil erosion and expedite recovery.

Group selections would not occur within the RHCAs, although they may be located immediately adjacent to RHCAs, and certainly within the movement distances that MYLF may exhibit within lacustrine (lake/pond) environments. The suitability of the lacustrine environment is questionable due to the seasonal nature of the lacustrine environment and the presence of predatory fish in the wildlife analysis area.

Within the RHCAs, there is the potential for the following indirect effects: loss of sheltering habitat and riparian vegetation from backing fire, changes in the microclimate (reduced humidity, and increased air temperatures) due to the thinning and burning activities, and increased sedimentation to the stream channel to increased overland flows from the proposed project. Backing fires in the RHCAs and underburning in the uplands can increase sediment production in streams if buffer strips are not maintained (Chamberlin et al. 1991, USFWS 2001).

Annual water yields can be significantly increased after fire due to the reduction of transpiring vegetation (Agee 1993, USFWS 2001). Pile burning has essentially no direct effect on riparian vegetation since piles are typically placed outside of RHCAs. Since piles focus on removal of smaller sized fuels, existing larger diameter down woody debris would remain on site to provide for alternate sheltering and dispersal cover.

Vegetation management in the uplands can potentially change the hydrologic regime in the area. Soil erosion could direct sedimentation into streams that could create short-term unsuitable water quality that could disrupt habitat use by this species. However, with the implementation of SAT guidelines, RHCA buffers, sensitive area buffers, and Best Management Practices, it is anticipated that there would be no disruption in flows and minimal short-term sedimentation into streams (refer to CWE Report, Waterman 2011).

Habitat modifications as identified above, that are unfavorable to amphibians may favor their predators and increase the likelihood of further population declines due to unsustainable levels of predation (Knapp and Matthews 2000, Jennings and Hayes 1994). The perennial streams within the project area contain rainbow and brown trout, both known predators of yellow-legged frogs. Implementation of RHCAs, BMPs, and meeting Riparian Management Objectives would maintain suitable habitat conditions for trout in all streams they currently occupy.

All three species of garter snakes (*Thamnophis sp.*) that occur within the project area will feed on frogs, tadpoles and egg masses. Garter snake populations, especially those of the aquatic garter snake, are not expected to be affected by project activities.

Borax applied to stumps in either action alternative should not affect MYLFs or FYLFs.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

In the aspen thin units (Alternative 1), the ambient air temperature regimes would be restored through the removal of thick patches of conifer, and through enhanced aspen dominance. An overall slight reduction in aquatic temperatures is anticipated in a long-term perspective. Through increased water yield, reduced transpiration, increased diversity of understory and riparian vegetation, as well as increased canopy coverage derived from greater riparian vegetation growth water temperatures may be slightly reduced thus improving conditions for aquatic inhabitance.

Alternative 1 would restore approximately 150’ of stream channel in an aspen/cottonwood stand (Unit 003). This restoration could improve YLF habitat in this stream channel.

Direct and Indirect Effects of Providing Access to Meet Project Objects while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

Road closures would decrease compaction, increase percolation into the roadbed, increase soil stability and limit concentrated flow as well as surface erosion derived from temporary roads. All temporary skid roads would be treated with water bars, in addition to being closed to traffic by installation of dirt berms. New and temporary road construction would increase the potential for soil movement and increased potential sedimentation into streams and aquatic habitats.

The use of water for dust abatement by drafting water from creeks especially during the summer months may cause changes in the flow regimes and water quality, especially within deeper pools and off channel waterholes. Changes in flow regimes can result in changes in surface water elevations, exposing egg masses to air drying for short periods (early summer) to potentially longer periods of exposure later in the summer, resulting in loss of egg viability. There is also the potential for individual tadpoles, egg masses, or amphibians to be taken up by the “drafting” process, resulting in mortality of individuals. New or changes to existing water drafting sites would be evaluated by a biologist and hydrologist prior to changes and uses. As necessary, back down ramps would be maintained to ensure bank stability and sedimentation is minimized. Amphibian/fish protection devices such as suction strainer (2mm gauge or less) would be used during drafting operations to prevent entrainment of tadpoles, egg masses or amphibians.

Cumulative Effects for Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternatives evaluates the impact on TES habitat from the existing condition within the wildlife analysis area.

Future activities on National Forest System lands include ongoing work within the Freeman DFPZ and Grizz DFPZ. The Freeman and Grizz DFPZs have a similar design of actions as the Ingalls project (Alternative 1). These activities would maintain the existing condition of riverine and lacustrine habitat in the wildlife analysis area.

The grazing activity within the wildlife analysis areas is expected to continue into the future, therefore any effects to riparian habitats would continue.

The great gray owl habitat improvement project would have no effect on YLF habitat.

The fuelwood gathering and Christmas tree cutting programs on the PNF are ongoing programs that have been in existence for years and are expected to continue. The past and future effect of these actions has and would be to shift forest successional stages to somewhat earlier stages, while generally retaining continuous forest cover, which would have no affect on the YLFs.

Most of the recreation use within the wildlife analysis area consists of activities around Lake Davis and the developed camping/boat launch areas and include fishing, camping, picnicking, hiking, horseback riding, mountain biking, pleasure driving, OHV use, wildlife watching, hunting, firewood gathering. These same activities also occur dispersed throughout the wildlife analysis area by individuals and small groups. The use is expected to continue at the current rate. There is also a proposed trail project in the Lake Davis area, that would construct a 7.4 mile trail on the east and north sides of the lake for hiking and mountain biking. The construction of this project would construct bridges over streams and have mitigations in place to protect perennial and intermittent streams, thus it should not affect YLFs or their habitat.

Red Clover/Poco Watershed Project and the Red Clover/Poco Prop 50 watershed restoration work should improve riparian habitat on these stream channels, which could improve habitat for yellow-legged frogs.

The Blakeless Underburn project would have no effect on yellow-legged frog habitat.

The Plumas National Forest Public Motorized Traveled Management Project is currently underway. The outcome of the route designation process is not expected to result in additional cumulative effects as no new routes would be created; only existing unauthorized routes would be added to the system.

Environmental Consequences – Bald Eagle

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

There would be no direct effects on bald eagles or bald eagle habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative could make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable bald eagle nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. Thus potentially suitable habitat for a bald eagle territory could become patchy or unevenly distributed with this alternative, and could lead to reduced or lower abundance of bald eagles within the wildlife analysis area.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There are no aspen/cottonwood thin units in bald eagle habitat, therefore there would be no direct or indirect effects on bald eagles or bald habitat of not improving aspen/cottonwood stands.

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to decommission and/or reconstruct roads, or replace or install culverts. Roads causing resource damage would continue fragment the hydrology and aquatic habitat as well as contribute to poorer water quality.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls project would provide no long-term protection of bald eagle habitat from large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USFS PSW, 2001)), which could lead to no potential habitat for eagles within the wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

Bald eagles exhibit great variation in response to human activity depending on the type, frequency, and duration of activity, modification of the physical environment, time of reproductive cycle, and individual bird accommodation to the disturbance (USDA Forest Service, 1977). The variable effects of human activity on the reproductive performance of bald eagles imply a threshold for detrimental impact between pristine isolation and habitat alteration.

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Potential direct effects on the bald eagle may result from the modification or loss of habitat or habitat components (primarily large trees, snags and other perches), and rarely from direct mortality if nest trees are felled. The action alternatives would not cut or remove nest trees or any large tree (≥30" dbh) that could be used for roosting or perching. Since bald eagles need large trees and have a preference for ponderosa pine, either of the action alternatives would enhance bald eagle habitat by thinning overstocked stands allowing for better growth and encouraging the regeneration of ponderosa pine.

Under both action alternatives there are approximately 300 acres of marginally suitable bald eagle habitat (WHR size class 4) with another approximately 600 acres being potentially suitable in the next 25 to 100 years. No currently suitable nesting habitat would be impacted with the implementation of either of the action alternatives. Both alternatives would release 65 acres of 715 acres in a primary use area and 1,086 acres of the 2,142 acres in secondary use areas through mechanical thinning. Of the 1,151 acres being released, dominant and co-dominant (20-30"dbh) trees would average an inch of growth every 5 years (personal comm. Beckwourth District Culturist). This would mean that 20 inch trees would reach suitable nesting size in 5 (21" dbh) to 50 years (30" dbh) instead of the 25 to 100 years if the stand went untreated.

In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and roosting activities. There is a low potential for smoke from burning piles, etc. to disrupt the normal behavior patterns of eagles using the area. Implementation of Limited Operating Periods (LOPs) around known bald eagle nests would remove the effects associated with direct disturbance on treatment units and temporary roads.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There are no aspen/cottonwood thin units in bald eagle habitat; therefore, there would be no direct or indirect effects on bald eagles or bald eagle habitat due to aspen/cottonwood thin.

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

Heavy recreation use on dirt roads would potentially cause increased sedimentation in streams, which decreases water quality (turbidity), which could impact foraging bald eagles. Reconstruction of existing roads may result in roads that are more accessible to general passenger vehicles and thus lead to a minor increase in recreational use of the area. New road construction would not likely result in an increase in recreational use, except perhaps by hunters in the fall. Construction of temporary roads would have no long-term impacts in the form of increased human use and presence in the area, but could lead to minor, temporary impacts in the form of increased sedimentation in streams and thus a decrease in water quality, which could negatively affect bald eagle foraging. However, changes in the fishery production are not expected as a result of implementing proposed fuel treatments (DFPZ). Implementation of BMPs and meeting all Riparian Management Objectives (RMO Analysis located in CWE report within project record) assures that there would be no indirect effects on the fisheries or fisheries habitat.

Cumulative Effects of Action Alternatives

The analysis of cumulative effects of the alternatives evaluates anticipated impact on TES wildlife from the existing condition (existing condition reflected by changes that have occurred in the past) within the wildlife analysis area. The past actions in the wildlife analysis area that contributed to the existing condition include grazing, timber harvest, prescribed burns, and recreation use.

Grazing is expected to continue at current levels. Grazing appears to have no cumulative effect on bald eagles since they have been breeding successfully for the last 25+ years in the Lake Davis area.

Future activities on National Forest System lands include ongoing work within the Freeman DFPZ and Grizz DFPZ. The Freeman and Grizz DFPZs have a similar design of actions as the Ingalls project (Alternative 1). The timber harvest activities in these projects would reduce the availability of old forest (CWHR Habitat 4M, 4D, 5M and 5D) stand structure and characteristics by approximately 0.3% or 184 acres out of 32,265 acres in the wildlife analysis area of the Grizz project and approximately 0.6 % or 379 acres out of 24,990 acres in the wildlife analysis area of the Freeman project. These projects would continue to implement measures from the BEHMA thus potentially improving habitat conditions for bald eagles.

The great gray owl habitat improvement project would have no effect on bald eagle habitat.

The fuelwood gathering and Christmas tree cutting programs on the PNF are ongoing programs that have been in existence for years and are expected to continue. The primary use areas in active bald eagle territories are protected from fuelwood gathering and Christmas tree cutting.

Most of the recreation use within the wildlife analysis area consists of activities around Lake Davis and the developed camping/boat launch areas and include fishing, camping, picnicking, hiking, horseback riding, mountain biking, pleasure driving, OHV use, wildlife watching, and hunting. The use is expected to continue at the current rate. There is also a proposed trail project in the Lake Davis area, that would construct a 7.4 mile trail on the east and north sides of the lake for hiking and mountain biking. The design and effects on the bald eagle habitat have not been analyzed. However, this could increase recreation opportunities in bald eagle primary and secondary use areas.

Red Clover/Poco Watershed Project and the Red Clover/Poco Prop 50 watershed restoration work are in Red Clover Valley, away from the primary nesting area for bald eagles, therefore they would have no direct effect on the eagles. However, both projects would improve riparian habitat on these stream channels, which could provide future foraging habitat for bald eagles.

The Blakeless Underburn project, within 2 miles of Lake Davis, would improve forest health and vigor and could therefore potentially provide the large tree component for future bald eagle habitat.

The Plumas National Forest Public Motorized Traveled Management Project is currently underway. The outcome of the route designation process is not expected to result in additional cumulative effects as no new routes would be created; only existing unauthorized routes would be added to the system.

Based on the direct, indirect and cumulative effects of the action alternatives, it is suspected that the overall potential nesting habitat in the wildlife analysis area would be improved. Improving future nesting habitat on the PNF would contribute to the PNF LRMP goal of 26 bald eagles territories on PNF lands, thus contributing to the overall Forest and State populations.

Environmental Consequences – California Spotted Owl

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

There would be no direct effects on spotted owl or spotted owl habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. Only one large fire has been recorded in the Ingalls Project area. It was 447 acres and occurred in 1937, cause is unknown. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire occurred, suitable owl habitat could become patchy and could lead to reduced or lower abundance of owls within the wildlife analysis area.

Indicator Measure 2: Habitat components modified, lost or fragmented.

With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by spotted owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting as well as the continued removal of current and future snags.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen on the landscape thus potentially reducing habitat diversity for spotted owls and their prey in the wildlife analysis area, due to lose of the aspen clone through succession (i.e., lack of stand recruitment and decadence of mature aspen).

Direct and Indirect Effects of Providing Access to meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to close and/or reconstruct roads, or replace or install culverts thus maintaining the current road density of approximately 2.8 miles/square mile. Roads causing resource damage would continue to fragment the hydrology and riparian habitat thus potentially reducing habitat diversity in the wildlife analysis area. All of which would decrease suitable habitat through disturbance and degradation.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls Project would not provide for the long-term protection of spotted owl habitat from large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USFS PSW, 2001)), which could lead to lower owl abundance from existing condition within the wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

Wildlife Analysis Area

Potential direct effects on the spotted owl may result from the modification or loss of habitat or habitat components. Direct mortality could occur if nest trees are felled but this would be exceedingly rare. The action alternatives would not cut or remove nest trees. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementation of Limited Operating Periods (LOP) around known spotted owl nests would minimize the effects to existing owl pairs associated with direct disturbance on treatment units and access routes.

Based on the vegetation layer and the CWHR model, about 4.2 % or 1,618 acres within the wildlife analysis area (38,368 NF acres) may be considered suitable spotted owl nesting habitat (5M, 5D), and about 40.4 % or 15,484 acres may be considered suitable foraging habitat (4M and 4D).

Changes to suitable habitat as a result of implementing fuels treatments in Alternative 1 and 3 would occur due to the reduction in some canopy cover (below the minimum 40%) and the removal of needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 28). More specifically under Alternative 3 foraging habitat would be reduced through the removal of both the canopy cover (<40%) and the needed structural components, in all tree habitats, while nesting habitat would not be affected. Alternative 1 would reduce foraging habitat through the removal of the canopy cover (to 40%) in all eastside pine types (i.e. EPN, JPN and PPN tree habitat) in the DFPZ. All other tree habitat (mixed conifer and fir) and foraging habitat in the pine types in the area thin units treated under Alternative 1 would retain canopy cover at above 50% for suitable foraging habitat as well as the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.). This would be accomplished through variable density thinning which concentrates on retaining stand structure, both vertically and horizontally, (i.e. large tree radial thin, moderately dense stands and wildlife structural diversity patches in the HRCA). Alternative 1would convert 2 acres of nesting habitat through aspen thin treatments and change 42 acres of foraging habitat to size1 through group selection.

Blakesley (2003) states, “Nest success was positively associated with the presence of large remnant trees within the nest stand.” Ninety percent of the nest trees were greater than 76 cm dbh (30” dbh) and averaged 117 cm dbh (46” dbh). In addition to their value for nesting success, Moen and Gutierrez (1997) found that stands used by owls for roosting contained trees greater than 100 cm dbh (39” dbh) more frequently than randomly selected stands. The radial thinning treatments in Alternative 1 would retain and invigorate larger trees in the wildlife analysis area. Table 28 shows the above mentioned changes to California spotted owl nesting and foraging habitat by alternative within the wildlife analysis area.

Table 28. Comparison of Alternatives 1and 3 on Spotted Owl Nesting and Foraging Habitat (4M, 4D, 5M, 5D) within the Wildlife Analysis Area

Foraging Habitat	Alternative 1 (PA) Acres		% (Alt. 1) Remaining in Wildlife Analysis Area	Alternative 3 Acres		% (Alt. 3) Remaining in Wildlife Analysis Area
	Area Thin/ DFPZ/GS	Aspen Release		DFPZ		
4M	+243	-45	102%	-135		99.0%
4D	-285	-14	90.4%	-132		95.8%
Total Foraging Change (acres)	**-42**	**-59**	**99.3% retained (1.0%)**	**-267**		**98.3% retained (-2.0%)**
Nesting Habitat						
5M	+1	-2	99.8%	0		100%
5D	-1	0	99.9%	0		100%
Total Nesting Change (acres)	**0**	**-2**	**99.8% retained (-0.2%)**	**0**		**100% retained (0%)**

* Reductions shown here are due to the thinning of canopy and removal of the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) leading to unsuitable foraging and nesting habitat.
** Reductions shown here are due to the thinning of canopy below 40% in eastside pine types leading to unsuitable foraging and nesting habitat.

Alternative 1 reduces foraging habitat on 101 acres out of 15,484 acres, reduces nesting habitat on 2 acres out of 1618 acres; Alternative 3 reduces foraging habitat on 267 acres out of 15,484 acres and does not affect nesting habitat. Thus the amount of habitat retained post project (98.3-99.3% foraging and 99.8% - 100% nesting) allows opportunities for future dispersal, nesting and foraging within the wildlife analysis area.

Within the Ingalls project area, the action alternatives would result in an increase in low contrast fragmentation; that is dense canopy cover would be reduced within the DFPZ units but would maintain a continuity of large trees within treated stands and across the landscape. According to the 1993 CASPO IG EA (Page IV-81) (USDA Forest Service, 1993), within stand fragmentation of the small tree canopy (trees <20 to 30 feet) is less of a concern than large tree or old forest attributes removal because:

1. Historical understory densities were discontinuous;
2. This habitat component can return relatively quickly (versus large overstory layer); and
3. Creating this type of fragmentation can help avoid larger scale, high contrast fragmentation of forested stands caused by large stand-replacing wildfire.

The key to lessening impacts of fragmentation within DFPZ and Area Thin treatments is to maintain forest cover composed of the largest, fire resistant conifer species, while also providing structural attributes needed for prey species (snag/large logs, some smaller trees). Removal of trees up to 29.9” dbh would occur, with the overall objective of leaving enough dominant and co-dominant (20”-30” dbh) trees to provide from 40-50% canopy cover. This tree retention opens up the treated stand but does not isolate stands from surrounding forest or create habitat islands isolated by non-forest, thus increasing the likelihood for successful dispersal of wildlife.

Alternative 1 is designed to retain all of these attributes within DFPZ and Area Thin units while Alternative 3 would leave only the large tree attribute in DFPZ.

Group selection (Alternative 1) openings would create low-high density openings within stands, but each group would retain structural elements (if present) such as conifers over 30" dbh, hardwoods and down logs up to 10-15 tons/acre, that would reduce within stand fragmentation and contribute to decreasing the size of the forest opening. Group selection openings up to two acres meet the definition of continuous forest cover with the retention of all conifers over 30" dbh, 30 to 40 percent of the basal area consisting of the largest of the healthy trees and the largest snags, eight snags per acre (minimum of 20 square feet basal area of snags per acre) (USDA Forest Service, 1993). "This interpretation is made because group selection tends to mimic natural regeneration patterns and other harvests (intermediate harvests), while variable in appearance, tend to leave sufficient forest vegetation that a perception of continuous forest cover is maintained" (USDA Forest Service, 1993). This is the assumption used in the programmatic analysis for the HFQLGFRA FEIS (USDA Forest Service, 1999), assuming group selection harvest at a ten-year treatment cycle (5.7% of the land base) up to a 20-year treatment cycle (11.4% of the land base). Groups at this level could mimic naturally occurring gaps within forested stands. However, groups in the Ingalls project do not retain 30 to 40 percent of the basal area consisting of the largest of the healthy trees and the largest snags, eight snags per acre (minimum of 20 square feet basal area of snags per acre) as suggested by USDA Forest Service, 1993 due to our design of the group selections and the lack of large tree component across the Ingalls Project area.

The density of groups within stands potentially increases edge effects, reduces forest interior habitat, and creates a condition in which otherwise suitable owl habitat becomes less suitable because it is adjacent, and/or surrounded by, non-habitat. Franklin et al. (2000) found a positive relationship with the amount of edge between owl habitat and non-habitat and that Northern spotted owls showed higher reproductive success in sites with intermediate numbers of owl habitat patches intermixed with non-habitat areas. Blakesley (2003) on the other hand reported a model of reproductive output showing a weak negative relationship with elevation and amount of non-owl habitat within the nest area. It is unknown at what threshold the amount of edge to interior habitat results in use, marginal use or non-use by old forest species, including spotted owls. In terms of acres treated, Alternative 1 treats 42 acres of owl foraging habitat with groups. Alternative 3 has no group treatments identified in their actions.

Home Range Core Areas (HRCA)

The Record of Decision for the SNFPA FSEIS (2004) established HRCAs of 1,000 acres for each PAC for the Plumas National Forest. However, HFQLG activities were specifically excluded from the HFQLG standard and guidelines. The analysis of impacts to the HRCAs is still necessary to evaluate impacts to spotted owls and their habitat. Each HRCA is delineated within 1.5 miles of a nest site or activity center incorporating the best available contiguous habitat.

The closest comparable research on California spotted owls using this HRCA scale is found in Lee and Irwin (2005) who studied a HRCA of 1,062 acres (430 ha). Lee and Irwin (2005) concluded there was a possible minimum requirement for reproduction. Their research indicates the majority of nesting territories contained more than 50% intermediate (CWHR M) and dense (CWHR D) canopy cover, averaging 70% of the territory. Lee and Irwin fitted a logistical regression model to their data, which suggested a lower threshold of 56% of the territory with no increasing benefit to reproduction from additional amounts of intermediate and dense canopy cover. It is important to note that Lee and Irwin's study considered the effects of fuels treatments on California spotted owls. Table 29 shows the amount of suitable habitat within each approximately 1,000 acre home range core area (HRCA) potentially affected by the Ingalls project.

Table 29. Suitable Habitat (4M/4D/5M/5D) impacted within each 1,000 acre HRCA

HRCA	Acres of HRCA by CWHR type*		Total Acres in each HRCA	Current % of Suitable Habitat in each HRCA	Total Acres of Suitable Habitat Reduced in the HRCA			Total % Suitable Habitat Retained in the HRCA	
	Other - AGS, BAR, LAC, MCH, MCP, PGS, SGB, URB, WTM, 2D-S, 3D-S, 4P-S, 5P-S	Suitable Habitat 4M, 4D, 5M, 5D			Alt.1 Suitable Habitat 4M, 4D, 5M, 5D	Alt.3 Suitable Habitat 4M, 4D, 5M, 5D		Alt.1 % of Suitable Habitat Retained	Alt.3 % of Suitable Habitat Retained
PLU0137^	166	989	1,155	86	0	0		100	100
PLU0175^	273	798	1,071	75	-33	-23		96	97
PLU0096	216	838	1,054	80	0	0		100	100
PLU0242	274	830	1,104	75	0	0		100	100
Total All	**929**	**3,455**	**4,384**	**77**	**-33**	**-23**		**99**	**99**

^PACs in the Ingalls Project Area
***1** = Seedling Tree <1" dbh, **2** = Sapling Tree 1 - 6" dbh, **3** = Pole Tree 6 - 11" dbh, **4** = Small Tree 11 - 24"dbh, **5** = Medium/Large Tree >24"dbh, **6** = Multi-layered Tree.
D = Dense Canopy Cover (> 60%), **M** = Moderate Canopy Cover (40 - 59%), **P** = Open Canopy Cover (25 – 39%), **S** = Sparse Canopy Cover (10 – 24%), **AGS** = Annual Grassland, **BAR** = Barren, **LAC** = Lacustrine, **MCH** = Mixed Chaparral, **MCP** = Montane Chaparral, **PGS** = Perennial Grassland, **SGB** = Sagebrush, **URB** = Urban, **WTM** = Wet Meadow (Mayer and Laudenslayer 1988).

All four HRCAs are currently above the lower threshold of 56% necessary for reproduction suggested by Lee and Irwin (2005). Alternative 1 reduces suitable habitat on 33 acres out of 3,455 acres; Alternative 3 reduces suitable habitat on 23 acres out of 3,455 acres. Of the four owl HRCAs, both alternatives would retain 99% of the existing suitable habitat. Thus, the amount of habitat retained post project in the HRCAs allows opportunities for future nesting and foraging within the wildlife analysis area.

Home ranges of neighboring spotted owls commonly overlap (Verner et al. 1992: 149). The action alternatives that eliminate or modify habitat, possibly could cause a shift in owl home range use, increasing the potential for intraspecific competition between neighbors. The increased competition associated with using the same restricted habitat parcels could impact owl behavior, possibly affecting nesting and reproduction. Because of this, directly affected territories and

HRCAs could have an indirect affect on adjacent PACs/HRCAs not directly affected by the Proposed Action, especially if the directly affected territory or HRCA overlaps with another territory or HRCA. Only one HRCA would be affected by the Ingalls project and it is not directly adjacent to any other HRCA.

With a total reduction of 33 acres of suitable habitat in one HRCA with Alternative 1 (derived from and a total reduction of 23 acres of suitable habitat in one HRCA with Alternatives 3, it is anticipated that owl behavioral and competitive interactions will not be impacted. It is uncertain as to whether the same number of owl sites occupied in 2006 and 2007 (three and two) would be occupied within the wildlife analysis area post project. However, since PACs and SOHAs are avoided by treatments and the majority of the habitat within the 1,000 acre plus HRCAs would not be affected by treatments, it is reasonable to assume that occupancy would be maintained.

Nest Core

Several researchers have evaluated the spatial scale at which northern spotted owls respond to habitat (Hunter et al. 1995, Bingham and Noon 1997, Meyer et al. 1998, Franklin et al. 2000 and Zabel et al. 2003). Blakesley (2003) has provided insight into spatial availability of habitat for California spotted owls. Each of these studies found that areas within ~200 ha (500 acres) of nests were influential in determining occupancy and/or fitness. Blakesley (2003) states that occupancy, apparent survival, and nesting success all increased with increasing amounts of old-forest characteristics and that reproductive output decreased with increasing amount of non-habitat within the nest core area (nest core area = 203 ha scale, or 500 acres surrounding nest sites). Based on these studies, one could argue that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area. Each 500 acre nest core is a circular buffer around a nest site or activity center. No suitable habitat within any of the 500 acre nest cores would be affected by the Ingalls project.

Protected Activity Centers (PACs) and Spotted Owl Habitat Areas (SOHAs)

There are no 1,000 acre SOHAs and four 300 acre PACs located within the wildlife analysis area. PACs are designated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. PACs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 37. Where there is insufficient suitable habitat (6, 5D, 5M, 4D and 4M), to meet the 300 acre standard and guideline for a PAC, the next best vegetation sizes and types are included. No fuels treatments, including DFPZ, Area thin, group selection, or aspen thin treatments would occur within the designated 300 acre PACs. The four PACs equal approximately 1,406 acres owl habitat that would be retained and remain suitable within the wildlife analysis area on National Forest System lands.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Habitat Components

In terms of acres treated, with the subsequent potential for snag removal, Alternative 1 treats approximately 694 more acres than Alternative 3. Assuming equal distribution and density of snags across the wildlife analysis area, Alternative 3 would maintain more existing snags than the Proposed Action. However, Alternative 1 would maintain and/or improve structural diversity (large trees, hardwoods, downed wood, snags, snag recruitment, etc.) for wildlife while still maintaining DFPZ integrity.

Prey Species and Competitors

Fuel treatments including thinning and prescribed burning would result in a shift in stand microclimate that would have a negative impact to flying squirrels (Lehmkuhl et al. 2006). These treated stands would have fewer trees, a less complex and more open canopy structure (<50% canopy cover), resulting in a higher variability stand microclimate, all of which create more xeric conditions that would likely lower availability and biomass of truffles. Retention of down woody material and the largest trees may retain some level of lichen and truffle diversity and biomass, providing flying squirrel forage resources within treated stands. With regular maintenance through prescribed burning every 10 or so years, downed wood would be hard to retain in the long term, resulting in lower density of truffles. These potential losses would be offset by the benefit that fuel treatment could have for reducing the large-scale loss of habitat through wildfire. Less than 12% (3,401 to 4,095 of 38,368 acres) of the National Forest System lands within the wildlife analysis area would be treated with the Ingalls Project, while 34,967 to 34,273 acres of National Forest terrestrial forested habitat would not be treated. Location of treatment acres are constrained across the landscape for various resource reasons (PACs and SOHAS for example) such that this untreated habitat is spread across the wildlife analysis area and thus would unlikely impact the distribution and viability of flying squirrel populations.

It is unknown as to how some of the important prey species preferred by spotted owls (woodrats and flying squirrels) would respond to group selection harvest units. With reforestation, as the brush/seedling habitat matures, woodrats may recolonize sooner as they are known to utilize earlier successional habitats (CWHR Version 8.1, and G. Rotta, personal communication). Downed logs created by the retention of snags would provide down woody structures that would provide habitat for prey species. Flying squirrels would likely be absent within the group selection openings but could possibly utilize the edges to their advantage, and would eventually inhabit these areas as the forest matures. It is unknown if these small openings within the forest would be used for foraging by spotted owls. Reforestation should shorten the timeframe to develop forested stands as well as accelerate the development of old forest conditions that owls prefer when compared to natural succession.

Habitat modeling conducted for the SNFPA FEIS and subsequent FSEIS to project trends in woodrat and flying squirrel habitat as a result of implementing fuels reduction activities and group selection harvest within the Sierra Nevada range, indicated that populations of both species would apparently increase slightly over current conditions, but the difference in populations in either the short or long term would be very small.

Edges created by groups (Alternative 1) within suitable owl habitat may reduce the use of foraging habitat by spotted owls and may increase use by great horned owls, an effective competitor and predator of the spotted owl. Responses of prey species, as well as spotted owl use of group openings is one of the main objectives of the post implementation monitoring that would be conducted by PSW research through the administrative study. The post project monitoring would provide information as to the change in great horned owl use and occupancy and contribute knowledge as to the coexistence of these two species.

Borax applied to stumps in either action alternative should not affect California spotted owls, or avian and mammalian prey species.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

The aspen thin units (Alternative 1) would have a direct affect on spotted owl habitat with the removal of larger conifers (up to 29.9" dbh), 59 acres of foraging habitat and 2 acres of nesting habitat would be removed.

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

No new road construction would occur within PACs. Both alternatives propose to construct temporary road and utilize temporary roads, all of which would be closed post harvest. There would be no increase in habitat fragmentation with the temporary road construction, no temporary road construction would occur within PACs. In addition, road closures on some existing roads (Alternative 1) would create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings. This should also reduce human activities that often lead to decreased habitat suitability for California spotted owls (snag and log removal thru woodcutting, and disturbance).

Open road density within the wildlife analysis area would decline under the Proposed Action from the existing approximately 2.8 miles/square mile to between 2.7 miles/square mile, which would slightly decrease habitat fragmentation.

Cumulative Effects of Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternatives evaluates the impact on TES habitat from the existing condition within the wildlife analysis area.

The action alternative in the Ingalls Project could contribute to a cumulative reduction in spotted owl nesting habitat. It is uncertain as to what influence these various reductions in habitat would have on owl activity and occupancy within the wildlife analysis area. As noted in the direct/indirect effects section, spotted owl PACs would not be entered for Ingalls Project activities, to conserve habitat for these species, and additional PACs and HRCAs would be created in the future, if warranted by new site-specific owl information.

Table 30. Cumulative Reduction of California Spotted Owl Nesting Habitat (5M, 5D) on Beckwourth Ranger District (RD)

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Stony DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ	Mabie DFPZ
	Alt. 3*	Alt. 2*	Alt. B*	Alt. 4*	Alt. 4*	Alt. 1*	Alt. 3*	Alt. 3*
Nesting Habitat	0 acres	0 acres	2 acres	0 acres	1 acre	0 acres	0 acres	0 acres
Project	Freeman DFPZ/GS	Old Sloat	Grizz DFPZ/GS	Cold Fire Recovery Project	Jackson DFPZ	Ingalls Project		
	Alt. 4*	Alt.1*	Alt. 4*	Alt. 1*	Alt. 3	Alt. 1	Alt. 3	Potential Cumulative Change
Nesting Habitat	379 acres	6 acres	184 acres	50 acres***	0 acres	2 acres	0 acre	**622 - 624 acres**

* Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.
*** Reductions shown here are due to the removal moderate-high and high severity small pockets of roadside hazard trees in sections of mapped low and/or moderate vegetative burn severity and shows the worst case scenario.

Future activities on National Forest System lands include ongoing work within the Freeman DFPZ and Grizz DFPZ. The Freeman and Grizz DFPZs have a similar design of actions as the Ingalls project (Alternative 1). The timber harvest activities in these projects would reduce the availability of old forest (CWHR Habitat 5M and 5D) stand structure and characteristics by approximately 0.3% or 184 acres out of 32,265 acres in the wildlife analysis area of the Grizz project and approximately 0.6 % or 379 acres out of 24,990 acres in the wildlife analysis area of the Freeman project. These activities would contribute to a reduction of acres in late seral closed canopy coniferous forest habitat in the wildlife analysis area.

On-going grazing activities would have no effect on spotted owl habitat.

The great gray owl habitat improvement project would remove 146 acres of early and mid seral habitat, but would eventually help to increase late seral habitat.

With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by spotted owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting as well as the continued removal of current and future snags

The recreation use at Lake Davis does not affect suitable spotted owl habitat. There proposed trail project in the Lake Davis area, that would construct a 7.4 mile trail on the east and north sides of the lake for hiking and mountain biking. Construction of this project would not affect spotted owl habitat.

Red Clover/Poco Watershed Project and Red Clover/Poco Prop 50 watershed restoration work would not affect spotted owl habitat.

The Blakeless Underburn project should improve forest health and vigor and could potentially provide spotted owl habitat in the future.

The Plumas National Forest Public Motorized Traveled Management Project is currently underway. The outcome of the route designation process is not expected to result in additional cumulative effects, as no new routes would be created; only existing unauthorized routes would be added to the system.

Environmental Consequences – Northern Goshawk

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

There would be no direct effects on northern goshawks or northern goshawk habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions. Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. Only one large fire has been recorded in the Ingalls Project area. It was 447 acres and occurred in 1937, cause is unknown. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable goshawk nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire, occurred suitable goshawk habitat could become patchy and could lead to reduced or lower abundance of goshawks within the wildlife analysis area.

Indicator Measure 2: Habitat components modified, lost or fragmented.

With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by northern goshawks, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting as well as the continued removal of current and future snags.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen on the landscape thus potentially reducing habitat diversity for northern goshawks and their prey in the wildlife analysis area, due to lose of the aspen clone through succession (i.e., lack of stand recruitment and decadence of mature aspen).

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to close and/or reconstruct roads, or replace or install culverts thus maintaining the current road density of approximately 2.8 miles/square mile. Roads causing resource damage would continue to fragment the hydrology and riparian habitat thus potentially reducing habitat diversity in the wildlife analysis area. All of which would decrease suitable habitat through disturbance and degradation.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls Project would not provide for the long-term protection of northern goshawk habitat from large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USFS PSW, 2001)), which could lead to lower owl abundance from existing condition within the wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

Wildlife Analysis Area

Potential direct effects on the northern goshawk may result from the modification or loss of habitat or habitat components, and rarely from direct mortality if nest trees are felled. The Proposed Action and alternatives would not cut or remove nest trees. In addition, disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities (Richardson and Miller 1997). Implementation of Limited Operating Periods (LOPs) around known goshawk nests would remove the effects associated with direct disturbance on treatment units and access routes.

Proposed activities could cause short-term displacement and disruption during the time equipment is present and underburning activities are taking place if there are unknown nest sites unprotected by PACs and LOPs.

Based on the California Wildlife Habitat Relationships (CWHR) model, about 17,102 acres or 45% within the wildlife analysis area on National Forest System lands may be considered suitable goshawk nesting habitat (4M, 4D, 5M, 5D). In the wildlife analysis area, 1% is composed of 5D, 3% is composed of 5M, 8% is composed of 4D and 32% is composed of 4M. An additional 21% or 8,211 acres may be considered suitable foraging habitat on National Forest System lands in the wildlife analysis area. This wildlife analysis area encompasses 38,368 acres of National Forest System lands and was chosen in order to put habitat treatments within the context of the surrounding landscape. Uncertainty exists in the amount of nesting habitat that is actually available within the wildlife analysis area, but using vegetation layer mapped data provides consistency throughout this analysis.

In a recently published monograph on northern goshawks in the interior Pacific Northwest (McGrath et al. 2003), it was reported that goshawk nests occurred in the lower 1/3 of slopes and in drainage bottoms more than expected based on availability (and less than expected on the upper 1/3 slopes and ridgetops, although the upper 1/3 was not completely avoided but used half as often as would be expected based on the availability of such areas). The goshawk habitat for the wildlife analysis area was not stratified or analyzed using McGrath method because it is uncertain as to its application to goshawks in the Sierra Nevada, nor is the data available for the goshawk nest sites on the Plumas that would indicate whether nest sites fall into the McGrath parameters. This is pointed out to identify that the availability of goshawk habitat within the wildlife analysis area may potentially be overestimated.

Changes to suitable habitat as a result of implementing fuels treatments in Alternative 1 and 3 would occur due to the reduction in canopy cover (below the minimum 40%) and the removal of needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 31). More specifically, Alternative 1 in DFPZ's and Area Thin units would retain the minimum or more canopy cover for suitable foraging and nesting habitat as well as the needed structural components, except for eastside pine (EPN, JPN and PPN) habitats in the DFPZ. This would be accomplished through variable density thinning which concentrates on retaining stand structure (both vertically and horizontally) (i.e. large tree radial thin, moderately dense stands and wildlife structural diversity patches in the HRCA). Foraging and nesting habitat would be reduced through the removal of the canopy cover (to 40%) in the DFPZ in all eastside pine types (i.e.), but would retain needed structural components (snags, vertical and horizontal layering, down woody debris, etc.). Under Alternative 3 foraging habitat would be reduced through the removal of both the canopy cover (<40%) and the needed structural components, in all tree habitats, while nesting habitat would be reduced through the removal of the needed structural components in all tree habitats. Table 31 shows the changes to Northern goshawk nesting and foraging habitat by alternative.

Table 31. Comparison of Alternatives 1and 3 on Northern Goshawk Nesting (4M, 4D, 5M, 5D) and Foraging Habitat (3M, 3D, 4P, 5P) within the Wildlife Analysis Area

Forage Habitat	Alternative 1 (PA) Acres		% (Alt. 1) Remaining in Wildlife Analysis Area	Alternative 3 Acres		% (Alt. 3) Remaining in Wildlife Analysis Area
	DFPZ, Area Thin,GS	Aspen Release		DFPZ	Aspen Release	
3M	+16	-12	100%	+26	0	102%
3D	-126	-5	82.0%	-108	0	84.8%
4P	0	-4	100%	+267	0	104%
5P	0	0	100%	0	0	100%
Total Foraging Change (acres)	**-110**	**-21**	**98.4% retained (-2%)**	**+185**	**0**	**+102% retained (+2%)**
Nesting Habitat						
4M	+243	-45	102%	-135	0	99.0%
4D	-285	-14	90.4%	-132	0	95.8%
5M	+1	-2	99.9%	0	0	100%
5D	-1	0	99.9%	0	0	100%
Total Nesting Change (acres)	**-42**	**-61**	**99.4% retained (1.0%)**	**-267**	**0**	**98.4** In one territory, **% retained (-2%)**

* Reductions shown here are due to the removal of the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) leading to unsuitable foraging and nesting habitat.
** Reductions shown here are due to the thinning of canopy below 40% in pine types leading to unsuitable foraging and nesting habitat.

Alternative 1 reduces foraging habitat 131 acres out of 8,211 acre, reduces nesting habitat on 103 acres out of 17,102 acres; Alternative 3 increases foraging habitat 185 acres for a total of 8,396 acres and reduces nesting habitat on 267 acres out of 17,102 acres. In terms of habitat changes to 4D and 5D (assuming higher probability of goshawk use of these types), 99.9 to 100 percent of the CWHR 5D would be retained with action alternatives and 90.4 to 95.8 percent of CWHR 4D would be retained.

It is an unknown as to how some of the important prey species preferred by goshawks (small mammals, birds) would respond to opening up forested stands with DFPZ and group selection harvest units. Based on CWHR modeling, it is known that several bird species respond favorably to either less dense forested stands and/or openings within forested stands, while some do not (HFQLGFRA FEIS, Appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. Responses of prey species, including small mammals and passerine bird use of group openings is one of the main objectives of the post implementation monitoring that would be conducted by PSW research through the administrative study. Post project monitoring would provide information as to the response by these prey species to DFPZ and group selection harvesting.

Borax applied to stumps in either action alternative should not affect northern goshawks, or avian and mammalian prey species.

Protected Activity Centers (PACs)

There are seven 200 acre PACs that are located within or overlap the wildlife analysis area. PACs are designated from aerial photos and additional acres are the result of designating the best available habitat in relationship to geographical features and stand continuity. PACs are delineated based on guidelines provided in the SNFPA FEIS 2001 ROD and the SNFPA FSEIS 2004 ROD page 38. Where there is insufficient suitable habitat (6, 5D, 5M, 4D and 4M), to meet the 200 acre guideline for a PAC, the next best vegetation sizes and types are included. Two goshawk PACs would be entered with the action alternatives. In one territory, both alternatives would thin 43 acres of 4D habitat retaining 50% or more of the canopy cover and structural habitat components therefore maintaining these acres as suitable nesting/foraging habitat. In the second territory, there are approximately 13 acres of ponderosa pine habitat (8 acres PPN4M, 5 acres PPN3M) that currently consist of nearly an all white fir understory. Alternative 1 would thin to remove some trees 12 -18” dbh to allow more sunlight to hit the ground to allow pine regeneration to occur, improving forest health on these acres which should improve goshawk habitat in the future. This territory would also have approximately 20 acres of pine type converted to aspen, which would improve biodiversity and goshawk foraging habitat.

Implementation of the action alternative during the nesting season around known nest sites could cause disturbance that could disrupt nesting behaviors and potentially lead to nest failure. The risk of this occurring is tempered by the delineation of a PAC around known nest sites and/or implementation of a LOP prohibiting disturbing activities from occurring within ¼ mile from nest sites.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Habitat Components

In terms of acres treated, with the subsequent potential for snag removal, Alternative 1 treats approximately 694 more acres than Alternative 3. Assuming equal distribution and density of snags across the wildlife analysis area, Alternative 3 would maintain more existing snags than the Proposed Action. However, Alternative 1 would maintain and/or improve structural diversity (large trees, hardwoods, downed wood, snags, snag recruitment, etc.) for wildlife, including goshawks and their prey, while still maintaining DFPZ integrity.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

Improving aspen habitat through thinning (Alternatives 1) may have short-term negative impacts but natural ecological recovery should reinvigorate the stand’s growth; thus these impacts should be short-lived with favorable long-term results to vegetation and stream health. The removal of conifers would promote sprouting leading to new younger trees with better growth, increase regeneration, and maintain or improve the current conditions thus potentially improving habitat diversity in the wildlife analysis area leading to more foraging opportunities for northern goshawks.

Direct and Indirect Effects of Providing Access to Meet Project Objectives andwhile Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

No new road construction would occur within PACs. Both alternatives propose to construct temporary road and utilize temporary roads, all of which would be closed post harvest. There would be no increase in habitat fragmentation with the temporary road construction, no temporary road construction would occur within PACs. In addition, road closures on some existing roads (Alternative 1) would create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings. This should also reduce human activities that often lead to decreased habitat suitability for northern goshawks (snag and log removal thru woodcutting, and disturbance).

Open road density within the wildlife analysis area would decline under the Proposed Action from the existing approximately 2.8 miles/square mile to between 2.7 miles/square mile, which would slightly decrease habitat fragmentation.

Cumulative Effects of Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternatives evaluates the impact on TES habitat from the existing condition within the wildlife analysis area. Cumulative effects on the Northern goshawk are similar to those described for the California spotted owl on pages 63 – 64.

Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires have contributed and would continue to contribute to loss of habitat for this species. Table 32 provides a cumulative total on the amount of suitable goshawk nesting habitat that has been impacted by the fuels treatments, group selection and area thinning projects implemented under HFQLG on the BKRD.

Table 32. Cumulative Changes (Reduction) in Northern Goshawk Nesting Habitat (4M, 4D, 5M, 5D, 6) on Beckwourth RD.

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Stony DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ	Mabie DFPZ
	Alt. 3*	Alt. 2*	Alt. B*	Alt. 4*	Alt. 4*	Alt. 1*	Alt. 3*	Alt. 3*
Nesting Habitat	1,574 acres	0 acres	230 acres	25 acres	35 acres	0 acres	0 acres	0 acres

Project	Freeman DFPZ/GS	Old Sloat	Grizz DFPZ/GS	Cold Fire Recovery Project	Jackson DFPZ	Ingalls Project		
	Alt. 4*	Alt.1*	Alt. 4*	Alt. 1***	Alt. 3	Alt. 1	Alt. 3	Potential Cumulative Change
Nesting Habitat	3,416 acres	125 acres	2,444 acres	68 acres	42 acres	103 acres	267 acres	**8,062 – 8,226 acres**

* Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.
*** Reductions shown here are due to the removal moderate-high and high severity small pockets of roadside hazard trees in sections of mapped low and/or moderate vegetative burn severity and shows the worst case scenario.

The Ingalls project potentially contributes to a cumulative reduction in goshawk nesting habitat. It is uncertain as to what influence these various reductions in habitat would do to goshawk activity and occupancy within the wildlife analysis area. However, it is not anticipated that this cumulative habitat reduction would result in loss of occupancy or productivity of known goshawk PACs, based on the location of project activities to known PACs and the distribution of known PACs across the wildlife analysis area, and retention of at least 98% of available suitable nesting habitat distributed across the wildlife analysis area on National Forest System lands post project implementation.

Environmental Consequences – Great Gray Owl

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

There would be no direct effects on great gray owls or their habitat, as no activities would occur that would cause disturbance to nesting or foraging birds, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. Only one large fire has been recorded in the Ingalls Project area. It was 447 acres and occurred in 1937, cause is unknown. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable goshawk nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire, occurred suitable great gray owl habitat could become patchy and could lead to reduced or lower abundance of great gray owls within the wildlife analysis area.

Indicator Measure 2: Habitat components modified, lost or fragmented.

With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by great gray owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting as well as the continued removal of current and future snags.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen on the landscape thus potentially reducing habitat diversity for great grey owl and their prey in the wildlife analysis area, due to lose of the aspen clone through succession (i.e., lack of stand recruitment and decadence of mature aspen).

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to close and/or reconstruct roads, or replace or install culverts thus maintaining the current road density of approximately 2.8 miles/square mile. Roads causing resource damage would continue to fragment the hydrology and riparian habitat thus potentially reducing habitat diversity in the wildlife analysis area. All of which would decrease suitable habitat through disturbance and degradation.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls Project would not provide for the long-term protection of great gray owl habitat from large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USFS PSW, 2001)), which could lead to lower owl abundance from existing condition within the wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

Wildlife Analysis Area

Potential direct effects on the great gray owl may result from the modification or loss of habitat or habitat components through thinning (reduce canopy cover and availability of future nest trees), and through underburning (snag/log and tree removal (safety hazards, etc.)). Disturbances associated with logging, temporary road building, or other associated activities within or adjacent to occupied habitat may disrupt nesting, fledging, and foraging activities. Implementing limited operating periods within 600 feet of occupied meadow habitats and restricting harvest activity within ½ mile of nest sites (if discovered) would reduce or completely eliminate potential disturbance impacts to this species from the Proposed Action.

Based on the vegetation layer and the CWHR model, about 2% or 646 acres within the Wildlife Analysis Area (38,368 acres) may be considered suitable great gray owl nesting habitat (4M, 4D, 5M, 5D, within 300 yards of a meadow) (USFS PSW, 2004), and about 2% or 659 acres may be considered suitable foraging habitat (meadows and open forested stands (CWHR S and P)).

Changes to suitable habitat as a result of implementing fuels treatments in both action alternatives would occur due to the removal of large structural components and reduction in canopy cover to 40 - 50%. The more open canopied forested stands still retain the minimum canopy cover for suitable habitat but become unsuitable due to the removal of the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.). DFPZ treatments will bring canopy cover down to 40%, the minimum to be classified as “M”, therefore the minimum to be considered foraging habitat. However, the removal of other important habitat components such as snags and vertical layering further diminish habitat value and render it unsuitable for foraging. Stands treated as Area Thin also decrease in habitat value due to a reduction in canopy cover to 50% and the removal of other important habitat components. There may also be some additional risk associated with isolated torching events during prescribed fire that could kill additional trees thus further opening up the canopy, and reducing foraging and nesting opportunities.

Alternative 1 reduces nesting habitat on 50 acres of 646 acres; Alternative 3 reduces nesting habitat on 45 acres of 646 acres. Thus the amount of nesting habitat retained post project would be 92.3% - 93.0% allows opportunities for future nesting within the wildlife analysis area.

Protected Activity Centers (PACs)

No preliminary PACs would be entered with the action alternatives. Implementation of the action alternatives during the nesting season around known nest sites could cause disturbance that could disrupt nesting behaviors and potentially lead to nest failure. The risk of this occurring is tempered by the delineation of a preliminary PAC and/or implementation of a LOP prohibiting disturbing activities from occurring within ¼ mile from nest sites.

Group selection openings created within the same watersheds as the existing suitable habitat could provide additional foraging habitat. Project activities are not expected to result in indirect effects, nor are they expected to create conditions that would not allow for occupancy and establishment of a great gray owl territory around the suitable meadow habitat within the project area.

Borax applied to stumps in either action alternative should not affect great gray owls, or avian and mammalian prey species.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Habitat Components

In terms of acres treated, with the subsequent potential for snag removal, Alternative 1 treats approximately 694 more acres than Alternative 3. Assuming equal distribution and density of snags across the wildlife analysis area, Alternative 3 would maintain more existing snags than the Proposed Action. However, Alternative 1 would maintain and/or improve structural diversity (large trees, hardwoods, downed wood, snags, snag recruitment, etc.) for wildlife while still maintaining DFPZ integrity.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

One of the aspen thin units (Alternative 1) is within suitable gray owl habitat because it is a meadow aspen stand. Removing conifers < 30” in size from the meadow would help to maintain the aspen and meadow habitat, which is important for foraging great gray owls. It is expected that short-term negative impacts may occur but natural ecological recovery should reinvigorate the stand’s growth; thus, these impacts should be short-lived with favorable long-term results to vegetation and meadow health. In meadow type aspen stands, the removal of conifers not only helps to regenerate aspens but also helps to stop the conversion of meadow habitat to forest habitat thus potentially improving foraging habitat for great gray owls.

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

No new road construction would occur within PACs. Both alternatives propose to construct temporary roads and utilize temporary roads, all of which would be closed post harvest. There would be no increase in habitat fragmentation with the temporary road construction, no temporary road construction would occur within PACs. In addition, road closures on some existing roads (Alternative 1) would create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings. This should also reduce human activities that often lead to decreased habitat suitability for great gray owls (snag and log removal thru woodcutting, and disturbance).

Open road density within the wildlife analysis area would decline under the Proposed Action from the existing approximately 2.8 miles/square mile to between 2.7 miles/square mile, which would slightly decrease habitat fragmentation.

Cumulative Effects of Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternatives evaluates the impact on TES wildlife from the existing condition within the Wildlife Analysis Area. The past actions in the Wildlife Analysis Area that contributed to the existing condition include grazing, timber harvest, watershed restoration, and recreation use.

Cumulative effects on the great gray owl could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on private and federal lands may contribute to habitat loss for this species. High intensity stand replacement fires have contributed and would continue to contribute to loss of habitat for this species.

No matter what alternative is chosen for the Ingalls project, grazing is expected to continue at current levels. There are five grazing allotments that overlap into the wildlife analysis area, of which two are inactive. Of the three active allotments, two are in the Lake Davis area and overlap the great gray owl habitat and preliminary PAC, Grizzly Valley Community and Grizzly Valley. Approximately 77 percent of the Grizzly Valley Community allotment is within the wildlife analysis area, 277 cow/calf pairs are authorized from June 16 through September 30. Approximately 35 percent of the Grizzly Valley allotment is within the wildlife analysis area, 505cow/calf pairs are authorized from June 16 through September 15. This activity would continue to impact meadow vegetation thus potentially affecting prey species (voles and pocket gophers) abundance and availability due to the lack of suitable breeding, foraging and hiding cover.

The great gray owl habitat improvement project would remove 146 acres of early and mid seral habitat, but would eventually help to increase late seral habitat. This project is designed to provide future great gray owl nesting habitat.

The fuelwood gathering and Christmas tree cutting programs on the PNF are ongoing programs that have been in existence for years and are expected to continue. With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by great gray owls, especially during the nesting season, could cause disturbance that could disrupt and preclude successful nesting as well as the continued removal of current and future snags.

The recreation use at Lake Davis will be on going and any impacts to great gray owl habitat would likely continue. The proposed trail project in the Lake Davis area, that would construct a 7.4 mile trail on the east and north sides of the lake for hiking and mountain biking. Construction of this project would not affect great gray owl habitat.

Red Clover/Poco Watershed Project and Red Clover/Poco Prop 50 watershed restoration work could provide future suitable great gray owl foraging habitat in Red Clover Valley.

The Blakeless Underburn project should improve forest health and vigor and could potentially provide future great gray owl nesting habitat.

The Plumas National Forest Public Motorized Traveled Management Project is currently underway. The outcome of the route designation process is not expected to result in additional cumulative effects as no new routes would be created; only existing unauthorized routes would be added to the system. Table 33 provides a cumulative total on the amount of suitable great gray owl nesting habitat that has been impacted by the fuels treatments, group selection and area thinning projects implemented under HFQLG on the BKRD.

Table 33. Cumulative Changes (Reduction) in Great Gray Owl Nesting Habitat on the Beckwourth RD.

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ	Mabie DFPZ
	Alt. 3*	Alt. 2*	Alt. 4*	Alt. 4*	Alt. 1*	Alt. 3*	Alt. 3*
Nesting Habitat	0 acres	0 acres	25 acres	35 acres	0 acres	0 acres	0 acres
Project	Freeman DFPZ/GS	Grizz DFPZ/GS	Ingalls Project				
	Alt. 4*	Alt. 4*	Alt. 1	Alt. 3	Potential Cumulative Change		
Nesting Habitat	1,882 acres	605 acres	50 acres	45 acres	2,532 – 2,537 acres		

Ingalls project potentially contributes to a cumulative reduction in great gray owl nesting habitat. It is uncertain as to what influence these various reductions in habitat would do to great gray owl activity and occupancy within the Wildlife Analysis Area. However, it is not anticipated that this cumulative habitat reduction would result in loss of occupancy or productivity of the preliminary great gray owl PACs, based on no entry into preliminary PACs, the location of project activities to preliminary PACs, and retention of at least 92% of available suitable nesting habitat distributed across the Wildlife Analysis Area on National Forest lands post project implementation.

Environmental Consequences – Mesocarnivores (Pacific Fisher, American Marten, Sierra Nevada Red Fox, and California Wolverine)

Alternative 2 – No Action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

There would be no direct effects on mesocarnivores or mesocarnivore habitat, as no activities would occur that would cause disturbance to denning/resting or foraging mesocarnivores, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees, large snags and down woody material. If a large fire occurred suitable mesocarnivore habitat could become patchy within the wildlife analysis area.

With the current PNF woodcutting program, the project area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by mesocarnivores, especially during the denning season, could cause disturbance that could disrupt and preclude successful denning.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen on the landscape thus potentially reducing habitat diversity for mesocarnivores and their prey in the wildlife analysis area, due to lose of the aspen clone/cottonwood stand through succession (i.e., lack of stand recruitment and decadence of mature aspen).

Direct and Indirect Effects of Providing Access to Meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

There would be no action taken to close and/or reconstruct roads, or replace or install culverts thus maintaining the current road density of approximately 2.8 miles/square mile. Roads causing resource damage would continue to fragment the hydrology and riparian habitat thus potentially reducing habitat diversity in the wildlife analysis area. All of which would decrease suitable habitat through disturbance and degradation.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls Project would not provide for the long-term protection of mesocarnivore habitat from large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. Total wildfire acres and high intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted in SNFPA (USFS PSW, 2001), which could lead to the loss of existing habitat within the wildlife analysis area. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales

Indicator Measure 2: Habitat components modified, lost or fragmented.

Wildlife Analysis Area

A population is defined as a group of individuals of the same species occupying a defined area at the same time (Hunter 1996). Regarding Sierra Nevada Red Fox, wolverine, and possibly the fisher, all of which have very large home ranges, the PNF would probably contribute to the population within the Sierra Nevada mountain range, if individuals were found on the Forest. However, due to the lack of suitable habitat (subalpine conifer (SCN)) and verified sightings across the Plumas NF the Ingalls project would not affect the red fox or wolverine.

Numerous systematic surveys using various accepted methodologies, spatially conducted over 65% of the PNF since the mid 1980's, indicate that the Plumas does not now contribute to the Sierra Nevada populations of these two forest carnivores; they are either non-existent or in such small numbers that the known detection methodologies are inadequate to determine presence. As stated earlier, a male fisher has been tracked on the west side of the Plumas, but did not stay, and the reintroduced population is more than 40 miles from the Ingalls project area. A small population of marten exists on the Plumas, located within the Lakes Basin area on the Plumas/Tahoe NF border. Martens have been detected within the proposed Big Hill Project area but well outside of the Ingalls wildlife analysis area. Based on known detections of marten on the PNF, no changes in marten occupancy or distribution on the PNF should occur as a result of the Ingalls project.

Potential direct effects on these carnivores from vegetation management activities consist of modification or loss of habitat or habitat components, especially in regards to denning/resting habitat and foraging/travel habitat. Additional direct effects are possible behavioral disturbance to denning from logging, road building, or other associated activities (refer to HFQLGFRA BA/BE).

Changes to suitable habitat as a result of implementing fuels treatments in Alternatives 1 and 3 would occur due to the reduction in canopy cover (some below the minimum 40%) and the removal of needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) (Table 34). More specifically under Alternative 1 denning habitat would be reduced through the removal of the canopy cover (<60%) in all eastside pine types (i.e. EPN, JPN and PPN tree habitat) in the DFPZ. In OFEH and all other tree habitat (mixed conifer and fir) in the DFPZ treated under this alternative suitable habitat would retain the minimum canopy cover for foraging and denning habitat as well as the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.). This would be accomplished through variable density thinning which concentrates on retaining stand structure Alternative 3 would reduce foraging and denning habitat through the removal of both the canopy cover (<40%) and the needed structural components, in all tree habitats. Table 34 shows the above mentioned changes to American marten and Pacific fisher denning and foraging habitat by alternative.

Table 34. Comparison of Alternatives 1 and 3 on American Marten and Pacific Fisher Suitable Habitat (4M, 4D, 5M, 5D) within the Wildlife Analysis Area

Foraging Habitat	Alternative 1 (PA) Acres		% (Alt. 1) Remaining in Wildlife Analysis Area	Alternative 3 Acres		% (Alt. 3) Remaining in Wildlife Analysis Area
	*DFPZ, Area Thins, GS	Aspen Release		**DFPZ,	Aspen Release	
4M	+243	-45	102 %	-135	0	99.0 %
5M	+1	-2	99.9 %	0	0	100 %
Total Foraging Change (acres)	**+244**	**-47**	**102 % retained (+2%)**	**-135**	**0**	**99% retained (-1.0 %)**
Denning Habitat						
4D	-285	-14	90.4 %	-132	0	95.8 %
5D	-1	0	99.9 %	0	0	100 %
Total Denning Change(acres)	**-286**	**-14**	**91.6 % retained (-8.4 %)**	**-132**	**0**	**96.3 % retained (- 3.7 %)**

* Reductions shown here are due to the thinning of canopy below 40% in pine types leading to unsuitable foraging and denning habitat.
**Reductions shown here are due to the removal of the needed structural components (snags, vertical and horizontal layering, down woody debris, etc.) leading to unsuitable foraging and denning habitat.

Based on the vegetation layer, about 9.3% or 3,579 acres within the wildlife analysis area on National Forest System lands (38,368 NF acres) may be considered suitable denning habitat (4D and 5D), and about 35% or 13,523 acres may be considered suitable foraging habitat (4M and 5M). For marten and fisher habitat, Alternative 1 reduces denning habitat on 300 acres of 3,579 acres, but increases foraging habitat on 244 acres for a total of 13,767 acres; Alternative 3 reduces denning habitat on 132 acres of 3,579 acres and reduces foraging habitat on 135 acres of 13,523 acres. Retention of conifer trees >30” dbh, and retention of all hardwoods would provide structural attributes selected by marten and fisher for denning and resting sites. Down woody debris would be retained at 10-15 tons/acre in the largest logs. Snags would be retained at three to six snags per acre.

Zielinski et al. (2004) reported that fisher used large trees, large conifer snags and large hardwoods supporting cavities or platforms for rest sites, and suggested that fishers require multiple resting structures distributed throughout their home ranges. Zieleinski et al. suggested that “managers can maintain resting habitat for fishers by favoring the retention of large trees and the recruitment of trees that achieve the largest sizes”. With both action alternatives, no trees over 30” dbh would be removed, four of the largest snags per acre would be maintained (except group selections) and hardwoods would be retained. Conifers retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the openings and meadows; mistletoe brooms higher than 20’ from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc would decrease the risk of deleterious effects to old-forest related wildlife over the Ingalls project area in the long term (Dunk, 2005).

It is an unknown as to how some of the important prey species preferred by marten and fisher (small mammals, birds) would respond to group selection harvest units. The increased diversity and edges created by groups within forested stands may provide increased foraging opportunities for marten and fisher. Responses of prey species, including small mammals and passerine bird use of group openings and DFPZs is one of the main objectives of the administrative study conducted by PSW.

Borax applied to stumps in either action alternative should not affect mesocarnivores, or avian and mammalian prey species.

Direct and Indirect Effects of Aspen and Cottonwood Treatments

Indicator Measure 3: Change in vegetation and stand characteristics.

Improving aspen habitat through thinning (Alternative 1) may have short-term negative impacts but natural ecological recovery should reinvigorate the stand's growth; thus these impacts should be short-lived with favorable long-term results to vegetation and stream health. The removal of conifers would promote sprouting, leading to new younger trees with better growth, increase regeneration, and maintain or improve the current conditions thus potentially improving habitat diversity in the wildlife analysis area leading to more foraging opportunities for mesocarnivores.

Direct and Indirect Effects of Providing Road Access to meet Project Objectives while Reducing Transportation System Effects

Indicator Measure 4: Changes in road density.

Both alternatives propose to construct temporary road and utilize temporary roads, all of which would be closed post harvest. There would be no increase in habitat fragmentation with the temporary road construction. In addition, actions including road closure on some existing roads (Alternative 1) and on new temporary roads (both alternatives), would create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings. This should also reduce human activities that often lead to decreased habitat capability for carnivores (snag and log removal thru woodcutting, and disturbance).

Open road density within the wildlife analysis area would decline under the Proposed Action from the existing approximately 2.8 miles/square mile to between 2.7 miles/square mile, which is still providing for low habitat capability for forest carnivores. Overall this would slightly decrease habitat fragmentation.

Cumulative Effects of Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternatives evaluates the impact on TES habitat from the existing condition within the wildlife analysis area. Cumulative effects on the Mesocarnivores are similar to those described for the California spotted owl on pages 64-65.

Cumulative effects on forest carnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in urbanization, increases in recreational use of Forest Service system lands, and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for this species. Moderate-high and high severity large stand-replacing fires have contributed and would continue to contribute to loss of habitat for these species.

The Ingalls project potentially contributes to a cumulative reduction in suitable fisher and marten habitat. It is uncertain as to what influence these various reductions in habitat would do to potential future fisher and marten activity and occupancy within the wildlife analysis area. These cumulative reductions are not expected to increase large scale, high contrast fragmentation above existing levels.

Table 35. Cumulative Change (Reduction) of Pacific Fisher and American Marten Denning Habitat (4D, 5D, 6) on Beckwourth RD.

Project	Red Clover DFPZ/GS	Dotta DFPZ/GS	Stony DFPZ/GS	Last Chance DFPZ/GS	Poison DFPZ/GS	Crystal-Adams DFPZ/GS**	Humbug DFPZ	Mabie DFPZ
	Alt. 3*	Alt. 2*	Alt. B*	Alt. 4*	Alt. 4*	Alt. 1*	Alt. 3*	Alt. 3*
Denning Habitat	1,255 acres	0 acres	230 acres	25 acres	26 acres	0 acres	127 acres	375 acres
Project	Freeman DFPZ/GS	Old Sloat	Grizz DFPZ/GS	Cold Fire Recovery Project	Jackson DFPZ	Ingalls Project		
	Alt. 4*	Alt.1*	Alt. 4*	Alt. 1***	Alt. 3	Alt. 1	Alt. 3	Potential Cumulative Change
Denning Habitat	1,549 acres	13 acres	429 acres	34 acres	630 acres	300 acres	132 acres	**4,825 – 4,993 acres**

*Selected Alternative for the projects.
** Subsequent litigation dropped all group selections and applied a 12 inch upper diameter limit to the majority of the project area so the acres reflected in this table did not actually get reduced.
*** Reductions shown here are due to the removal moderate-high and high severity small pockets of roadside hazard trees in sections of mapped low and/or moderate vegetative burn severity and shows the worst case scenario.

The fisher does not currently inhabit the HFQLG area and even though reintroduction has begun just west of the Plumas National Forest, it would probably be several more years before available habitats would become fully occupied (Facka, per. com). Based on the home range and stand size reported in the April 8, 2004 Federal Register, it appears as if the wildlife analysis area supports large blocks of contiguous suitable habitat. Based on studies of home range sizes referenced in the above-mentioned Federal Register, estimates of potentially suitable and contiguous habitat that must be present before an area can sustain a population of fishers range from 31,600 acres in California, 39,780 acres in the northeastern United States, and 64,000 acres in British Columbia. Based on the vegetation layer and GIS, it appears as if the Ingalls project does not meet this acreage figure under existing conditions, 17,102 acres of 4M, 4D, 5M, 5D, 6 habitats on National Forest System lands (38,368 acres) in the wildlife analysis area. Thus the Ingalls project area most likely does not support habitat attributes needed to contribute to the potential for recovery of the species in this area of the PNF.

Since no California wolverines or Sierra Nevada red fox are believed to exist in, or near, the wildlife analysis area, no direct, indirect or cumulative impacts are expected for the California wolverine and Sierra Nevada red fox.

Environmental Consequences – Bats (Pallid Bat, Townsend's Big-eared Bat, and Western Red Bat)

Alternative 2 – No action Alternative

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 2)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

There would be no direct effects on bats or bat habitat, as no activities would occur that would cause disturbance to denning bats, nor any impacts to the existing habitat conditions.

Indirect effects of no action include the potential for future wildfire and its impact on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead to increased rates of spread resulting in potential modification of suitable bat habitat including the loss of large trees, large snags and down woody material.

Direct and Indirect Effects of Aspen and Cottonwood Treatments (Alternative 2)

Indicator Measure 3: Change in vegetation and stand characteristics.

There would be no action taken to maintain and restore aspen/cottonwood on the landscape thus potentially reducing habitat diversity in the wildlife analysis area, due to lose of the aspen clone/cottonwood stand through succession (i.e., lack of stand recruitment and decadence of mature aspen). Stream channel restoration and planting of cottonwood plugs would not occur; therefore no improvement to western red bat habitat would occur

Direct and Indirect Effects of Providing Road Access while Reducing Transporation System Effects (Alternative 2)

Indicator Measure 4: Changes in road density.

There would be no action taken to close and/or reconstruct roads, or replace or install culverts, both of which do not provide habitat. Roads causing resource damage would continue fragment the hydrology and aquatic habitat thus potentially reducing habitat diversity in the wildlife analysis area.

Cumulative Effects of No Action

The No Action Alternative for the Ingalls Project would not provide long-term protection of bat habitat from being greatly altered by a large stand-replacing fire. There would be no actions designed to reduce the risk of high intensity wildfire. There would be no thinning that could enhance the growth of dominant and co-dominant (20”-30” dbh) trees that may provide future habitat availability.

Action Alternatives

The implementation of Management Area direction and habitat prescriptions and allocations for California spotted owl, northern goshawk, forest carnivores, and willow flycatchers, including the retention of large trees, retention of hardwoods, snags and LWD and maintaining aquatic/riparian ecosystem processes, would provide many of the habitat attributes necessary to support the sensitive bat species. Potentially suitable habitat may exist within the project area for all three of these bat species (Pallid, Townsend’s big-eared and Western red bats).

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Action Alternatives)

Indicator Measure 1: Acres of suitable habitat modified, lost or fragmented at various scales.

Indicator Measure 2: Habitat components modified, lost or fragmented.

Direct effects from the proposed activities are possible if any of these species occurs in the project area. Destruction of active roosts through felling or removal of small trees with hollows could displace or harm individual bats. Chain saw activity or the use of heavy equipment causing ground vibrations may cause noise and tremor disturbance significant enough to cause temporary or permanent roost abandonment resulting in lowered reproductive success. These effects would be most severe during the breeding season (May 20 to August 15) when the potential exists for disturbance to active breeding females and maternity colonies. If any of these sensitive bat species breed in the area, project activities during the breeding season could affect individual bats, including direct mortality.

These bats have been known to utilize large conifer snags and tree hollows as day roosting sites, so some roosting habitat may be lost. Habitat attributes such as large live trees, and large snags could be removed or modified by the action alternatives. Hazard trees, including snags, along the road, and those removed for safety reasons, could result in direct mortality of bat species that may be roosting within the tree or snag. However, with both action alternatives no trees over 30” dbh would be removed, four to six of the largest snags per acre would be maintained (except group selections) and all hardwoods would be retained. The promotion of black oaks through the black oak radial thin would benefit Pallid and Townsend’s big-eared bats roosting and foraging opportunities. Conifers retained possessing one or more of the following characteristics that are of value for wildlife: large limbs extending into the openings and meadows; mistletoe brooms higher than 20’ from the ground; multiple tops; bole sweep; broken tops; heart rot; snags; etc; all habitat attributes that provide for bat roosting and/or foraging habitat.

Due to the small size of bats, and the difficulty of surveying for them, it is hard to determine where they are roosting. Because they are insectivores, removal of logs may reduce the amount of microhabitat available for wood boring beetles that may be utilized as prey.

There would be no habitat disruption of or modification to rock outcrops, caves and mining adits. No man-made structures that could provide habitat for bats are planned for removal or modification, other than roads and culverts, both of which do not provide habitat.

As part of a strategic system of defensible fuel profile zones, this project would reduce the potential for high-severity wildfires, which could eliminate vast tracts of habitat for these species. Prey base for bats (insects) may have some site-specific short-term reductions post underburning due to direct mortality of eggs, larvae, pupae and adults from fire. However, post-fire conditions have been shown, in many instances, to increase plant vigor (Lyon and Stickney 1976, DeByle 1984, Stein et al. 1992). It has also been shown that many herbivore insects preferentially feed on and have increased reproductive success and fitness on more vigorous plants and plant parts, "the plant vigor hypothesis" (Price 1991, Spiegel and Price 1996). Therefore, post fire conditions may increase the forage base available to bats.

Direct and Indirect Effects of Aspen and Cottonwood Treatments (Action Alternatives)

Indicator Measure 3: Change in vegetation and stand characteristics.

The removal of conifers would promote sprouting leading to new younger trees with better growth, increase regeneration, and maintain or improve the current conditions thus potentially improving habitat diversity in the wildlife analysis area leading to increased foraging and roosting opportunities for all three of these bat species (Pallid, Townsend's big-eared and Western red bats). Planting of cottonwood plugs is planned in unit 003, as part of stream channel restoration, to help promote growth of new cottonwoods in this stand. Should these plugs take, it would provide habitat in the future for these bat species, especially western red bats that use cottonwood leaves for roosting.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transporation System Effects (Action Alternatives)

Indicator Measure 4: Changes in road density.

Both alternatives propose to construct temporary roads and utilize temporary roads, all of which would be closed post harvest. There would be no increase in habitat fragmentation with the temporary road construction. In addition, road closures on some existing roads (Alternative 1) would create conditions to allow for vegetation recovery and reduce within stand gaps created by road openings. This should also reduce human activities that often lead to decreased habitat suitability for all three of these bat species (Pallid, Townsend's big-eared and Western red bats) (snag and log removal thru woodcutting, and disturbance). Overall this would slightly decrease habitat fragmentation.

Cumulative Effects of Action Alternatives

The existing condition reflects the changes of all activities that have occurred in the past. The analysis of cumulative effects of the action alternative evaluates the impact on TES wildlife from the existing condition within the wildlife analysis area.

No populations of sensitive bat species are known to occur in the wildlife analysis area, but based on surveys conducted across the Forest in various habitats, their presence is suspected. Cumulative effects on bats could occur with the incremental loss of the quantity and/or quality of habitat for these species. Overall, increases in urbanization, increases in recreational use of National Forest System lands, and the utilization of natural resources on state, private and federal lands may contribute to habitat loss for these species.

With the current PNF woodcutting program, the wildlife analysis area would be open to public woodcutting 12 months a year, limited only by available access. Uncontrolled public use within the areas used by bats, especially during the breeding season (maternity roosts), could cause disturbance that could disrupt and preclude successful recruitment of young as well as remove roost trees.

Summary of Determinations

See Table 36 for a summary of the determinations.

Table 36. Determinations of Effects on Threatened, Endangered, Proposed, and Sensitive Animal Species that Potentially Occur on the Plumas National Forest

Species	Action Alternatives*	Alternative 2* (No Action)
AMPHIBIANS		
Foothill yellow-legged frog (*Rana boylii*)	MAI	WNA
Sierra (Mountain) yellow-legged frog (*Rana sierrae*)	MAI	WNA
BIRDS		
Bald eagle (*Haliaeetus leucocephalus*)	MAI	WNA
California spotted owl (*Strix occidentalis occidentalis*)	MAI	WNA
Northern goshawk (*Accipiter gentilis*)	MAI	WNA
Great Gray Owl (*Strix nebulosa*)	MAI	WNA
MAMMALS		
American marten (*Martes americana*)	MAI	WNA
Pacific fisher (*Martes pennant pacifica*)	MAI	WNA
California wolverine (*Gulo gulo luteus*)	WNA	WNA
Sierra Nevada red fox (*Vulpes vulpes necator*)	WNA	WNA
Pallid bat (*Antrozous pallidus*)	MAI	WNA
Townsend's big-eared bat (*Corynorhinus townsendii*)	MAI	WNA
Western red bat (*Lasiurus blossevillii*)	MAI	WNA

*__Determinations:__ **T, E & P Species: WNA** = Will Not Affect, **MAINLA** = May Affect but Is Not Likely to Adversely Affect Individuals or their designated critical habitat, **MAILAA** = May Affect and Is Likely to Adversely Affect Individuals or their designated critical habitat.
FS Sensitive Species: WNA = Will Not Affect, **MAI** = May Affect Individuals, but is not likely to result in a trend toward Federal listing or loss of viability, **MAILRTFL** = May Affect Individuals, and is Likely to Result in a Trend toward Federal Listing or loss of viability.

Management Indicator Species (MIS)

Introduction

The purpose of this report is to evaluate and disclose the impacts of the Ingalls Project on the eleven (11) Management Indicator Species (MIS) identified in the Plumas National Forest (NF) Land and Resource Management Plan (LRMP) (USDA Forest Service 1988) as amended by the Sierra Nevada Forests Management Indicator Species Amendment (SNF MIS Amendment) Record of Decision (USDA Forest Service 2007). This report documents the effects of the Proposed Action and alternatives on the habitat of selected project-level MIS. Detailed descriptions of the Ingalls Project alternatives are found in Chapter 2 of the Ingalls Project Environmental Assessment (EA) (USDA Forest Service 2011). Implementation could begin as early as summer, 2012. All activities proposed would be completed within approximately five to eight years.

MIS are animal species identified in the SNF MIS Amendment Record of Decision (ROD) signed December 14, 2007, which was developed under the 1982 National Forest System Land and Resource Management Planning Rule (1982 Planning Rule) (36 CFR 219). Guidance regarding MIS set forth in the 1988 Plumas LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to (1) at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects, and (2) at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the 1988 LRMP as amended.

Effects Analysis Methodology

Geographic Analysis Areas

The treatment area is defined as the units to be treated, between 3,401 and 4,095 acres. The project area is defined as the treatment area plus an additional larger land base, which equals approximately 17,909 acres. This project area is located at elevations ranging from 5,400 feet along Red Clover Creek to 8,319 feet at the top of Mt Ingalls. For the purpose of this MIS report, the wildlife analysis area is defined as the project area (which includes the treatment areas) plus an additional larger land base. The additional larger land base was delineated based on the potential indirect and cumulative effects on California spotted owl Protected Activity Center (PAC) and Home Range Core Area (HRCA) distribution. The wildlife analysis area goes out to and encompasses the closest PACs/HRCAs to the project area. The wildlife analysis area totals approximately 38,901 acres, of which 38,368 acres are on National Forest System lands. This wildlife analysis area is being used for all wildlife species analyzed in this MIS report since the effects of the project to those species and their habitat would not extend beyond the wildlife analysis area boundary.

All direct, indirect and cumulative effects discussed, occur within this 38,368 acre Wildlife Analysis Area. The direct and indirect effects of each alternative, together with the additive or cumulative effects of each alternative, have been considered in evaluating impacts to MIS and MIS habitat.

Specific Methodology

The Ingalls Project was reviewed on the ground and using aerial photographs, digital orthophoto quadrangles (DOQs), vegetation layer spatial datasets, species specific spatial datasets and known information to help determine the potential presence of MIS species (i.e. Mule deer, Hairy woodpeckers, etc.). In the field, while conducting protocol surveys for TES species, any observations of MIS species are documented on 1:24000 scale quad maps. Species nest sites and locations are then incorporated into spatial datasets based on the mapped locations or Global Positioning System (GPS) points. For the analysis of effects, changes to suitable habitat were determined by using a spatial dataset of the vegetation layer combined with type of treatments (i.e. mechanical thinning, group selection, aspen thin, grapple pile, mastication, etc).

Affected Environment/Environmental Consequences

General Affected Environment

For the comparative analysis contained in this MIS Report, the CWHR system is used to evaluate habitat conditions and the suitability of wildlife habitat. Table 4 in the MIS Report displays all pre-treatment vegetation information currently available within the Wildlife Analysis Area. All vegetation information is displayed using the CWHR vegetation codes. The vegetation layer is a composite of remote sensed data and local project specific vegetation data all based on aerial photo interpretation.

General Environmental Consequences

Cumulative Impacts of actions on MIS Habitat or Ecosystem Components

The cumulative changes in MIS habitat or ecosystem components as a result of implementing silvicultural treatment as per action alternatives are displayed for the Wildlife Analysis Area in Table 37.

Table 37. Summary of Changes in Ingalls Wildlife Analysis Area Pre and Post Action Alternatives Treatment on MIS Habitat acres.

Habitat or Ecosystem Component	Pre-treatment MIS Habitat - Acres (Alt.2 – No Action)	Post Treatment MIS Habitat - Acres (Alt.1)	Change in MIS Habitat - Acres	Post Treatment MIS Habitat - Acres (Alt.3)	Change in MIS Habitat - Acres
Early Seral Coniferous Forest	3,736	3,769	+33	3736	0
Mid Seral Coniferous Forest	24,000	23,877	-123	24,000	0
Late Seral Open Canopy Coniferous Forest	285	285	0	285	0

Habitat or Ecosystem Component	Pre-treatment MIS Habitat - Acres (Alt.2 – No Action)	Post Treatment MIS Habitat - Acres (Alt.1)	Change in MIS Habitat - Acres	Post Treatment MIS Habitat - Acres (Alt.3)	Change in MIS Habitat - Acres
Late Seral Closed Canopy Coniferous Forest	1,618	1,616	-2	1,618	0
Hardwood/conifer	32	32	0	32	0
Riparian	295	295	0	295	0
Riverine & Lacustrine	2,597	2,597	0	2,597	0
Shrubland (west-slope chaparral types)	559	559	0	559	0
Wet Meadow	1,153	1,153	0	1,153	0
CWHR not included in MIS Habitat	4,093	4,186	+93	4,093	0
Grand Total	**38,368**	**38,368**	**0**	**38,368**	**0**

Effects of the Proposed Project on the Habitat for the Selected Project-Level MIS

Early and Mid-Seral Coniferous Forest Habitat (Mountain quail)

Effects of Alternative 2 (No Action)

Direct, Indirect, and Cumulative Effects to Habitat

There would be no direct or indirect effects on early and mid seral coniferous forest habitat, as no activities would occur that would impact the existing habitat conditions, thus there would also be no additional cumulative effects as a result of selecting this alternative. As a result, existing early and mid seral coniferous forest conditions and mountain quail habitat conditions would be maintained.

Cumulative Effects Conclusion

It is anticipated that implementation of the No Action Alternative, in combination with present and reasonably foreseeable future actions, would not have a cumulative effect to the population and habitat distribution across the Plumas National Forest. Thus existing early and mid seral coniferous forest conditions and mountain quail habitat conditions would be maintained.

Effects of the Action Alternatives

Direct and Indirect Effects to Habitat

Changes under each action alternative would be very nominal. Alternative 3 would have no net change in early or mid seral coniferous forest habitat while Alternative 1 would type convert 17 acres of early seral and 74 acres of mid seral coniferous forest habitat to aspen habitat, thus creating healthier growing conditions for the aspen by reducing shading (subsequently increasing sunlight to aspen) and increasing the water available to the aspen. Alternative 1 also increases early seral habitat by 42 acres and reduces mid seral habitat by 42 acres through the implementation of group selections. Overall, the amount of early and mid seral coniferous habitat retained post project would be 99.7% (Alternative 1) and 100% (Alternative 3) within the Wildlife Analysis Area.

Cumulative Effects Conclusion

It is anticipated that implementation of the action alternatives, in combination with present and reasonably foreseeable future actions would increase the amount of early and mid seral coniferous forest habitat while the removal of snags would not affect these habitats within the Wildlife Analysis Area. These changes will not alter the existing trend in the early and mid seral coniferous forest habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Mountain Quail Trend

The direct/indirect and cumulative effects of the Ingalls Project would have a nominal affect on the amount and/or distribution of early and mid seral habitat within the Wildlife Analysis Area. However, this change in the amount of early and mid seral habitat in the Wildlife Analysis Area will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion

Late Seral Closed Canopy Coniferous Forest Habitat (California spotted owl and Northern flying squirrel)

Effects of Alternative 2 (No Action)

Direct, Indirect, and Cumulative Effects to Habitat

There would be no direct or indirect effects on late seral closed canopy coniferous forest habitat, as no activities would occur that would impact the existing habitat conditions, thus there would also be no additional cumulative effects as a result of selecting this alternative. As a result, existing late seral closed canopy coniferous forest conditions and California spotted owl/northern flying squirrel habitat conditions would be maintained.

Cumulative Effects Conclusion

It is anticipated that implementation of the No Action Alternative, in combination with present and reasonably foreseeable future actions, would not have a cumulative effect to the population and habitat distribution across the Plumas National Forest. Thus, existing late seral closed canopy coniferous forest conditions and California spotted owl/northern flying squirrel habitat conditions would be maintained.

Effects of the Action Alternatives

Direct and Indirect Effects to Habitat

Changes under each action alternative would be very nominal. Alternative 3 would have no effect on late seral closed canopy coniferous forest habitat while Alternative 1 would decrease the amount of late seral closed canopy coniferous forest habitat by 2 acres through the implementation of aspen/cottonwood enhancement. Thus, the amount of late seral closed canopy coniferous forest habitat retained post project for Alternative 1 would be 99.9% within the Wildlife Analysis Area.

Cumulative Effects Conclusion

It is anticipated that implementation of the Alternative 1, in combination with present and reasonably foreseeable future actions, would decrease the amount of late seral closed canopy coniferous forest habitat within the Wildlife Analysis Area. However, the affected area is small 2 acres for this project), thus, these changes will not alter the existing trend in the late seral closed canopy coniferous forest habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Trends

California spotted owl

The direct/indirect and cumulative effects of the Ingalls Project would have a nominal affect on the amount and/or distribution of late seral closed canopy coniferous forest habitat within the Wildlife Analysis Area. However, this change in the amount of late seral closed canopy coniferous forest habitat in the Wildlife Analysis Area will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of California spotted owls across the Sierra Nevada bioregion.

Northern flying squirrel

The direct/indirect and cumulative effects of the Ingalls Project would have a nominal affect on the amount and/or distribution of late seral closed canopy coniferous forest habitat within the Wildlife Analysis Area. However, this change in the amount of late seral closed canopy coniferous forest habitat in the Wildlife Analysis Area will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of northern flying squirrels across the Sierra Nevada bioregion.

Riparian Habitat (Yellow warbler)

Effects of Alternative 2 (No Action)

Direct, Indirect, and Cumulative Effects to Habitat

There would be no direct or indirect effects on riparian habitat, as no activities would occur that would impact the existing habitat conditions, thus there would also be no additional cumulative effects as a result of selecting this alternative. As a result, existing riparian habitat conditions and yellow warbler habitat conditions would be maintained.

Cumulative Effects Conclusion

It is anticipated that implementation of the No Action Alternative, in combination with present and reasonably foreseeable future actions, would not have a cumulative effect to the population and habitat distribution across the Plumas National Forest. Thus existing riparian habitat conditions and yellow warbler habitat conditions would be maintained.

Effects of the Action Alternatives

Direct and Indirect Effects to Habitat

Alternative 3 has no direct or indirect affect on riparian habitat in the Wildlife Analysis Area. However, Alternative 1 would directly affect 150' of stream channel in an aspen/cottonwood stand through stream channel restoration. This project would stabilize eroded streambanks, treat headcuts, and revegetate the streambanks. Indirectly this project would improve water quality due to reduced sedimentation and improve riparian vegetation growing conditions (Waterrman 2011). This alternative would also indirectly affect 95 acres or 32% of the riparian habitat within the Wildlife Analysis Area as a result of habitat modification (removing conifers). Overall, indirect effects from removing conifers from areas surrounding riparian habitat should allow for the flourishing of willow/aspen/cottonwood type vegetation. This would be accomplished by allowing more sunlight to reach plants and the forest floor, plus more water availability with less conifer competition.

Cumulative Effects Conclusion

It is anticipated that implementation of the action alternatives, in combination with present and reasonably foreseeable future actions would maintain the amount of riparian habitat by removing competing conifers, while the removal of snags would not affect these habitats within the Wildlife Analysis Area. These changes will not alter the existing trend in the riparian habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Yellow Warbler Trend

The direct/indirect and cumulative effects of the Ingalls Project would have no affect on the amount and/or distribution of riparian habitat within the Wildlife Analysis Area. Since there will be no affect, the Ingalls Project will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of yellow warblers across the Sierra Nevada bioregion.

Riverine & Lacustrine Habitat (Aquatic Macroinvertebrates)

Effects of Alternative 2 (No Action)

Direct, Indirect, and Cumulative Effects to Habitat

Selection of the No Action Alternative would contribute to no direct or indirect effects to riverine and lacustrine habitats, thus there would also be no additional cumulative effects because of selecting this alternative. Therefore, there would be no direct, indirect or cumulative impacts to riverine and lacustrine habitats. As a result, existing riverine and lacustrine habitat conditions and aquatic macroinvertebrate habitat conditions would be maintained.

Cumulative Effects Conclusion

It is anticipated that implementation of the No Action Alternative, in combination with past, present and reasonably foreseeable future actions, would not have a cumulative effect to the population and habitat distribution across the Plumas National Forest. Thus, existing riverine and lacustrine conditions and aquatic macroinvertebrate habitat conditions would be maintained.

Effects of the Action Alternatives

Direct and Indirect Effects to Habitat

No Riparian Habitat Conservation Areas (RHCAs) or Streamside Management Zones (SMZs) equipment exclusion zones would be directly impacted by equipment operations during harvest/thinning activities. Under Alternative 1 approximately 150’ of stream channel in an aspen/cottonwood stand would be affected through stream channel restoration. This project would stabilize eroded streambanks, treat headcuts, and revegetate the streambanks. Indirectly this project would improve water quality due to reduced sedimentation and improve riparian vegetation growing conditions (Waterman 2011).

Flow

Streams within the Wildlife Analysis Area are not expected to change flow due to the implementation of the action alternatives. For example, all perennial streams are expected to remain perennial, all intermittent streams are expected to remain intermittent, and the same for ephemeral streams. Flow will change depending on the water year. The existing flow condition should remain the same post treatment unless a large water event occurs, thus affecting the existing macroinvertebrate habitat.

Water surface shade (Waterman 2011)

The canopy cover in RHCAs will be greater than 40 percent. This would allow stream shading during the early summer months when many streams are flowing, maintain moister microclimates for fish and macroinvertebrates and stream temperatures would not be affected. In addition to reducing the risk of high-intensity fires, thinning RHCAs will allow the ecosystem within this corridor to return to a more productive historic condition. Through increased water yield, reduced transpiration, increased diversity of understory and riparian vegetation, as well as increased canopy coverage derived from greater riparian vegetation growth, water temperatures may be slightly reduced thus improving conditions for sensitive aquatic macroinvertebrates.

Sediment (Waterman 2011)

Increased sediment delivery could result in changes to stream channel morphology, water quality, and downstream fish habitat. Factors within sediment regimes such as timing, volume, and character of sediment input and transport will be more consistent with those conditions under which the riparian and aquatic ecosystems developed. It is anticipated with these treatments that stream channel integrity, channel processes and sediment regimes will more closely represent historic conditions.

Cumulative Effects Conclusion

It is anticipated that implementation of the action alternatives, in combination with present and reasonably foreseeable future actions would maintain the amount and improve the quality of riverine and lacustrine habitat by reducing conifer competition, improving overall riparian vegetation vigor and maintaining water surface shade within the Wildlife Analysis Area. These changes will not alter the existing trend in the riverine and lacustrine habitat. Thus existing riverine and lacustrine conditions and aquatic macroinvertebrate habitat conditions would be maintained.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Aquatic Macroinvertebrates Habitat Trend

The direct, indirect and cumulative effects of the Ingalls Project would not alter the amount riverine and lacustrine habitats within the Wildlife Analysis Area. There would be no change in the amount of riverine and lacustrine habitats in the Wildlife Analysis Area therefore the Ingalls Project will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of aquatic macroinvertebrates across the Sierra Nevada bioregion.

Snags in Green Forest Ecosystem Component (Hairy woodpecker)

Effects of Alternative 2 (No Action)

Direct, Indirect, and Cumulative Effects to Habitat

Selection of the No Action Alternative would contribute to no direct or indirect effects to snags in green forest habitat, thus there would also be no additional cumulative effects as a result of selecting this alternative. Therefore, there would be no direct, indirect or cumulative impacts to snags in green forest habitat. As a result, existing snags in green forest habitat conditions and hairy woodpecker habitat conditions would be maintained.

Cumulative Effects Conclusion

It is anticipated that implementation of the No Action Alternative, in combination with present and reasonably foreseeable future actions, would not have a cumulative effect to the population and habitat distribution across the Plumas National Forest. Thus, existing snags in green forest habitat conditions and hairy woodpecker habitat conditions would be maintained.

Effects of the Action Alternatives

Direct and Indirect Effects to Habitat

Changes under each action alternative would be very nominal. The potential exists for some snags to be removed due to safety and operability concerns; however, snag recruitment is also expected with retention of 30”+dbh conifers and some recruitment due to fire kill. The net result of snag loss and gain is undetermined. However, the two action alternatives call for the retention of snags at SNFPA Standards (3 to 6 snags/acres, ≥15” dbh), where available. Since the pine types are currently below standards, it would be important to leave all snags >12” dbh in the pine types.

Cumulative Effects Conclusion

It is anticipated that implementation of the action alternatives, in combination with present and reasonably foreseeable future actions would decrease the amount of snags in green forest habitat within the Wildlife Analysis Area. These changes will not alter the existing trend in the snags in green forest habitat.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale Hairy Woodpecker Trend

The direct/indirect and cumulative effects of the Ingalls Project, in terms of potential medium-sized and large-sized snags per acre within green forest habitat, under action alternatives would not change with time, the amount and distribution of snags in green forest habitat within the Wildlife Analysis Area. Since there will be no affect, the Ingalls Project will not alter the existing trend in the ecosystem component, nor will it lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.

Water and Soil Resource Effects Assessment

Introduction

This assessment addresses impacts to both hydrologic resources and soil resources. Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation, and domestic water supplies. Information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects as well as the downstream physical effects (Menning et al. 1996, McGurk and Fong 1995). This CWE analysis addresses effects to both near-stream and downstream uses by using the Region 5 Cumulative Off-site Watershed Effects Analysis method (USDA Forest Service 1988a). This method is based on the concept of equivalent roaded acres (ERA), which is described in the Cumulative Watershed Effects Method section of this document.

Soils provide the nutrient and hydrologic foundation necessary to sustain terrestrial ecosystems. Soil productivity is generally considered the capacity of soils to produce plants. Indicators of soil productivity include soil cover, soil porosity, and organic matter. Maintenance of soil cover is important to prevent accelerated soil erosion. Soil porosity is used to assess soil compaction. Organic matter in the soil and on the soil surface stores nutrients used by plants and organisms that inhabit the soil. Threshold values indicate when changes in soil properties and soil conditions may result in long-term losses in inherent productivity or hydrologic function of the soil. Detrimental soil disturbance may result when threshold values are exceeded for certain soil properties.

Effects Analysis Methodology

Scope of the Analysis

This section describes the geographic and temporal boundaries utilized in this assessment. These areas differ for the watershed effects analysis and the soil assessment areas.

Table 38. Summary of Environmental Indicators and Measures Examined in this Assessment

Key Ecosystem Element	Environmental indicators	Variable Assessed
Water Quality	Chronic Sedimentation	Equivalent Roaded Acres
Soil Productivity	Organic Matter losses Large Woody Debris losses Soil loss Reduced Vegetation Establishment and Water Infiltration	Surface Fine Organic Matter Large Woody Debris Effective Soil Cover Detrimental Compaction

The geographic area examined for the cumulative watershed effects analysis consists of the 16 subwatersheds that have treatments proposed within their boundaries. These subwatersheds encompass approximately 16,464 acres, or about 4 percent of the Beckwourth Ranger District.

These analysis subwatersheds range from 363 to 2,976 acres in size. Five of the subwatersheds (Big Grizzly, Old House, Lightning, Vulture, and Sullivan) are in the Freeman Creek Hydrologic Unit Code 6 (HUC6) watershed, and 11 subwatersheds (Light, Crystal, Coldwater, Turner, Red, Contact, Wilson, Ridge, Bagley, Pebble, and Marble) are in the Lower Red Clover Creek HUC6 watershed (Figure 10). The Freeman Creek HUC6 watershed is part of the Lake Davis HUC5 watershed. The Lake Davis HUC5 watersheds drain into the Middle Fork of the Feather River. The Lower Red Clover Creek HUC6 Watershed is part of the Red Clover Creek HUC5 watershed. The Red Clover Creek HUC5 drains into Indian Creek, which drains into the East Branch of the North Fork of the Feather River.

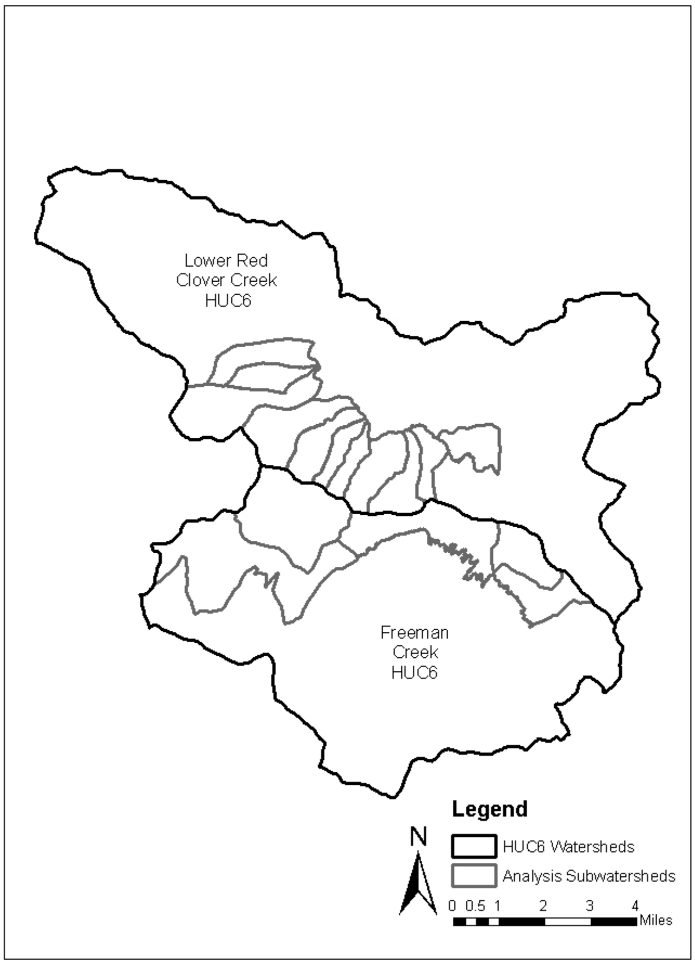

Figure 10. The two HUC6 watersheds that encompass the Ingalls Project area.

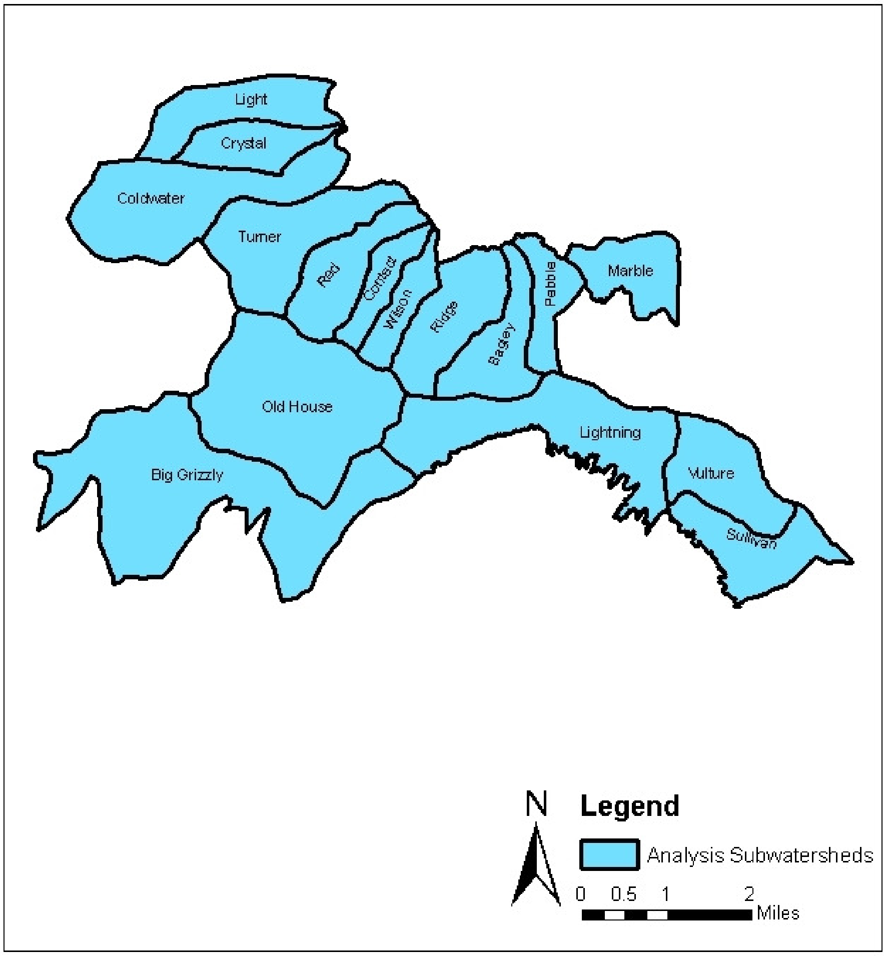

Figure 11. The analysis subwatersheds examined for cumulative watershed effects.

The temporal bounds of the watershed effects analysis typically range from 25 to 35 years. However, this value varies depending on the type of disturbance activity contributing to cumulative effects. Timber harvest activities were generally considered recovered after 30 years, so harvests occurring prior to 1981 were excluded from the effects model. For variables that do not recover within 30 years (e.g. soil compaction) accommodations are made within the analysis. Wildfire effects were considered recovered after 10 years. No temporal component was included for existing roads, regardless of when they were constructed. This assumes that the existing roads get enough use and/or maintenance to maintain them in their current state. The timeframes chosen to analyze the effects of anthropogenic and natural disturbances to watersheds reflect the resultant recovery of changes to watershed function, specifically surface runoff patterns and timing.

In addition, the mechanical and underburn treatment units (2,630 – 3,324 acres) which are part of the proposed treatment area (4095 acres) within the project area (17,909 acres) were used as the geographical area examined for the soil assessment. The temporal bounds of the soil assessment range from 10 to 30 years because climate change, unforeseeable future projects, demographic changes, etc… make assumptions beyond this period speculative.

Cumulative Watershed Effects Methodology

For the purpose of this CWE analysis, the effects of past, present, and reasonably foreseeable future impacts were assessed using the Region 5 Cumulative Off-site Watershed Effects Analysis (USDA Forest Service 1988a).

Defined beneficial uses for project watersheds are described below and include water recreation, industrial, municipal, terrestrial wildlife habitat, and cold freshwater habitat. Among these beneficial uses, aquatic habitat is the most sensitive to adverse sedimentation and water temperature or chemistry effects that could potentially result from land disturbing activities such as those proposed for this project. Alterations to watershed hydrology are believed to be the most probable mechanism for initiating these effects on aquatic habitat (USDA Forest Service 1988a). The Region 5 CWE model utilizes conceptual site disturbance coefficients called equivalent roaded acres (ERA) to track changes in the hydrologic functioning of watersheds. ERA coefficients are used to compare the effect of management activities such as timber harvest, pile burning, underburning, and grazing to the effect of a road in terms of altering surface runoff patterns and timing. Disturbances are added together to determine a cumulative ERA value for each analyzed watershed. Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition.

Watersheds and their associated stream systems can absorb some level of land disturbance without causing unacceptable effects to beneficial uses of water. However, there is a point where additive or synergistic effects of land use activities would cause a watershed to become highly susceptible to cumulative effects. For the Region 5 model, the estimated upper limit of watershed tolerance is called the threshold of concern (TOC). For this analysis, when the total calculated ERA in a watershed, expressed as a percentage of the watershed area, exceeds the TOC, susceptibility for adverse cumulative effects to downstream beneficial uses is high.

The R5 Soil and Water Conservation Handbook (USDA Forest Service 1988a) states that the TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. Susceptibility to negative impacts are increased as a watershed approaches or is impacted beyond the TOC. If the watershed is approaching or above the TOC, a more thorough investigation of the activities planned within the watershed is necessary. Additional field surveys and/or more detailed analysis are done for subwatersheds that approach or exceed TOC or experience considerable increases in ERA.

Project level TOCs are estimated by considering the sensitivity of each analyzed watershed. Natural watershed sensitivity is an estimate of a watershed's natural ability to absorb land use impacts without increasing the effects of cumulative impacts to unacceptably high levels (USDA Forest Service 1988a). Measures used to evaluate watershed sensitivity include the potential for: 1) soil erosion; 2) high intensity and/or long duration precipitation events, including rain-on-snow; 3) landslides and debris flows; and 4) channel erosion within alluvial stream channels. The TOC generally ranges between 12 percent and 20 percent ERA depending upon the intrinsic sensitivity of the watershed and beneficial uses of water (USDA Forest Service 1988a). Based upon the assessment of these measures within the Ingalls analysis subwatersheds, as well as a review of land use history and resultant impacts to beneficial uses in similar watersheds, the TOC has been conservatively set at 12 percent ERA for the upland areas of each analyzed subwatershed.

In recent years, ERA analyses have focused more attention on near stream activities with respect to sediment yields and peak flows. It has been shown throughout the literature over the past century that most sediment delivery originates within close proximity to stream courses, whether they are perennial, intermittent, or ephemeral streams. For this analysis, ERA values for each watershed are calculated and reported separately for near-stream areas and upland areas. The TOC for sensitive areas has been conservatively set at 8 percent ERA.

For this project analysis, the indicated risk of CWE is a conservative estimate because, in most cases, the reported ERA values within sensitive areas are over-predicted due to how the timber activity was entered into the GIS interface. In most cases sensitive areas and their corresponding protection buffers that were not treated as part of timber activity have not been excluded from the treated area GIS layer. Therefore, the ERA values within the sensitive areas for the analyzed subwatersheds end up being an over prediction of the actual disturbance that has occurred within these areas. Additionally, acres within internal exclusion zones (no proposed treatment) and 25 percent or greater slope restriction zones within the RHCAs and SMZs were not omitted as part of this analysis.

Over the years since the R5 CWE model was developed, Plumas National Forest watershed staff have developed ERA disturbance coefficients based on visual observations, field surveys, published studies, transects, and aerial photo interpretation. Coefficients vary by past management activity, silvicultural prescription, site preparation methods, type of equipment utilized, and wildfire severity.

Disturbances were calculated with Geographic Information System (GIS) programs, using Plumas National Forest modified corporate data files. While substantial efforts are made to keep revising these data files as new information becomes available, site-specific field verification is required to more accurately capture attributes within the analysis area. Roads and stream channels are the emphases of this verification based upon findings from past management activities that showed that there may be up to 20% more roads on the landscape than are depicted in the corporate data. Conversely, the corporate data tends to over predict the presence of ephemeral streams, and occasionally fails to predict the presence of some stream segments. Where treatment activities are proposed, field data was collected to verify the presence or absence of stream courses and additional roads within the treatment units. These field-verified files were used when calculating ERA contributions. Stream miles, road densities, and road-stream crossing information presented are based on a combination of corporate data files and field verified data.

The assessment of past fire events was restricted to events within the last 10 years based on visual observations, field surveys, published studies, and aerial photo interpretation. Beyond this time frame, vegetation has generally had ample opportunity to reestablish and develop adequate crown cover to provide organic material to the soil; thereby providing physical protection against soil erosion, which decreases adverse effects on channel condition, fisheries, and water quality. According to the fire history on the Plumas National Forest there were no large fires that occurred within the analysis area within the last 10 years, and therefore no wildfires were included in this analysis.

The assessment of past timber harvest activities was restricted to events within the last 30 years. This value reflects the period of time required for site recovery following these types of activities and events. Beyond this period, vegetation has generally had ample opportunity to reestablish and develop adequate crown cover to provide organic material to the soil. Together, crown and litter cover provide physical protection against soil erosion. In addition, roots have reoccupied the soil mantle and most effects from compaction have been negated except along established roadways and some skid trails, temporary roads, and landings. These factors tend to moderate peak flows, and therefore diminish adverse effects on channel condition and water quality. A linear recovery coefficient was incorporated into the analysis to reduce the disturbance coefficients over a 30-year period.

Soil Assessment Methodology

Soil quality standards and guidelines that apply to this project exist at the Forest level with the Plumas National Forest Land and Resource Management Plan (USDA Forest Service 1988) and at the bioregional level with the Sierra Nevada Forest Plan Amendment Record of Decision (USFS PSW, 2004b). These standards and guidelines focus on protection and improvement of National Forest System lands for continuous forest and rangeland productivity and favorable water flows. To address these standards and guidelines, this soil assessment focused on soil productivity measures including surface organic matter, soil cover, compacted soils, and large woody debris. Ten to thirty years was chosen as a temporal timeframe for soil effects. After this time, the degree and variability of soil disturbances are expected to be similar to the No Action Alternative.

A field crew assessed soil productivity measures across 69 percent of the acreage that has been proposed for mechanical and/or prescribed fire treatment. The surveys were completed during the summer of 2010. Within the areas that were to be sampled, transects were randomly selected. To prevent locating transects parallel to skid trails, and thereby inadequately sampling them, transects were intentionally located so as to not run directly up and down a slope. In addition, transects were placed between system roads in order to concentrate sampling in the ground disturbing activity areas. Transects had 40 to 50 sample points. Transect length often varied and two transects were covered in each unit sampled. Transects were placed between the roads according to the slope conditions described above when a sampling area was bound by two system roads. Sample points were evenly distributed along the transect. At each point, the type of ground cover, detrimental compaction, and presence of skid trails and landings were determined.

Cover categories included three depth classes of duff and litter, three size classes of woody debris, live vegetation, rock, or bare soil. If bare soil was encountered, an assessment was made to categorize the location as disturbed or undisturbed by management activities, showing evidence of erosion or deposition, or recently burned.

For the purposes of this analysis, it was assumed that a 10 percent reduction in total soil porosity corresponds to a threshold soil bulk density that indicates detrimental soil compaction. To assess for detrimental soil compaction, the "spade method" was used which consists of measuring compaction from the resistance felt from sticking a spade shovel into the ground at the transect sample point. Soil bulk density samples were collected and analyzed on soils found in the project area to calibrate the spade method and assure that the person performing the test properly correlated the resistance felt with threshold soil bulk densities. Subsequently, a 12-16'' deep and 6-12'' wide hole was excavated with the spade to assess whether detrimental compaction exists based upon field indicators of soil compaction.

Affected Environment/Environmental Consequences

Affected Environment

The Ingalls project is located on the Beckwourth Ranger District of the Plumas National Forest (PNF) within the Sierra Nevada Mountain Province. The project area is within the Mt. Ingalls (#31), Lake Davis (#37), and Dotta (#36) Management Areas identified in the PNF Land and Resource Management Plan.

Precipitation

Average annual precipitation in the project area is approximately 34-45 inches. Variations in precipitation accumulation are dependent upon topography, with the higher elevations receiving more than the lower elevations. Elevations within the project area range from 5,160 feet to 8,372 feet. Precipitation falls primarily as snow above 6,000 feet, with yearly snowfall total approaching 62 inches at 6,900 feet. Snow estimates are a 10 year average from the Grizzly snow course (Department of Water Resources California Data Exchange Center). Precipitation distribution is characteristic of the Mediterranean climate, with most precipitation occurring between October and May. About half of the annual precipitation falls during December, January, and February. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

Soils and Parent Materials

The geology of the analysis area is primarily composed of Tertiary andesite, Tertiary rhyolite, Tertiary basalt, and Quaternary lake deposits. The various Tertiary geologic types dominate the analysis area and are found throughout the steeper terrain on the north and south sides of Turner Ridge. The Quaternary lake deposits are found in the flatter terrain in Grizzly Valley and along the north side of Lake Davis. Generally soils that are derived from extrusive igneous parent materials, including those found within the project area, have an affinity for mass instability, compaction, and road maintenance problems.

Soils throughout the project area vary considerably, with the occurrence of over 17 individual soil types. The maximum erosion hazard ratings of the soil types that are in the areas proposed for project activity range from low to high (**Error! Reference source not found.**). The texture classes of these soils range from clay loam to loamy sand. Barren rocky outcroppings occur occasionally throughout the project area. Stream flow is highly responsive to rainfall and snowmelt events once the soils become saturated. Stream channels will also respond when precipitation rates exceed the rate of infiltration (i.e. during a thunderstorm event). In this case, substantial surface runoff may occur.

Stream Channels and other Sensitive Areas

There are approximately 175 miles of stream channels in the analysis watersheds according to PNF corporate GIS files and project area stream survey data. These channels are made up of a variety of stream types with approximately 28 miles of perennial streams, 24 miles of intermittent streams, and 123 miles of ephemeral streams. Stream channels on the southern half of the project area are tributaries to Lake Davis, while stream channels on the northern half of the project area tributaries to Red Clover Creek. The stream channels within the proposed treatment units were surveyed to verify flow regimes and subsequent Riparian Habitat Conservation Area (RHCA) and Streamside Management Zone (SMZ) buffer designation. Buffer zone widths will vary from 50 to 300 feet depending on channel characteristics, flow regime, and the presence of fish (see SOPs in Appendix B).

Forty-nine springs, seeps, and wetlands were located in the analysis watersheds through a combination of field surveys by District Watershed Staff, District Botanists and corporate GIS database research. Forty-eight of these features are less than one acre in size, while one is greater than an acre. Buffer zone widths will vary from 100 to 150 feet around seeps, springs, and wetlands that are less than one acre and greater than one acre, respectfully. For the purposes of the ERA model, these buffered areas were incorporated into the “sensitive areas” GIS layer along with buffered RHCAs and SMZs.

These areas will be protected in a manner consistent with the Riparian Management Objectives (HFQLG FEIS), Riparian Habitat Conservation Area and Streamside Management Zone Plan and the Standard Operating Procedures (SOPs) for RHCAs and SMZs that can be found in the Appendix B of the Ingalls Project EA.

Beneficial Uses

Existing beneficial uses for the surface waters of the Ingalls Project area are identified in the Central Valley Water Quality Control Plan for the Sacramento and San Joaquin River Basins (California Regional Water Quality Control Board 2007). This plan identifies beneficial uses for specific water bodies and states that those beneficial uses generally apply to tributary systems of those water bodies. The 11 subwatersheds that are located north of Turner Ridge are tributaries to the North Fork of the Feather River. Existing beneficial uses for the North Fork of the Feather River include, municipal, industrial, recreation, and fish and wildlife habitats as defined below.

Municipal

Municipal and Domestic Supply – Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.

Industrial

Hydropower Generation – Uses of water for hydropower generation.

Recreation

Water contact recreation – Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to wading and fishing.

Non-contact water recreation – Uses of water for recreational activities near water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, camping, marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Fresh Water Habitat & Spawning, Reproduction, and/or Early Development

Cold freshwater habitat – Uses of water that support coldwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Wildlife Habitat

Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

The five subwatersheds in the assessment area that are located south of Turner Ridge are tributaries to Lake Davis. Existing beneficial uses for Lake Davis include, recreation and fish and wildlife habitats as defined below.

Recreation

Water contact recreation – Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to wading and fishing.

Non-contact water recreation – Uses of water for recreational activities near water, but where there is generally no body contact with water, nor any likelihood of ingestion of water. These uses include, but are not limited to, picnicking, sunbathing, hiking, camping, marine life study, hunting, sightseeing or aesthetic enjoyment in conjunction with the above activities.

Fresh Water Habitat & Spawning, Reproduction, and/or Early Development

Cold freshwater habitat – Uses of water that support coldwater ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates. Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Warm freshwater habitat – Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Wildlife Habitat

Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Environmental Consequences

Alternative 2 – No Action (Water Resource Indicators)

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen, and Cottonwood Treatments

Measurement Indicator 1 – Measurement Indicator 1 – Acres of DFPZ and Area Thin fuels reduction, aspen and cottonwood treatments within sensitive (i.e. RHCAs and SMZs) and upland areas.

Under the No Action Alternative, on site and downstream water quality and impacts to beneficial uses (e.g. drinking water, swimming, hydro power, etc.) of surface waters would remain unchanged in the immediate future. The No Action Alternative will maintain the existing condition of the water resources, riparian environment, and stream channels. Stabilization of stream channels and treatment of heavy concentrations of fuels that would reduce fire hazard and decrease the potential for large fires within the sensitive and upland areas and subsequent effects to water quality would not occur under this alternative. Subwatersheds will continue to regain their inherent hydrologic character as stand growth continues and previously disturbed sites recover. Given this site recovery, sections of streams within these subwatersheds that are in poor to fair condition would experience a very gradual, long-term improvement in channel stability as peak flows and sedimentation rates decrease. Sedimentation from roads would continue since a number of the roadways are in poor condition and situated in close proximity to streams.

This description assumes that fires are controlled to spot locations over the next 20 to 30 years. Given the increase in fuel loading resulting from insect mortality, there is a reasonable probability that a large, intense wildfire would occur during this time frame. It can be expected that this type of fire would be intense; destroying vegetation, ground cover and large organic debris within stream channels. A large intense fire within these drainages could cause peak flows to increase five to ten times above existing levels and sediment loads could increase up to 50 to

100 fold. On-site fishery habitat may be destroyed or severely reduced since a large fire could cause the stream to become devoid of cover, large organic debris, and aquatic food.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects. (Alternative 2)

Measurement Indicator 2 – Road density (miles per square mile) within the analysis subwatersheds.

Road densities are used as a risk assessment to assess direct and indirect effects of roads within the analysis subwatersheds. Hence, the mileage of roads per watershed in units of mile of road per square mile of land is an important tool for providing a risk rating of effects within RHCAs and SMZs and uplands. Roads and trails near streams are more likely to have an effect on stream function than those outside of RHCAs and SMZs (i.e. upland areas), due to their proximity to streams. Table 39 displays existing road densities and stream crossings within the analysis subwatersheds. Roads included in this analysis are system (County, and Forest-Service), and non-system (unclosed temporary access roads and undesignated OHV routes) roads.

Many of the analysis subwatersheds have an existing condition of moderate to high road densities and stream crossings. Road density in the analysis subwatersheds ranges from 1.9 to 5.3 miles of road per square mile of watershed area.

Table 39. Subwatershed Characteristics and Road Miles and Densities for Alternative 2.

Analysis subwatershed	Subwatershed Area (mi^2)	Miles of Stream by Type			Number of Road-Stream Crossings	Miles of Road	Road Density (mi/mi^2)
		Perennial	Intermittent	Ephemeral			
Light	1.2	0.6	1.6	4.7	21	6.4	5.3
Crystal	0.8	1.7	0.1	4.2	14	3.0	3.8
Coldwater	2.4	2.9	0.3	13.9	58	10.2	4.3
Turner	1.8	2.0	1.1	10.0	30	7.6	4.2
Red	1.1	1.2	1.2	5.7	15	3.4	3.1
Contact	0.6	1.0	0.9	3.5	10	1.4	2.3
Wilson	0.6	1.1	0.4	3.9	10	2.1	3.5
Marble	0.9	2.0	0.5	4.7	12	1.7	1.9
Pebble	0.7	1.1	0.1	3.4	8	1.3	1.9
Bagley	1.1	0.0	2.6	4.5	17	5.2	4.7
Ridge	1.3	2.4	1.2	8.0	14	4.4	3.4
Old House	3.5	3.1	4.6	12.9	53	13.7	3.9
Lightning	2.7	0.1	1.5	16.0	32	10.2	3.8
Big Grizzly	4.7	8.3	4.0	18.9	67	17.1	3.6
Vulture	1.2	0.0	2.5	3.1	12	3.6	3.0
Sullivan	1.2	0.1	1.2	5.5	23	4.7	3.9

Road-stream crossings range from 8 to 67 crossings per subwatershed. Road-stream crossings are of particular importance due to the fact that they often have a direct effect of contributing substantial amounts of sediment to stream channels (Gucinski et al. 2001) and potential sites for stream capture by the road. Flow capture by roads and trails that results in erosion of the road prism can result in indirect effects to stream channels in the form of excessive sedimentation. All crossings of perennial streams by unauthorized roads are assumed to be sources of sediment to streams. Crossings for unauthorized roads/routes are assumed to be unimproved fords, as they are not maintained to standards. On the other hand, Best Management Practices (BMPs) have been installed on a majority of roads and trails to reduce erosion and sedimentation at crossings and to prevent stream capture.

Under the No Action Alternative, the project activities to improve forest access and reduce transportation impacts would not occur. Direct and indirect impacts of high road densities and stream crossings would remain unchanged within the analysis subwatersheds.

Cumulative Watershed Effects Analysis – Water (Alternative 2)

Measurement Indicator 3–Equivalent Roaded Acres (ERA) values within analysis subwatersheds

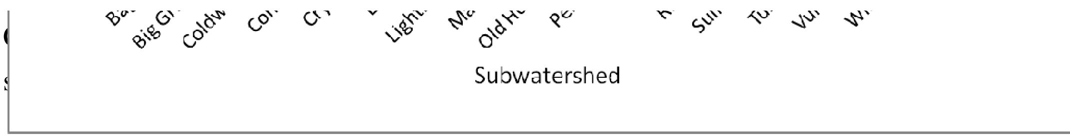

Figure 13 present a graphical representation of the major land uses that have contributed to the existing ERA values in each subwatershed. The ERA values vary across the subwatersheds due in part to road densities, past management activities, current livestock grazing, and current fuels management projects.

The Big Grizzly subwatershed has an upland ERA value that exceeds the determined TOC (12 percent ERA) and therefore is at a higher risk of generating offsite cumulative watershed effects. Factors leading to the high ERA value include past and current timber and fuels reduction activities, existing road densities, and livestock grazing within the subwatershed. It is important to note that nearly half of the upland ERA value is comprised of very recent or current DFPZ fuels reduction that have been or will be implemented under the Grizz and Freeman Projects, which were designed in part to reduce the likelihood of catastrophic wildfire. ERA totals that exceed the TOC indicate that natural watershed hydrology may be significantly altered, particularly with respect to alterations of surface runoff patterns and timing. Such alterations can result in scour and degradation of adjacent stream channels and/or increased hillslope erosion over natural rates with potential delivery of fine sediment to streams. However, based upon stream and soil surveys along with several site visits, many of the sensitive areas in the Big Grizzly subwatershed have not been impacted to degree that has been suggested by the ERA model.

ERA values for the sensitive areas of the Big Grizzly, Lightning, Old House, and Vulture, subwatersheds exceed the determined TOC (8 percent ERA) and therefore are at a higher risk of generating offsite cumulative watershed effects. Similar to the upland areas, the modeled ERA values are the result of timber harvests, fuels reduction projects, roads, and livestock grazing. However, the observed existing condition of stream channels and adjacent riparian buffers indicate that these subwatersheds have not been impacted to degree that has been suggested by the ERA model. Off-site cumulative watershed effects have not resulted in an impairment of the receiving water bodies or a failure of these waterbodies to provide their established beneficial uses.

Under the No Action Alternative, ERA values in the analysis subwatersheds would remain unchanged. Assuming that disturbances other than those listed in the *Present and Future Foreseeable Activities* section of this document do not occur, the modeled effects of past land disturbances would eventually return to pretreatment condition. Under this condition, the only ERA values that would be maintained would be the values from the roads and livestock grazing.

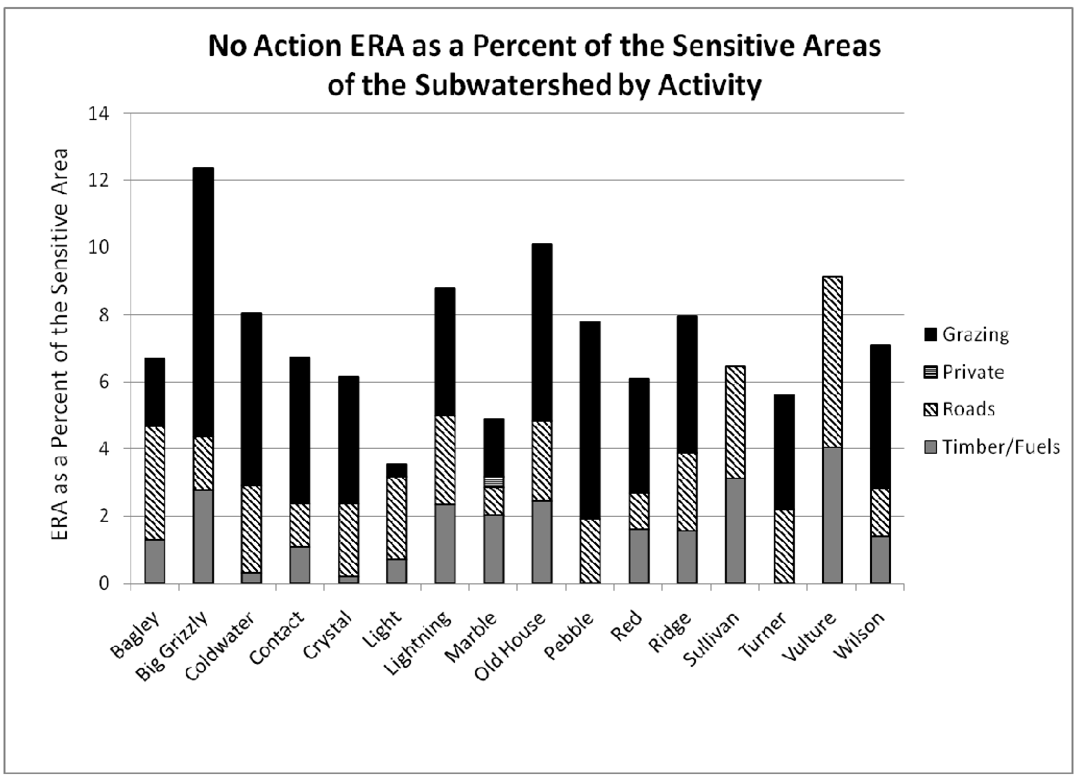

Figure 12. Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of the sensitive areas within each analysis subwatershed.

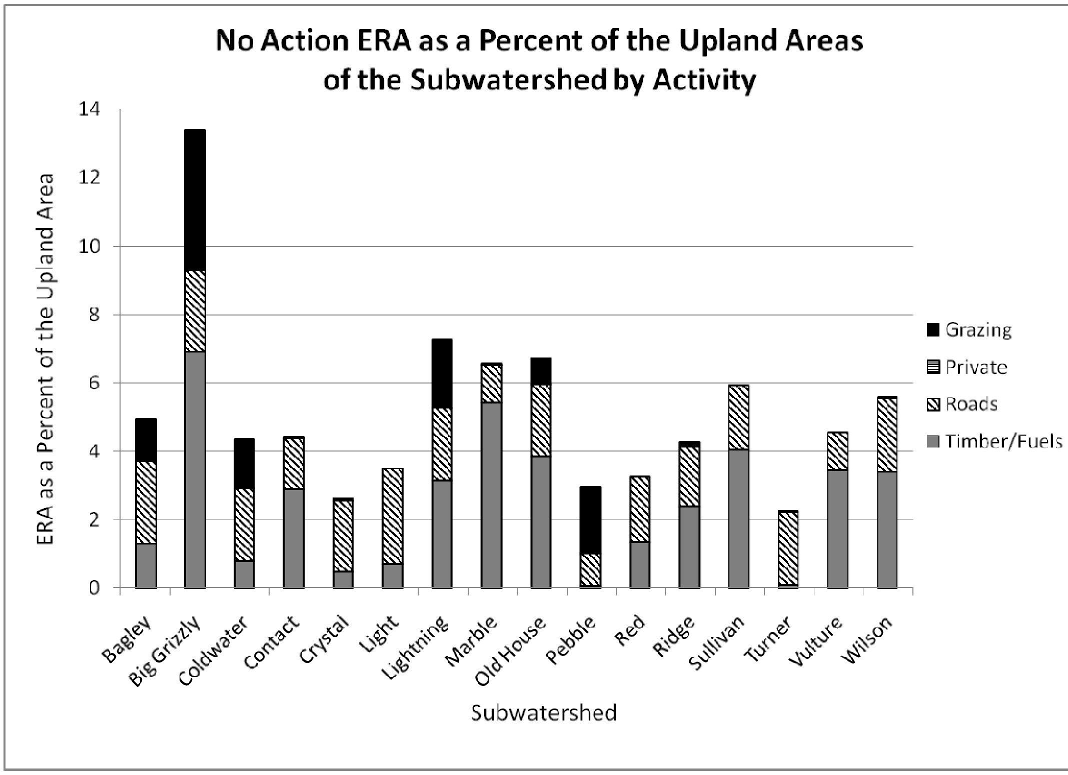

Figure 13. Alternative 2, the existing condition: Equivalent roaded acres (ERA), shown as a percent of the upland areas within each analysis subwatershed.

Soil Resource Indicators (Alternative 2)

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen and Cottonwood Treatments (Alternative 2)

Measurement Indicator 4 –Soil productivity (soil ground cover, fine organic matter and large woody material, soil porosity/compaction and soil buffing capacity) changes within DFPZ and Area Thin fuels reduction, Aspen and Cottonwood treatment units

Soil Cover

Under the No Action Alternative, soil cover will continue to increase as a result of needle cast and other material falling from trees. This accumulation of material was observed in units surveyed in 2010. The continued establishment of grass and shrub species will also provide additional soil cover. As a result of increased soil cover, the risk of soil erosion will decline on forested hillslopes. Soil cover dissipates the energy of falling raindrops through interception. Without soil cover, falling rain causes rain splash, a force that loosens soil and sets soil grains in motion. The litter layer acts as a sponge by increasing storage capacity and slowing the velocity of overland flow. At high velocities overland flow results in rain-wash, another erosive force. Without vegetative cover, an intense storm can generate huge quantities of sediment from hillsides (Cawley 1990). Reduced soil erosion helps retain soil nutrients and a favorable growth medium on site.

Organic Matter and Large Woody Debris

Surface organic matter and large woody debris (LWD) serve as a nutrient reservoir for plants and other organisms that inhabit the soil. As they are incorporated into the soil through decomposition, surface organic matter and LWD contribute positively to water-holding capacity, nutrient retention, infiltration, and hydrologic function of the soil. Surface organic matter acts as a buffer to moderate extremes of soil temperature.

Under the No Action Alternative, surface organic matter can be expected to increase as organic materials continue to accumulate. LWD amounts can also be expected to increase as trees fall to the forest floor in the coming years. An increase in organic matter and LWD would result in improvements to the water-holding capacity, nutrient retention, infiltration, and hydrologic function of the soil. However, the continued accumulation of organic matter and LWD on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Soil Porosity and Detrimental Compaction

Field assessments completed for soil compaction, skid trails, and landings were conducted on proposed mechanical treatment units. Compaction values ranged from 0 to 34 percent of the points surveyed in each unit, while skid trail and landing presence ranged from 0 to 22 percent of the points surveyed.

Under the No Action Alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals, would contribute to the increase in soil porosity and decrease in compaction. In addition, incorporation of organic matter into the soil by biological processes such as invertebrate and vertebrate soil mixing, and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

The No Action Alternative will maintain the existing condition of soil ground cover, organic matter, large woody debris, soil porosity, and detrimental compaction. Activities to improve soil productivity elements in areas that do not currently meet the desired conditions would not occur with this alternative.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects. (Alternative 2)

Measurement Indicator 5 –Miles of road maintenance, reconstruction, obliteration and temporary road construction within analysis subwatersheds.

Currently there are approximately 96 miles of roads throughout the analysis subwatersheds. Under this alternative, it is assumed that most roads within the analysis subwatersheds would continue to exist and be maintained at their current levels. Therefore, most roads would continue to exhibit denuded and highly compacted soil, thereby having direct and indirect effects to soil productivity throughout the analysis subwatersheds. However, some roads may become revegetated as limited use occurs on them, which may increase porosity and ground cover gradually over time as the road naturally recovers. Restoration and improvement of road conditions would not occur. However, short-term detrimental soil productivity effects associated with temporary road construction also would not occur with this alternative.

Cumulative Watershed Effects Analysis – Soils (Alternative 2)

Soil Cover

Under the No Action Alternative, it is assumed that soil productivity elements would continue to improve. Ground cover can be expected to increase as organic materials accumulate on the soil surface. However, given the amount of standing surface and ladder fuels in some of the units surveyed within the analysis area, there is a high potential for recruitment of hazardous levels of fuels. The current fuel conditions within the Ingalls project consist of moderate to high amounts of surface, ladder and canopy fuels. This accumulation of fuels could result in a high severity wildfire within the analysis area, which in turn would likely consume organic materials on the forest floor and reduce soil cover in the affected area. If soil cover were reduced to bare soil over a widespread, contiguous area following a wildfire, the soil would be much more susceptible to erosion.

In addition, fire can volatilize organic compounds in the soil, some of which migrate down a temperature gradient and condense on soil particles below the surface (DeBano 1990). As a result, hydrophobicity (a non-wettable layer) can develop below the surface. This repellant layer can greatly reduce infiltration rates. During a precipitation event, soil above the non-wettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Factors such as soil texture, slope, and post-burn precipitation intensity will affect the degree and type of post-fire erosion. Dry, coarse grained soils are particularly susceptible to this type of fire-induced hydrophobic condition (Clark 1994).

Organic Matter and Large Woody Debris

Under the No Action Alternative, surface organic matter can be expected to increase as organic materials continue to accumulate. However, a future wildfire could consume organic horizons on the forest floor, creating a non-wettable layer, as described above. Immediately following a high-intensity wildfire, organic matter levels would be reduced significantly due to consumption of finer materials on the forest floor. However, depending on the fire intensity, within several months a thin layer of needlecast from scorched trees would increase cover of organic matter (Pannkuk and Robichaud 2003). Fires short-circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. When organic matter burns, essential nutrients can be transferred to the atmosphere through volatilization and ash convection (Raison 1985). Nutrients may also be lost following fire due to leaching (Boerner 1982). Some nutrients are returned relatively quickly by terrestrial cycling pathways. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et. al. 1999). Such changes in the soil temperature regime would affect rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

Soil Porosity and Detrimental Compaction

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline and soil porosity is expected to increase. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity (Clark 1994).

Alternative 1 – Proposed Action (Water Resource Indicators)

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen and Cottonwood Treatments

Measurement Indicator 1 – Acres of DFPZ andArea Thin Fuels Reduction, aspen and cottonwood treatments within sensitive (i.e. RHCAs and SMZs) and upland areas.

Under Alternative 1, mechanical equipment entry will be allowed into the outer edges of the RHCAs and SMZs based upon design features and SOPs (Ingalls Project EA, Appendix B) stated in the Ingalls project EA. Limited mechanical treatment will occur in the outer portion of the RHCAs where slopes are less than 25 percent. The canopy cover in RHCAs will be greater than 40 percent. This would prevent effects to stream temperatures by allowing stream shading and maintaining moister microclimates for fish and macroinvertebrates. Aspen and cottonwood stand treatment will follow applicable design features (Ingalls Project EA, Table 6) and SOPs (Ingalls Project EA, Appendix B) for treatment in RHCAs and are authorized by the RMO objectives.

Direct effects of mechanical treatment, pile burning, and underburning within sensitive and upland areas may include disturbance and displacement of soils, removal or consumption (underburning) of soil ground cover, and reduction in porosity and increase in soil compaction within these areas. These disturbances may lead to direct effects on water quality in the stream channels adjacent to the units. This could result in indirect effects to downstream beneficial uses through water temperature increases and sedimentation.

Direct effects of stream channel restoration work within Unit 003, an aspen/cottonwood treatment unit, would include stabilization of eroding steam banks, treatment of headcuts, and revegetation of streambanks. Indirect effects would include improvement in water quality due to reduced stream channel sedimentation and in improvement in riparian forest growing conditions.

The Forest Service water quality protection program relies on implementation of prescribed best management practices (BMPs). BMPs are monitored and tested for implementation and effectiveness to assess for potential direct and indirect effects from management activities. Those

BMPs tested have been shown to effectively meet practice objectives when properly implemented. There is a strong correlation between implementation of BMPs and measures of effectiveness (ground cover, lack of sediment delivery to channels, etc.) (USDA Forest Service 2009).

Additionally, the Plumas National Forest Annual Report for the Best Management Practices Evaluation Program (USDA Forest Service 2009) found that of the 81 evaluations conducted on the Plumas, only 3 rated a “fail” for BMP implementation, resulting in a BMP implementation rate of 96.3% (USDA Forest Service 2009). For the 51 evaluations of BMPs typically associated with timber and fuel management activities (T01, T02, T04, E08, E09, E11, and F25) in 2009, the implementation rate is 98% and the effectiveness rate is 96%. It is expected that by following the appropriate best management practices and project design features and SOPs there will be no detrimental direct or indirect effects from implementation of proposed activities associated with this alternative.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects.

Measurement Indicator 2 – Road density (miles per square mile) in the analysis subwatersheds.

The Proposed Action includes 14 miles of maintenance and reconstruction and 4.8 miles of obliteration of Forest System and Non-System Roads within the analysis subwatersheds. Road maintenance may consist of brushing, blading the road surface, and/or improving drainage. Road reconstruction would include installation of new drainage features to disperse runoff and correct several identified sources of road-generated sediment. Reconstruction would also improve several stream crossings and reduce the risk of erosion of the road prism during large flood events. Obliteration would involve one or more of the following: excavation of the road prism and placement of fill to restore the natural hillslope contour; subsoiling of the road surface restore hydrologic function and facilitate vegetative re-growth; and/or abandonment (if the road has become completely over grown with vegetation). Obliteration would also involve removing drainage structures, restoring vegetative cover, blocking access or some combination of these treatments. Under Alternative 1, road densities would be reduced by an average of 20 percent in the four analysis subwatersheds where road obliteration has been proposed (Light, Pebble, Ridge, and Sullivan subwatersheds). Road densities would remain unchanged in the remaining 12 analysis subwatersheds (Table 40).

Overall reduction in road-generated sediment through the obliteration of roads within the analyzed subwatersheds would be substantial in the long-term.

Road maintenance, reconstruction, and obliteration related to this alternative are expected to have a direct effect on the improvement and protection of water quality and adjacent riparian vegetation along Red Clover Creek, Lake Davis, and other unnamed drainages throughout the analysis subwatersheds along with having positive indirect effects on downstream water quality and beneficial uses. In addition, based upon the type and location of road treatments proposed in Alternative 1 and implementation of BMPs, any resultant sedimentation is expected to be minimal.

Table 40. Subwatershed Road Miles and Densities for Alternative 1.

Analysis subwatershed	Miles of Road	Road Density (mi/mi²)		Analysis subwatershed	Miles of Road	Road Density (mi/mi²)
Light	6.1	5.1		Pebble	1.1	1.6
Crystal	3.0	3.8		Bagley	5.2	4.7
Coldwater	10.2	4.3		Ridge	3.5	2.7
Turner	7.6	4.2		Old House	13.7	3.9
Red	3.4	3.1		Lightning	10.2	3.8
Contact	1.4	2.3		Big Grizzly	17.1	3.6
Wilson	2.1	3.5		Vulture	3.6	3.0
Marble	1.7	1.9		Sullivan	2.9	2.4

Cumulative Watershed Effects Analysis – Water (Alternative 1)

Measurement Indicator 3 – Equivalent Roaded Acres (ERA) values within analysis subwatersheds

Under Alternative 1, ERA values range from 5.2 to 13.5 percent of the sensitive areas and 2.8 to 14.5 percent of the upland areas in each subwatershed (Figure 14 & Figure 15).

Increases in ERA values from the Proposed Action, in the sensitive areas, range from 0.1 percent to 5.8 percent and less than 0.1 percent to 7.0 percent for upland areas in the analysis subwatersheds. Although most subwatersheds are below the upland TOC, the ERA total for the Big Grizzly subwatershed exceeds the determined upland TOC by 2.5 percent. In sensitive areas, the ERA values for the Light, Marble, Pebble, Red, Sullivan, and Turner are below the TOC. ERA values in the remaining 10 subwatershed exceed the established TOC value for sensitive areas by 0.5 to 5.5 percent.

ERA values would be increased as a result of the Proposed Action's mechanical treatments and underburning on acres within the analysis subwatersheds. Detrimental effects that may potentially result from increases in ERA include fluvial erosion from treated hillsides and compacted surfaces, resulting in delivery of fine sediment to adjacent stream channel buffer zones, which vary in width and are determined through analysis of streamflow regime, observed channel characteristics, and the presence or absence of fisheries.

The Big Grizzly subwatershed has an upland ERA value that exceeds the determined TOC (12 percent ERA) and therefore is at a higher risk of generating offsite cumulative watershed effects. Factors leading to the modeled increase in ERA include past and current timber and fuels reduction activities, existing road densities, and livestock grazing within the subwatershed. It is important to note that nearly half of the upland ERA value is comprised of very recent or current DFPZ fuels reduction that have been or will be implemented under the Grizz and Freeman Projects, which were designed in part to reduce the likelihood of catastrophic wildfire. ERA totals that exceed the TOC indicate that natural watershed hydrology may be significantly altered, particularly with respect to alterations of surface runoff patterns and timing. Such alterations can result in scour and degradation of adjacent stream channels and/or increased hillslope erosion over natural rates with potential delivery of fine sediment to streams. However, based upon stream and soil surveys along with several site visits, many of the sensitive areas in the Big Grizzly subwatershed have not been impacted to degree that has been indicated by the ERA model. Although the upland ERA value for the Big Grizzly subwatershed is above the TOC, project BMPs and design features for streamside areas, including slope restrictions and equipment exclusion zones, would assure that significant effects to water quality would not occur and downstream beneficial uses would not be impacted.

In addition, the Bagley, Lightning, Marble, Old House, and Wilson subwatersheds have high upland ERA values that are approaching, but do not exceed the TOC. Upland ERA values in these subwatersheds are greater than eight percent of the subwatershed area. However, as with the Big Grizzly subwatershed, the observed existing condition of stream channels and adjacent riparian buffers, along with implementation of project BMPs and design features, assure that significant impacts to water quality and beneficial uses would not occur in these subwatersheds. Adverse cumulative watershed effects due to implementation of the Proposed Action are not expected for any of the analysis subwatersheds.

ERA values for the sensitive areas of the Bagley, Big Grizzly, Coldwater, Contact, Crystal, Lightning, Old House, Ridge, Vulture, and Wilson subwatersheds exceed the determined TOC (eight percent ERA) and therefore are at a higher risk of generating offsite cumulative watershed effects. Similar to the upland areas, the modeled ERA values are the result of timber harvests, fuels reduction projects, roads, and livestock grazing. However, the observed existing condition of stream channels and adjacent riparian buffers, along with implementation of project BMPs and design features, assure that significant impacts to water quality and beneficial uses would not occur in these subwatersheds as a result of Alternative 1. Field surveys of the watersheds and associated stream systems that are above or near the TOC were conducted to verify stream channel and hillslope conditions and properly select project design elements that would reduce the risk of detrimental effects to the soil and water resources. No adjustment in ERA values was incorporated in the model analysis to account for project BMPs or design features. Additionally, it is important to mention that the equipment exclusion zones for RHCAs and SMZs were not removed from the total treatment acreage proposed in action alternatives. Therefore, ERA values for sensitive areas are conservative estimates within the analysis subwatersheds.

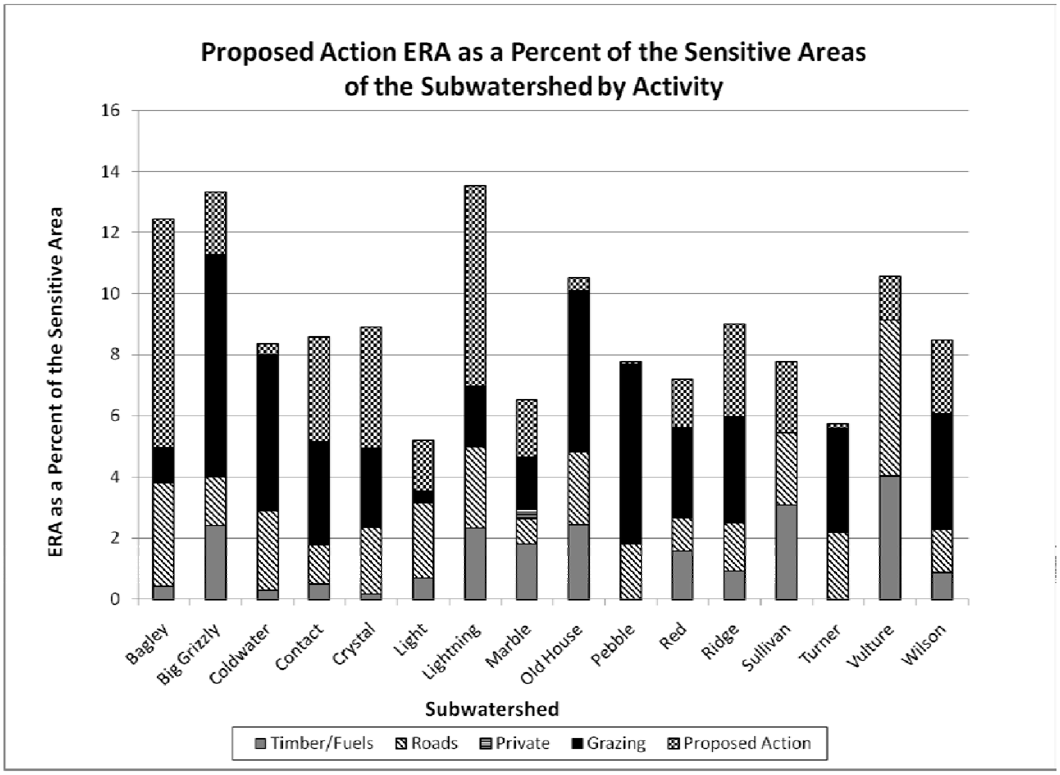

Figure 14. Alternative 1, the Proposed Action (PA): Equivalent roaded acres (ERA), shown as a percent of the sensitive area of each analysis subwatershed, broken down by land use.

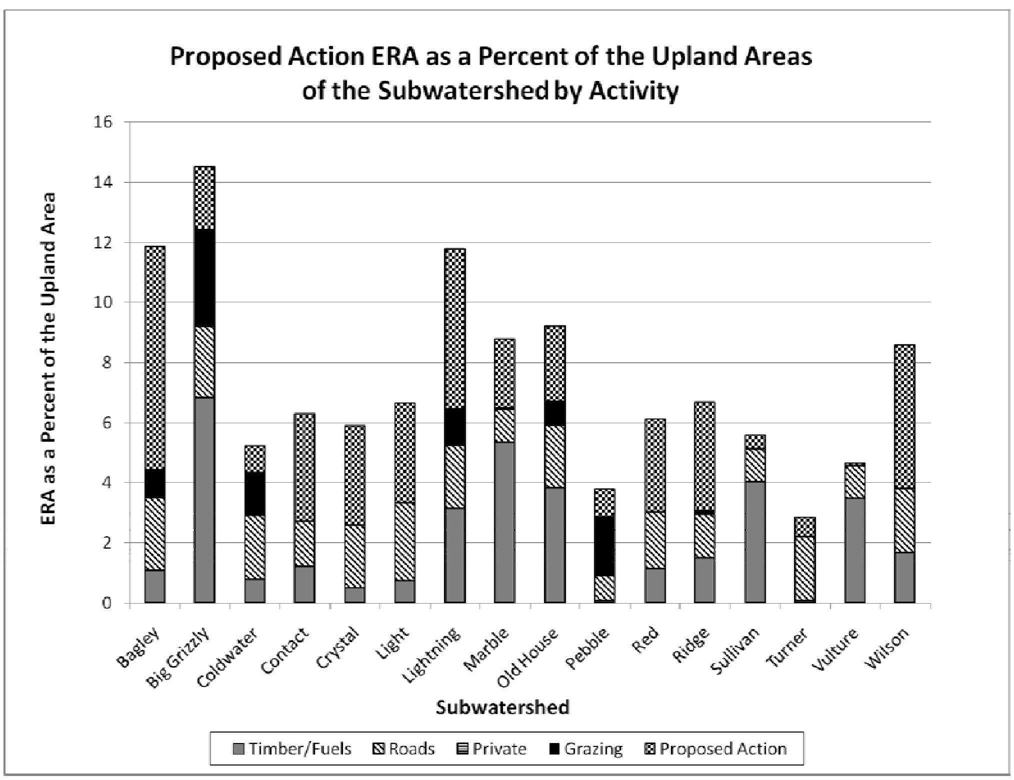

Figure 15. Alternative 1, the Proposed Action (PA): Equivalent roaded acres (ERA), shown as a percent of

the upland area of each analysis subwatershed, broken down by land use.

Alternative 1 – Proposed Action (Soil Resource Indicators)

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen and Cottonwood Treatments

Measurement Indicator 4 –Soil productivity (soil ground cover, fine organic matter and large woody material, soil porosity/compaction and soil buffing capacity) changes within DFPZ and Area Thin fuels reduction, Aspen and Cottonwood treatment units

By following the design features and Standard Operating Procedures outlined in the Ingalls Project EA and this report, any direct or indirect effects to soil condition under implementation of Alternative 1 would not be of a size or pattern that would result in a significant change in production potential for the project area. All standards and guidelines for soil productivity presented in the PNF LRMP and the SNFPA ROD would be met under the implementation of Alternative 1, as discussed below.

Sufficient soil cover is necessary to prevent soil erosion rates from exceeding the rate of soil formation. The stated long-term average rate of forest soil formation is approximately one ton of soil per acre per year (one ton per acre is equivalent to the thickness of two sheets of paper). It is not expected that hillside erosion over any given treatment area would exceed one ton per acre per year, however, on a site specific basis this erosion rate may be exceeded on individual landings, roads or skid trails.

As summarized in the 2007 HFQLG Soil Monitoring Report (Westmoreland 2008), Westmoreland and others conducted pre and post-harvest soil monitoring data collection and statistical analysis on the Lassen, Plumas and Sierraville District of the Tahoe National Forests between 2001 and 2007 as part of the HFQLG Forest Recovery Act monitoring program. To assess for existing conditions, planned treatment units were sampled pre-treatment from 2001 to 2004, post-treatment monitoring occurred on these units from 2004 to 2007. As a result, 52 units (39 thinning units, 11 group selection units and 2 mastication units) were analyzed for soil ground cover, large woody debris and soil compaction (loss of porosity) as they relate to standard and guidelines. Soil monitoring results are described below in their appropriate section.

Soil Cover

Operation of mechanical equipment within the proposed mechanical treatment units would result in a disturbance and possible loss of the existing ground cover. However, it is difficult to accurately predict treatment effects on effective ground cover. Harvest operations may increase activity fuels and effective ground cover, while pile burning and underburning reduces the cover of these materials. Mastication would increase soil cover as materials are broadcast away from the machine. The direct effects of increasing soil ground cover on-site ameliorates the potential for soil displacement and increases in overland flow that may influence indirect effects to off-site soil cover.

Skid trails and burn piles are other ways ground cover is reduced. However, there is a less of a concern over erosion associated with concentrated overland flow with burn piles because even though they lack ground cover vegetation, they are islands contained within surrounding vegetation. Burn pile estimates range from 5 to 10 per acre and 10 to 20 feet in diameter; based upon these estimates, burn piles would occupy roughly 1%-7% of a treated area. Ground cover lost from burn piles is in the form of dispersed islands where sediment transport would likely be trapped by the surrounding vegetation and is not of the same concern as larger barren strips created from skid trails.

In accordance with PNF LRMP and the Regulatory Environment section of this document, project standards for effective ground cover will determined by soil erosion hazards ratings. The 16 units with low EHRs will have a standard of 40% effective ground cover. The 33 units with a moderate EHR will have a standard of 50% effective ground cover. The remaining 8 units with a high EHR will have a standard of 60% effective ground cover. Survey data indicates that existing soil cover amply exceeds the 40% - 60% standard. For the 77 sets of pre- and post-treatment survey data that is available from the HFQLG soil monitoring program, large differences in post-treatment ground cover are apparent between different treatment types (Young 2010). The 51 thinning units averaged 80% soil cover post-project, while the 24 group selection units averaged 60% soil cover post-project.

Statistical analysis of the 52 thinning and group selection data sets available in 2007 determined statistically significant ($P < 0.05$) differences between pre- and post-project soil cover condition. For the 39 thinned units, the 95% confidence level described a post-project reduction in the areal extent of soil cover ranging from 9% to 15%. Average existing effective cover for the surveyed thinning units, including the aspen and cottonwood units, in Alternative 1 is 94%. Since existing effective cover exceeds 78% for all sampled units, even the higher end of the 95% confidence range for decrease in soil cover (a 15% decrease) is expected to leave the units with sufficient cover to meet the project standard of 40-60% post implementation ground cover standard. Standard Operating Procedures (Appendix B of the EA) assure compliance with the ground cover standard by incorporating mitigation methods that would leave slash and chip material on-site in units with deficient post-harvest soil cover.

For the 11 group selection units, the 2007 HFQLG soil monitoring data indicated a statistically significant and more dramatic reduction in post-project ground cover. For group selection units, the average decrease in the areal extent of effective soil cover was 48%, with a 95% confidence interval ranging from -36% to -62% (Westmoreland 2008). Average existing effective cover for the surveyed group selection units in Alternative 1 is 94%. As with the thinning units, the SOPs (Appendix B of the EA) would assure compliance with the 60% ground cover standard. Furthermore, a 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to bring Forests into compliance with soil standards (USDA Forest Service 2008). These techniques would result in a decrease for soil cover in group selection units that is much less substantial than the 48% decrease (on average) observed in the 2007 HFQLG monitoring report.

For the 2 mastication units, the 2007 HFQLG soil monitoring data indicated that because the pre-treatment conditions of the two mastication units were drastically different, the average values are not very meaningful (Westmoreland 2007). As previously mentioned, it is expected that mastication would increase soil cover as materials are broadcast away from the machine. The direct effects of increasing soil ground cover on-site ameliorates the potential for soil displacement and increases in overland flow that may influence indirect effects to off-site soil cover.

After the initial reduction in effective soil cover due to mechanical treatments, ground cover would increase substantially over the next 2 years due to needle cast and natural re-vegetation of the treated units. A significant reduction in soil cover would increase the risk of surface soil erosion temporarily in affected areas. While the average areal extent of effective soil cover for a unit is a good measure for analyzing soil productivity effects, actual soil erosion would be highly dependent upon the size and distribution of bare areas as well as site specific factors such as soil erodibility, slope magnitude, topographic variations that limit slope length, and configuration of the unit. The effect of short term reductions in soil cover for Alternative 1 would generally be inconsequential to soil erosion and productivity because contiguous bare areas would be isolated, relatively small, and well dispersed across the treated unit. Concentrated and contiguous removal of soil cover is most likely to occur in areas such as landings, skid trails, and temporary roads. For these features, soil erosion would be controlled by implementation of BMPs and SOPs, measures that include installation of waterbars and crossdrains and placement of post-logging slash on skid trails.

Organic Matter and Large Woody Debris

It is expected that from the actions of this alternative, organic matter would be directly affected by the removal of trees and treatment of slash material. Accurate prediction of treatment effects on surface fine organic matter is difficult but trends would likely be consistent with those observed for effective soil cover in the 2007 HFQLG soil monitoring report (described above). Operation of equipment within the harvest units is expected to displace existing organic matter and disturb shrubs and grasses. Mastication treatment units are expected to have an increase in organic matter as masticated debris is broadcasted away from the machine. The post-treatment depth and distribution of the organic layer depends on the slash treatment method selected to attain the ground cover and fuel loading design elements of the project.

Under this alternative, organic matter and soil nutrients may be affected by this project though soil displacement via road and landing construction, prescribed burns, burn piles, and removal of vegetative material from the site. Therefore it is imperative that the effects from the proposed activities be mitigated through the SOP retention requirements.

This alternative has the most acres proposed for pile burning and underburning of the action alternatives. Underburn treatments may reduce organic matter, but burning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers.

Pile burning would decrease surface fine organic matter locally, but over time adjacent trees and shrubs would provide litter to cover the burned area. Fireline construction around prescribed burn areas and piles would create bare soil conditions. Over time, adjacent trees and shrubs would provide organic cover and levels of fine organic matter are expected to trend toward the existing condition. Soil cover mitigations required by project SOPs will also increase levels of fine surface organic matter and post-project levels are expected to be near or exceed 50%, particularly in the longer term (more than 2 years after treatment). In the short term, the extent and pattern of reductions in fine organic matter associated with Alternative 1 would not result in a significant change in production potential for the treated units. When available, organic matter will be redistributed over skid trails, landings, and roads that are proposed for obliteration.

Large woody material monitoring results from the 2007 HFQLG Soil Monitoring report stated that large woody material decreased from levels observed during pre-treatment monitoring. Only 62% of the thinning units and 18% of group selection units met the recommended guideline of 3 large down logs per acre under the post-project condition, whereas 85% of the thinning units and 73% of the group selection units met the guideline under the pre-project condition. Large down woody material was reduced more within group select units with only 2 out of the 11 units meeting the guideline, 3 of the 11 units having no logs pre-treatment, and 6 of the 11 units not meeting the guideline. In terms of the 40 thinning units monitored, 6 units had no logs in the pre-treatment, 8 units were reduced from meeting the guideline to not meeting it, and 25 units meeting the guideline pre- and post-treatment.

Based upon field observation while conducting soil surveys for the Ingalls Project, it appears that many of the units had very similar large woody material findings within proposed treatment units as found in the aforementioned pre-treatment monitoring results. If Alternative 1 were to result in large down woody material reductions similar to the 23.1% reduction within thinning treatment units and 54.5% reduction within group selection, many of the units would be at risk of not meeting this project’s large woody material standard of 10-15 tons per acre. However, the 2008 letter from the three Supervisors of the HFQLG Forests described above in the soil cover section also presented management techniques to bring Forests into compliance with soil standards (USDA Forest Service 2008). Those techniques, along with other standard operating procedures such as leaving down woody material on site or leaving cull logs at the stump rather than skidding them to the landing in areas deficient in large woody debris would ensure that the project standard for large woody material would be met.

It is not expected that the decreases in fine organic matter and LWD as a result of this alternative would result in detrimental direct or indirect effects to the water-holding capacity, nutrient retention, infiltration, and hydrologic function of the soil. This is based upon the proper implementation of project BMPs, design features, and SOPs.

Soil Porosity and Detrimental Compaction

Soil porosity is the volume of voids compared to solids for a given volume of soil. The porosity of the soil is important for gas exchange and water movement into and through the soil. Ground based management activities can potentially reduce porosity by compacting the soil. The degree of detrimental soil compaction varies with soil texture, soil moisture content at the time the activity takes place, the weight and ground pressure of the equipment used, and whether woody material remains in place to cushion the weight of equipment. Increases in the areal extent of detrimentally compacted ground are expected for treated units due to equipment traffic and the need for new skid trails, landings, and temporary roads.

Proposed treatment units are susceptible to detrimental compaction when the soil moisture content is near field capacity. Sandy soils and soils with high rock content are less susceptible to detrimental compaction. There is a high risk for detrimental compaction to occur in proposed treatment units with high clay content if operations occur when the soils have a moisture content that is near field capacity. To control the risk of detrimental compaction, SOPs for soil protection in Appendix B of the EA require that heavy equipment treatment operations occur only when the upper 8" of the soil profile is essentially dry. Additional Standard Operating Procedures for the Ingalls project state that based upon soil type, existing landings and skid trails used by the project and newly created skid trails with compacted soil, will be subsoiled using a wingtip subsoiling implement in accordance with the recommendations.

The use of heavy equipment and recurring stand entries increases the potential for a reduction of soil porosity and increase of soil compaction. The degree of soil compaction varies with soil texture and moisture content, while plant responses to compaction depend strongly on changes in the soil water regime (Gomez et al. 2002). Ongoing research has focused on the effects of soil compaction to long term soil productivity. Powers et al (2005) recently published the ten-year results of the Long Term Soil Productivity (LTSP) study, a study initiated in 1989 and comprised of more than 60 sites, including sites in the Sierra Nevada. The study focuses on two soil condition indicators readily affected by management activities, soil compaction and surface organic matter. The national ten-year results indicate that soil compaction effects on total biomass productivity (all vegetation within a site, not just tree growth) differs depending upon soil texture, along with other factors such as initial bulk density, rock content, and climate.

Soil porosity/compaction monitoring results reported in the 2007 HFQLG Soil Monitoring report stated that a review of monitoring data indicates that legacy compaction is commonplace. Most of the detrimental compaction observed post-project also existed pre-project (Young 2010). Statistical analysis for 40 thinned units and 11 group selection units determined that the mean post-project areal extent of detrimental compaction as not statistically different from the pre-project mean. Confidence intervals indicated broad ranges that suggested both a trend toward increasing the extent of detrimental compaction and a trend toward decreasing extent.

The existing areal extent of detrimentally compacted soil for proposed treatment units varies widely, from 0% to 34%. For units that indicate widespread compaction under the existing condition, subsoiling SOPs for Alternative 1 would likely result in a decrease in the extent of detrimentally compacted soil. For any mechanical harvest, the extent and degree of compaction depends on site-specific soil conditions such as texture and rock fragment content, moisture content at the time of operations, and harvest equipment features. The soil texture classes within the units proposed for mechanical treatment are generally sandy to loamy, resulting in compaction potentials that range from slight to moderate. The Ingalls project SOP for wet weather operations will minimize soil compaction in the mechanical treatment units. By following the SOPs and utilizing existing skid trails where feasible, direct and indirect effects associated with detrimental compaction due to project activities are not expected to be of a size or pattern that would result in a significant change to soil production potential.

In addition to skid trails and landings, 8.4 miles of temporary roads would have to be constructed to provide access to the landings from system roads. Depending on soil type, construction and use of these features can compact soils and decrease soil porosity. In order to mitigate these effects, the Standard Operating Procedures (SOPs) for this project state that existing landings and skid trails used by the project and newly created skid trails, landings, and temporary roads with compacted soil would be subsoiled using a wingtip subsoiling implement where specified by the District's physical scientist. In addition, the obliteration of 4.8 miles of roads under this alternative would alleviate some of the compaction effects.

Soil Buffering Capacity and Borax Effects

Pile burning and underburning may cause short-term alterations to soil pH and nutrient cycling at a relatively small scale (Raison 1985). Based upon the location, areal extent, and degree of pile burning and underburning of the two action alternatives, it is not expected that there will be a detrimental effect to soil buffering capacities within the analysis subwatersheds. In addition, Borax (common name borax; chemical name sodium tetraborate decahdrate) is not expected to change soil buffering capacity. Borax is generally active in the soil. Boron from Borax is absorbed by the mineral portion of the soil and is absorbed from the soil by plants. Boron is an essential plant nutrient which naturally occurs in the soil at concentrations of 5 to 150 parts per million. Borax remains unchanged in the soil for varying lengths of time, depending on soil acidity and rainfall. The average persistence is one or more years. Borax is less persistent in acid soils and in areas with high rainfall. Soils in the project area are mostly slightly acidic, with pH values ranging from 6.0-7.0. Soil microorganisms do not break down Borax. Borax is partially soluble in water, and the potential for leaching into ground water or surface water contamination is low (Information Ventures Inc. 1995). All action alternatives will treat an average of 0.9 pounds of borax per acre within the project treatment units. Soil buffering capacity and Borax direct and indirect effects are expected to remain largely unchanged by all action alternatives therefore will not be discussed under Alternative 3.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects.

Measurement Indicator 5 –Miles of road maintenance, reconstruction, obliteration and

temporary road construction within analysis subwatersheds.

Under Alternative 1, there are approximately 96 miles of roads throughout the analysis subwatersheds. As a result of the road obliteration proposed with this alternative, there will be a reduction of approximately 5 miles of roads within the analysis subwatersheds. As previously mentioned, it is assumed that most roads within the analysis subwatersheds would continue to exist and be maintained at their current levels. Four of the analysis subwatersheds would receive some form of road obliteration with this alternative, thereby having a positive direct and indirect effect on soil productivity and hydrologic function within these subwatersheds. Detrimental soil effects associated with temporary road construction would occur with this alternative. However, these effects are expected to be limited to direct effects only as all applicable BMPs will be followed in constructing roads as part of this alternative. Indirect effects will continue to be monitored with the BMP implementation and effectiveness evaluations as discussed in the 2010 Plumas National Forest Annual Report for the Best Management Practices Evaluation Program.

Cumulative Watershed Effects Analysis – Soils (Alternative 1)

Soil Cover

A reduction in ground cover is likely to be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. A high-intensity wildfire entering an area proposed for treatment would result in a much greater reduction in ground cover than the proposed treatments alone. The fuel reduction treatments proposed under Alternative 1 would reduce the likelihood of that type of future high-intensity wildfire. It is unlikely that implementation of Alternative 1 would add any negative cumulative effects on soil cover.

Organic Matter and Large Woody Debris

Following the proposed treatments, organic matter on the soil surface would decrease in some areas, due to mechanical displacement, while organic matter would increase in other areas due to additions of treated slash material and implementation of the LWD retention standard. This may result in greater heterogeneity of the forest floor. Patches of organic matter would provide habitat for soil invertebrates and microorganisms. Patches of bare areas would be susceptible to local erosion. Increases in woody materials on the forest floor due to lop and scatter or mastication treatments may cause short term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift 1977).

It is not expected that the decreases in fine organic matter and LWD as a result of this alternative would result in detrimental cumulative effects to the water-holding capacity, nutrient retention, infiltration, and hydrologic function of the soil. This is based upon the proper implementation of project BMPs, design features, and SOPs.

Soil Porosity and Detrimental Compaction

Depending on soil type, construction and use of skid trails and landings can compact soils and decrease soil porosity. In order to mitigate these effects, the Standard Operating Procedures (SOPs) for this project (Ingalls project EA, Appendix B) state that existing landings and skid trails used by the project and newly created skid trails, landings, and temporary roads with compacted soil would be subsoiled using a wingtip subsoiling implement where specified by the District's physical scientist. It is important to note that the SOP requirements for subsoiling were established from recommendations made by the Regional Soil Scientist as a result of a field review of subsoiling that was conducted June 12-14, 2006 on the Plumas and Tahoe National Forest by personnel from each forest (USDA Forest Service 2006). In addition, the obliteration of 4.8 miles of roads under this alternative would ameliorate some of the compaction effects.

Cumulative effects related to soil porosity and detrimental compaction as a result from actions associated with this alternative will be mitigated through subsoiling of compacted soils along with the implementation of other soil protection measures and mitigations.

Alternative 3 – Non-Commercial Funding Alternative (Water Resource Indicators)

Alternative 3 differs from Alternative 1 through changes made in the prescriptions for units and

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen and Cottonwood Treatments

Measurement Indicator 1 – Acres of DFPZ and Area Thin fuels reduction, aspen and cottonwood treatments within sensitive (i.e. RHCAs and SMZs) and upland areas.

The total treatment area proposed for this alternative is approximately 2,630 acres, which is 694 acres less treatment than Alternative 1. Mechanical treatments under Alternative 3 would be reduced by 161 acres in sensitive areas and 533 acres in upland acres when compared Alternative 1. Hand thin and underburn acreages would remain unchanged when compared to Alternative 1.

Any differences in effects to water quality from those discussed for Alternative 1 as a result of these differences in proposed treatments would be slight and localized. By following the appropriate best management practices, project design features and SOPs there will be no detrimental direct or indirect effects from implementation of proposed activities associated with this alternative. Alternative 3 does not provide the beneficial indirect effects to water quality that would result from the stream channel stabilization work within unit 003.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects.

Measurement Indicator 2 – Road density (miles per square mile) within the analysis subwatersheds.

Alternative 3 includes 13.3 miles of maintenance and reconstruction and does not include road obliteration work or new construction. As a result of this, road densities, road stream crossings, and elimination of routes causing resource damage will not change when compared to the previously discussed Alternative 2.

Cumulative Watershed Effects Analysis (Alternative 3)

Measurement Indicator 3 – Equivalent Roaded Acres (ERA) values within analysis subwatersheds .

Under Alternative 3, ERA values for the analysis subwatersheds range from 3.5 to 13.2 percent of the sensitive areas and 2.6 to 13.9 percent of the upland areas in each subwatershed (Figure 16 and Figure 17). ERA increases from the No Action Alternative range from 0 to 6.3 percent of the upland area and 0 to 4.4 percent of the sensitive areas in the analysis subwatersheds. Although most subwatersheds are below the upland TOC, the ERA total for the Big Grizzly subwatershed exceeds the determined upland TOC by 1.9 percent. In sensitive areas, ERA values exceed the sensitive TOC in the Bagley, Big Grizzly, Lightning, Old House, Ridge, Sullivan, and Vulture subwatersheds by 0.1 to 5.2 percent.

In addition, the Bagley, Lightning, and Old House subwatersheds have high upland ERA values that are approaching, but do not exceed the TOC. Upland ERA values in these subwatersheds are greater than eight percent of the subwatershed area. ERA values for the sensitive areas of the Contact, Crystal, Marble, Pebble, Red, Coldwater, and Wilson subwatersheds are also high, but do not exceed the TOC. ERA values for the sensitive areas in these subwatersheds are greater than 6 percent.

For Alternative 3, these differences in ERA values do not result in a substantial change from the risk of cumulative watershed effects that was presented for Alternative 1. Field surveys of the watersheds and associated stream systems that are above or near the TOC were conducted to verify stream channel and hillslope conditions and properly select project design elements that would reduce the risk of detrimental effects to the soil and water resources. Implementation of project BMPs and design features, along with the observed existing condition of stream channels and adjacent riparian buffers, assure that significant impacts to water quality and beneficial uses would not occur in these subwatersheds as a result of Alternative 3.

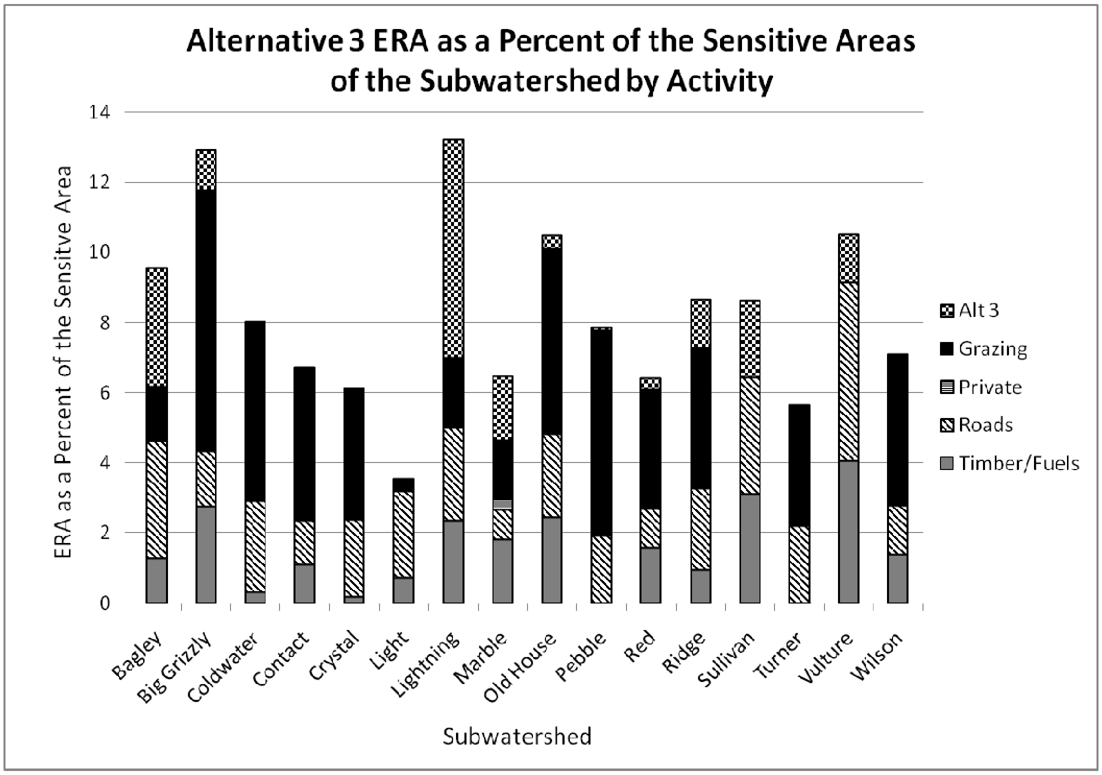

Figure 16. Alternative 3: Equivalent roaded acres (ERA), shown as a percent of the sensitive area of each analysis subwatershed, broken down by land use.

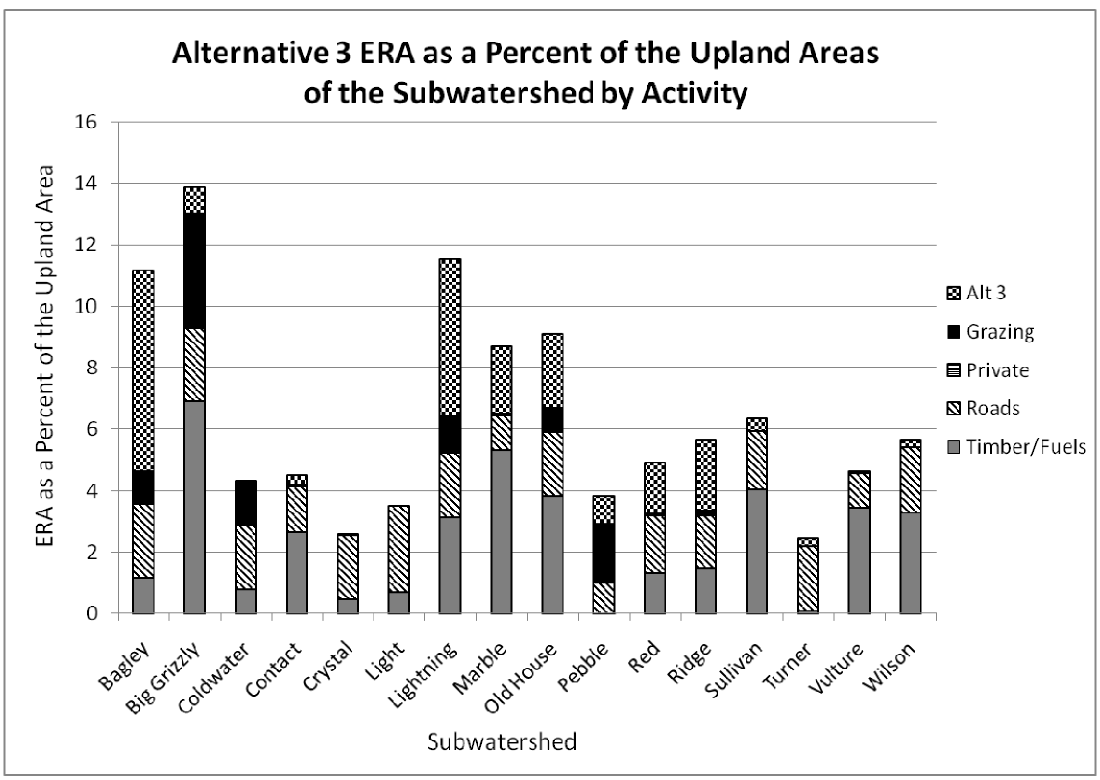

Figure 17. Alternative 3: Equivalent roaded acres (ERA), shown as a percent of the upland area of each

analysis subwatershed, broken down by land use.

Soil Resource Indicators (Alternative 3)

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments, Aspen and Cottonwood Treatments

Measurement Indicator 4 –Soil productivity (soil ground cover, fine organic matter and large woody material, soil porosity/compaction and soil buffing capacity) changes within DFPZ and Area Thin fuels reduction, Aspen and Cottonwood treatment units

Alternative 3 includes 1507 acres of mechanical treatment, 780 acres of hand thinning with under burning, and 343 acres of underburning. Direct and indirect effects to the soil productivity measures listed above will essentially be the same as Alternative 1, with the only difference being the amount of acreage mechanically treated. As stated above, amount of mechanical thinning has been reduced by 694 acres when compared to Alternative 1. The changes in the silvicultural prescription for the DFPZ units under Alternative 3 are not expected to produce effects that differ from those discussed under Alternative 1.

Direct and Indirect Effects of Providing Road Access to Meet Project Objectives while Reducing Transportation System Effects.

Measurement Indicator 5 –Miles of road maintenance, reconstruction, obliteration and temporary road construction within analysis subwatersheds.

Road restoration work on routes contributing excessive resource damage would not occur under this alternative. Under Alternative 3, the overall direct and indirect effects of road maintenance and temporary road construction would be effectively the same as Alternative 1. Localized improvements to the soil resource that would result from road restoration work would not occur under this Alternative.

Cumulative Effects Analysis – Soils (Alternative 3)

Cumulative effects to soil cover, organic matter, large woody debris, soil porosity, and detrimental compaction under Alternative 3 will be the same as what was previously discussed under Alternative 1. The changes in silvicultural prescriptions under this alternative will not result in a departure from the conditions presented under Alternative 1.

Botany Biological Evaluation

Introduction

The purpose of this Biological Evaluation (BE) is to provide an analysis of the Proposed Action and alternatives in the Ingalls Project Environmental Assessment and to determine whether they would result in a trend toward a Sensitive species becoming Federally listed as Threatened or Endangered under the Endangered Species Act (1973, as amended).

This biological evaluation documents potential effects from this project on *Astragalus lentiformis* (lens-pod milk-vetch) and *Ivesia sericoleuca* (Plumas ivesia), other Forest Service Region 5 Sensitive plant and fungi species, which are known to occur or have potential to occur within the project area. No other currently listed Forest Service Sensitive species are known or expected from the project area.

Analysis Methodology

The analysis of effects on rare plant species was a three-step process (FSM 2672.43). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas National Forest (USDI 2009), USDA Forest Service Region 5 Sensitive Species List (USFS 2006), Plumas National Forest rare plant records and geodatabases and California Natural Diversity Database records (CNDDB 2009).

The second step involved field reconnaissance surveys. The Ingalls Project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for rare species. Survey unit areas received intuitive survey coverage having a high potential for scoped species to occur. Therefore, surveys were conducted to cover at least 50% of the area with walking transects. Complete surveys were conducted at all contractor-discovered special habitat sites for the scoped species and at all known and contractor-discovered sensitive and special interest species sites for scoped species.

The project area was surveyed for vascular plants in 2007 by professional botanists. Non-vascular plant surveys also were conducted in 2007 by the Forest bryologist. Past surveys conducted as part of other projects in or near the project area include: Lovejoy Grizz survey 2005, Walker Grizz survey 2005, Mabie DFPZ 2002, Freeman Group Select and DFPZ 2004, Layman Fire Salvage Sale 1990-92, Ingalls Timber Sale 1984-86, Long Valley & Willow Creek 2 Grazing Allotments, Ravine Salvage Sale 1990, Ravine 2 Salvage Sale 1993, Long Valley Timber Sale 1980-95, Camp Layman RAC, Humbug DFPZ and Beckwourth Ranger District general noxious weed survey program.

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence, habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—conflict determination. Data were imported into a Geographic Information System (GIS) and used to analyze proximity to treatment units, identify detrimental effects and develop mitigation measures (see the Specific Design Features or Mitigations section). For management and record keeping purposes, occurrences of sensitive plants and noxious weeds may be divided into and recorded as suboccurrences but they will be discussed here as occurrences.

Insert Cumulative Effects analysis area definition for botanical resources.

Affected Environment/Environmental Consequences

There are two sensitive plant species that are known to occur within the analysis area, the lens-pod milk-vetch (*Astragalus lentiformis*) and the Plumas ivesia (*Ivesia sericoleuca*).

Affected Environment for *Astragalus lentiformis* (lens-pod milk-vetch)

There are 70 documented occurrences of this perennial herb, all of which are located within the boundaries of the Plumas NF. Though sometimes locally numerous, this species' range is very restricted being limited to the southeastern portion of the Beckwourth RD, worldwide. This plant is known to grow in Plumas County from Squaw Valley, Lake Davis and Claireville Flat east to Frenchman Lake. It usually is found on bare volcanic soils, between 4,500 and 6,500 feet in elevation in eastside pine, eastside pine/sagebrush scrub, or sagebrush scrub/grassy flats. It also occasionally is found in less open eastside pine forest where enough light reaches the ground to support a scattered shrub layer; however it appears less vigorous in this micro-habitat. The plant's response to decreased light and increased duff (principally pine needles) is to grow more upright and to produce fewer leaves, flowers and fruits. This last type of habitat is thus considered to be less than optimal for the plant and is thought to become less suitable over time if the shrub and canopy coverage increases.

The trend for this narrow endemic is unknown. Threats from management activities include fire suppression, livestock grazing, timber harvest, road construction, mining, reservoir construction and utility line construction. Botanists on the Plumas National Forest have observed that it is a disturbance follower that probably evolved with the natural disturbance of fire (USFS 2005a). With 100 years of fire suppression, the species is found mainly in areas where human caused disturbance regimes occur. Though this species has been found in areas that have been disturbed, the intensity, extent and frequency of the disturbance(s) has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes.

There are 9 occurrences, totaling 161 acres of lens-pod milk-vetch within the analysis area. Of those only 8 occurrences totaling 54 acres are within 100 feet of treatment units.

Environmental Consequences for *Astragalus lentiformis (*lens-pod milk-vetch)

Alternative 2 – No Action Alternative

Direct and Indirect Effects

There would be no lens-pod milk-vetch sites affected under Alternative 2, because there would be no action taken at this time.

Though there are no direct effects from the no-action Alternative, there are possible negative indirect effects from no action. Indirect effects from the No-action Alternative would be those associated with continued live and dead fuel accumulation with the current and future threat of wild fire. The lens-pod milk-vetch prefers early seral stage habitat. An increase in canopy cover and continued accumulation of down wood and leaf litter as a result of no action could be detrimental to this species. By not taking action through prescribed burning, the canopy, wood and duff layer would not be reduced in the surrounding habitat. Though the population may persist at its current level, it may not have additional ideal habitat in which to expand. If it does not continue to experience natural or anthropogenic disturbances periodically in the future, then eventually the forest canopy would close in and create conditions for more shade tolerant species to out-compete the lens-pod milk-vetch for light and other resources.

Continuing live and dead fuel accumulation increases the risk of high intensity wildfire. It is impossible to determine where, when and how a wildfire may enter an area, making any calculations of effects of wildfire to Sensitive plant populations unpredictable. Many times the effects of fire suppression can have larger impacts to Sensitive plants and their habitat than the wildfire itself and actual effects often depend on fire timing and intensity. With the No-action Alternative, stands would not be thinned or burned. As a result, both ladder and surface fuels would continue to increase over time, leading to an increase in the risk of a high intensity wildfire. High intensity fire may kill sensitive plants and affect soil seed sources. If no action is taken the potential for negative effects from a wildfire would be greater.

Cumulative Effects for Alternative 2

Cumulative effects for the No-action Alternative may result from ongoing firewood cutting, Christmas tree cutting, cattle grazing and high-intensity fire. Cumulative effects of the two activities were discussed under Alternative 1 and apply here. Risk of high-intensity wildfire is probably the most important factor contributing to potential cumulative effects of the No-action Alternative. The area surrounding the lens-pod milk-vetch population has signs of fire exclusion. Historically, the eastside pine habitat would have experienced frequent low- to moderate-intensity fires as opposed to high-intensity stand-replacing fires. Fuel loads are above desired levels in the stands surrounding some populations of lens-pod milk-vetch. Without treatment, fuel loads would increase and later pose risk of high intensity wildfire. Quantifying the threat a wildfire poses to the sensitive species is difficult since the species is dependent on fire, but a stand-replacing wildfire may be detrimental. There is potential for the lack of prescribed fire under the No-action

Alternative to contribute toward declining habitat suitability for lens-pod milk-vetch which has historically relied on some level of disturbance to maintain its place in the plant community.

Noxious weeds would continue to pose a threat, though they are not as likely to be introduced as they would be with the action alternatives. Without project activities to introduce weeds, introduction would be limited to other vectors such as firewood cutting, Christmas tree cutting, cattle grazing or wildfire suppression activities. The near-term risk of introduction and spread of noxious weeds is lower under the no action alternative than it is under the other alternatives. As the risk of wildfire increases with fuel build up over time the risk of noxious weed introduction from suppression activities would also increase.

Cattle grazing will continue in the analysis area and may affect lens-pod milk-vetch populations. Cattle grazing may harm or kill plants by trampling and may reduce reproduction rate.

Alternative 1 – Proposed Action

Direct Effects

There are 8 documented occurrences of lens-pod milk-vetch, totaling 54 acres within 100 feet of treatment units in Alternative 1. For management purposes these occurrences may be recorded as suboccurrences but they will be discussed here as occurrences. Parts of some affected occurrences would remain undisturbed in control areas. The control areas will be flagged and avoided. They would remain undisturbed to ensure that some lens-pod milk-vetch plants be allowed to produce mature seeds. Disturbed ground adjacent to control areas would provide suitable habitat for seeds to germinate and establish new individuals. Control areas are listed by occurrence number and unit identification number in table form in Appendix C. Sixty-six percent of the 161 acres of lens-pod milk-vetch in the analysis area is at least 100 feet away from any treatment unit and would not be disturbed by project activities.

The interim management prescription will be applied. Prescribed fire will be used to treat ASLE7_012 in units 45, 47 and 49. A control area in unit 48 would protect portions of ASLE7_012 from direct disturbance from the proposed mechanical thin activities. Another control area would protect ASLE7_044 in unit 13 from any direct impacts. Piles would not be constructed on occurrences of less than 50 individuals or less than ¼ acre in area. Sixty-six percent of the 161 acres of lens-pod milk-vetch in the analysis area is at least 100 feet away from any treatment unit and would not be disturbed by any project activities. Three of the nine lens-pod milk-vetch occurrences in the analysis area will have control areas that protect portions of the occurrence. Control areas would be flagged and avoided.

Direct and Indirect Effects of DFPZ and Area Thin Fuels Reduction Treatments (Alternative 1)

There are portions of 6 occurrences of lens-pod milk-vetch in mechanical thinning units. The affected portions of those 6 occurrences total approximately 22 acres. There are portions of 2 occurrences of lens-pod milk-vetch in hand thinning units. The affected portions of those 2 occurrences total approximately 32 acres.

There may be both beneficial and detrimental indirect effects to lens-pod milk-vetch. This is a disturbance following species and although some plants may be damaged or killed by thinning activities, the undisturbed portions of these occurrences would be able to produce seeds. Thinning activities such as heavy equipment operation would provide suitable habitat for those seeds to germinate by creating bare soil. As explained above a closed canopy is not the optimal habitat for this species. Mechanical thinning and mastication followed by underburning together would reduce the canopy and ground fuels to a greater extent than any of the activities alone. It is likely that this would improve habitat conditions by providing additional open canopy and pockets of disturbed ground that the sensitive plants could colonize. Existing plants are likely to respond with increased vigor and seed production. Applying variable activities across the landscape may create a mosaic of disturbances favorable to the species. However, it is possible that the combination of activities all in one stand potentially could degrade habitat by creating too much disturbance. This could limit the expansion of lens-pod milk-vetch from the adjacent population.

There are portions of 2 occurrences of lens-pod milk-vetch in underburning units. The affected portions of these occurrences total approximately 12 acres. Underburning in eastside pine habitat may mimic natural fire disturbance by reducing the thickness of the duff layer and opening up small pockets of canopy. This ground disturbance may provide better conditions for the establishment of lens-pod milk-vetch from the nearby population. However, it is possible that underburning would provide too low or too high of an intensity, or it may not be done frequently enough for the needs of lens-pod milk-vetch. In this case, underburning may not provide the benefits of habitat improvement.

Underburning in spring may kill some lens-pod milk-vetch plants. Fall burning is unlikely to damage plants as they would have already dispersed mature seeds. This is a perennial species that has been observed by PNF botanists to respond favorably to underburning. The loss of some individuals is likely to be compensated for by new individuals germinating and increased vigor of surviving plants.

Bare ground created by burning, fireline construction, thinning, and other proposed activities increases the risk of noxious weed invasion which may offset any benefits of increased habitat. If noxious weeds were to invade the treatment area, they potentially could take over portions of the lens-pod milk-vetch habitat and eventually reduce numbers of plants if not treated properly. Following standards and guidelines would greatly reduce the risk of noxious weed invasion.

Direct and Indirect Effects of Aspen and Cottonwood Treatments (Alternative 1)

There are no sites of lens-pod milk-vetch found within 100 feet of the aspen treatment unit under Alternative 1. Therefore there would be no direct or indirect effects expected to lens-pod milk-vetch from implementation of improving aspen stand growing conditions under this alternative.

Direct and Indirect Effects of providing road access to meet project objectives while

reducing transportation system effects (Alternative 1)

There would be direct effects to the lens-pod milk-vetch from activities that maintain and improve the transportation system within the project area. These activities would be necessary to provide the access needed to meet project objectives while reducing transportation system effects in the project area. Under Alternative 1 there is one occurrence of lens-pod milk-vetch that would be directly affected by the proposed road obliteration. This occurrence (ASLE7_008B) is along a non-system road identified as road 111A. The road is proposed to be treated by subsoiling through the occurrence. This action will disturb approximately 0.07 acres (3000sq ft) of a 60-acre occurrence. The remainder of the occurrence will be undisturbed; it lies in a no treatment unit of the DFPZ. Some plants would probably die as a result of subsoiling. This is a disturbance following species and the subsoiling would provide suitable conditions for new individuals to germinate and become established. The undisturbed 59-acre portion of this occurrence would provide a seed source to germinate in the suitable habitat created by subsoiling.

Cumulative Effects for Alternative 1

Other future foreseeable projects include ongoing firewood cutting, Christmas tree cutting, cattle grazing, recreation, Lake Davis trail, Blakeless Underburn, Red Clover Watershed Restoration, Red Clover Poco Watershed project and the PNF Public Motorized Travel Management. These activities have potential to be beneficial and harmful. As mentioned above, lens-pod milk-vetch is a disturbance follower, most likely following the natural disturbance of fire. It also is associated with human caused disturbances such as roads, powerlines, skid trails and other edge habitat.

Disturbances that create bare ground and open the canopy may benefit this species by providing additional habitat into which seeds can disperse, germinate and become established. Therefore, activities such as firewood cutting, Christmas tree cutting and underburning may provide those habitat conditions conducive to the species establishment and expansion.

Cattle grazing will continue in the analysis area and may affect lens-pod milk-vetch populations. Cattle grazing may harm or kill plants by trampling and may reduce reproduction rate.

The effects of the Blakeless Underburn project to the lens-pod milk-vetch are nearly identical to the described above under the heading: “Direct and Indirect Effects of Reducing fuel loads”. Existing and future portions of the Lake Davis trail have been planned to avoid impacts to lens-pod milk-vetch.

The Red Clover Prop 50 Watershed Restoration and Red Clover Poco Watershed projects were designed to avoid the lens-pod milk-vetch occurrences and would not directly affect the species. Red Clover Prop 50 Watershed Restoration was implemented in 2010. A follow-up treatment to that project is scheduled to occur in 2011. The follow-up treatment will be consistent with the proposed action and will comply with all mitigations that were required in the original environmental analysis for that project. Indirect and cumulative effects from these two projects are unlikely because the lens-pod milk-vetch is not found in the wet meadows or riparian areas where the project activities would occur.

The PNF Public Motorized Travel Management Final Environmental Impact Statement (FEIS) has designated routes for off-highway vehicles within the Ingalls project area. However none of those routes are within 100 feet of lens-pod milk-vetch occurrences. The process of designating routes included evaluating impacts to lens-pod milk-vetch. There are approximately 2900 acres of lens-pod milk-vetch documented on the PNF. The FEIS designated trails with the potential to impact approximately 1% (30 acres) of that area.

Cumulatively, if moderate disturbance is applied on a landscape level this should benefit the species in a wider area. Such activities have potential to kill individuals or interrupt reproductivity where individuals are present on the landscape. Firewood cutting and hazard tree removal within an occurrence may kill individual plants if trees are fallen on them. Also, these activities may contribute to fuels on the ground where limbs are cut and left from the firewood. These fuels may bury plants and contribute to some fuel loading in the stand. Contribution to fuel loading would be minimal and not be expected to add enough fuel to add to risk of stand-replacing fire that could be harmful to the plants.

Additionally, as mentioned previously in the "General Effects, Indirect Effects of Underburn and Pile Burn Section", burning following other anthropogenic disturbances can increase the risk of noxious weed invasion beyond that of any activity alone. Noxious weeds would continue to pose a threat to native plant habitat and sensitive plant species. With the underburn activities prescribed in the Proposed Action that would reduce ground fuels in the stand, noxious weeds can more easily invade the area. Weed invasion introduced into the adjacent stand eventually could move into the sub-occurrence and reduce the size of the milk-vetch population. Cumulatively, if this disturbance is applied on a landscape level without standard operating procedures, noxious weeds could easily become established. Following standards and guidelines would greatly reduce the cumulative effects of noxious weeds.

Not enough is known about the amount and type of disturbance favorable to the species to develop management prescriptions that mimic historical disturbance regimes. Too much disturbance or the wrong kind of disturbance may kill individual plants, inhibit reproduction and reduce habitat. It is known that the species would colonize and grow well in disturbed areas. Therefore, the cumulative activities are expected to provide suitable habitat by creating pockets of light to moderate disturbance across the landscape.

Alternative 3 – Non-Commercial Funding Alternative

Direct and Indirect Effects

There are eight documented occurrences totaling approximately 54 acres of lens-pod milk-vetch within 100 feet of treatment units in Alternative 3. The direct and indirect effects described above in the general effects of the action alternatives on p. 13 apply to alternative 3. The more specific direct, indirect and cumulative effects to the lens-pod milk-vetch of alternative 1 described on p. 20 also apply to Alternative 3with the following exception. The road obliteration on road 111A would not occur. The 0.07 acres of occurrence ASLE7_008B would not be impacted by road work under Alternative 3.

Several control areas will be implemented to protect portions of the occurrences that would be directly affected. The control areas will be flagged and avoided. They would remain undisturbed to ensure that some lens-pod milk-vetch plants be allowed to produce mature seeds. Disturbed ground adjacent to control areas would provide suitable habitat for seeds to germinate and establish new individuals. Control areas are listed by occurrence number and unit identification number in table form in Appendix C.

Cumulative Effects for Alternative 3

The cumulative effects for Alternative 3 are the same as those for Alternative 1. Alternative 3 eliminates mechanical thin treatment on 695 acres including the 95 acres of treatment to enhance aspen and cottonwood population. However, the number of occurrences and acres of lens-pod milk-vetch affected under Alternative 3 would be identical to Alternative 1(See tables 2 and 3 for exact numbers).

Affected Environment of *Ivesia sericoleuca* (Plumas ivesia)

One occurrence of Plumas ivesia is within the analysis area. Although it is not within 100 feet of any treatment unit it is addressed here because it is within the analysis area. Approximately 0.1 acres of this 1.5- acre occurrence fall within the analysis area.

Environmental Consequences for *Ivesia sericoleuca* (Plumas ivesia)

Alternative 2 – No Action Alternative

Direct and Indirect Effects

There would be no Plumas ivesia sites or acres affected under Alternative 2, because there would be no action taken at this time. There is very little canopy cover within 100 feet from the one known occurrence in the analysis area. There is very little fuel and the likelihood of wildfire is very low. Direct and indirect effects to this species from the No Action alternative are very unlikely.

Cumulative Effects for Alternative 2

There would be no cumulative effects to the Plumas ivesia as a result of implementing Alternative 2.

Alternatives 1 and 3–Action Alternatives

Direct and Indirect Effects

The occurrence will not be directly affected. It lies 50 feet from the nearest DFPZ unit. Although that unit is part of the DFPZ it would not be treated under any of the alternatives.

There would be no indirect effects to Plumas ivesia because the nearest treatment would be over 500 feet from this occurrence. Grizzly Creek flows between the occurrence and the DFPZ further isolating it from any indirect effects. The nearest known noxious weed occurrence is over 2000 feet away. That occurrence has been treated twice each year since 2006 and will continue to be treated.

Cumulative Effects

There would be no cumulative effects to the Plumas ivesia as a result of implementing either of the action alternatives.

Existing Conditions for sensitive fungi

There are no known sensitive fungi within the analysis area. Potential for Sensitive species of fungi for the Ingalls Project area were analyzed using a habitat model (Hoover and Hanlon 2008). The model was constructed to identify areas of potential habitat for fungi species. These areas were ranked according to the quality of the potential habitat (high, medium and low) and the likelihood of the Sensitive fungi species occurring there. According to the model 14 acres of medium-quality potential habitat exists in the analysis area.

Environmental Consequences for sensitive fungi

There are approximately 14 acres of medium-quality potential habitat in the project area according the PNF fungi habitat model. The model shows no high-quality potential habitat in the project area.

Alternative 2 – No Action Alternative

Effects to sensitive fungi are unlikely because the areas of potential habitat would not be affected by project activities.

Alternatives 1 and 3–Action Alternatives

Effects to sensitive fungi are unlikely because the areas of potential habitat would not be affected by project activities. The four parcels of identified sensitive fungi habitat in the analysis area are at least ½ mile away from any proposed project activity.

Summary of Determinations

It is the determination of the project botanist that Alternatives 1and 3 may affect individuals of lens-pod milk-vetch but are not likely to lead to a loss of viability or a trend toward federal listing as Threatened or Endangered for lens-pod milk-vetch. All alternatives are expected to maintain the existing plant occurrences within the project area as a result of implementing protection measures.

It is my determination that the Alternatives 1 and 3 will not affect the Plumas ivesia. All alternatives would avoid the location of the one known occurrence within the project area.

It is the determination of the project botanist that the Alternatives 1 and 3 will may affect individuals of sensitive species of fungi but are not likely to lead to a loss of viability or a trend toward federal listing as Threatened or Endangered. All alternatives would avoid the locations of known potential habitat within the project area.

Noxious Weed Risk Assessment

Introduction

This Noxious Weed Risk Assessment has been prepared to evaluate the effect of the Ingalls Project on California Department of Food and Agriculture (CDFA) listed noxious weeds and other invasive non-native plant species. This Risk Assessment documents potential effects from this project on spotted knapweed (*Centaurea maculosa*), tall whitetop (*Lepidium latifolium*), and Canada thistle (*Cirsium arvense*) in the analysis area. No other currently listed CDFA noxious weeds or other invasive non-native species are known from the project area.

Analysis Methodology

The area of analysis for noxious weed risk assessment includes the surrounding land up to 1 mile from the project boundary. Access routes to the project area were also considered in analyzing the risk of noxious weed infestation. Noxious weed surveys were conducted in the project analysis area by contract professional botanists and by Plumas National Forest botanists in 2007. Adequate noxious weed surveys have been completed within and adjacent to the project area. The earliest noxious weed records for this analysis area are from 2000. These records and any subsequent records of noxious weeds in the area were considered in this analysis.

Affected Environment/Environmental Consequences

Affected Environment

The California Department of Food and Agriculture's noxious weed list (http://www.cdfa.ca.gov) divides noxious weeds into categories A, B, and C. A-listed weeds are those for which eradication or containment is required at the state or county level. With B-listed weeds, eradication or containment is at the discretion of the County Agricultural Commissioner. C-listed weeds require eradication or containment only when found in a nursery or at the discretion of the County Agricultural Commissioner.

There is one known occurrence of the A-listed weed species spotted knapweed (Centaurea maculosa) in the analysis area. There are 25 known occurrences of the following B-listed weed species in the analysis area: tall whitetop (Lepidium latifolium) occurs in three sites, and Canada thistle (*Cirsium arvense*) in 22 sites.

Environmental Consequences

Alternative 2 –No Action

Non-project dependent weed vectors include: roads, personal woodcutting, grazing allotments, commercial timber harvest in adjacent lands, and recreational activities including camping, hiking, horseback riding, and hunting. The areas at greatest risk in this proposed project area are those located next to roads. Roads provide dispersal of exotic species via three mechanisms: providing habitat by altering conditions, making invasion more likely by stressing or removing native species, and allowing easier movement by wild or human vectors. Areas that are seasonally moist are at risk of infestation by tall whitetop. Three small sites of tall whitetop currently exist in the project area. They will continue to pose a threat if the Ingalls project is not implemented. These factors contribute to a moderate to high risk of noxious weed invasion.

Action Alternatives

There are high-priority weeds located in the analysis area. Each of these occurrences is small; the largest is 2.1 acres. They are in or near treatment units. They would be flagged and avoided; and would not be disturbed by project activities. The spotted knapweed along the access route to the project area, on county road 112, has been treated by hand pulling since 2004. Each year 2-3 plants have been found and they have been killed immediately. Tall whitetop along county road 112 has been treated annually since 2005. Continued hand pulling of spotted knapweed and tall whitetop is planned for 2011 field season. Canada thistle would be monitored as time and funding allow.

The cost to control these small infestations is relatively small. A stand-replacing wildfire could create conditions that would favor a broad scale infestation that would be difficult and expensive to control. The Ingalls project would reduce the threat of stand-replacing wildfires, and may promote the establishment of native species that have coevolved with frequent low-intensity fires in this region of the Sierra Nevada Mountains.

The project area is currently at moderate-to-high risk of noxious weed infestation. The implementation of the Ingalls project is predicted to result in a moderate-to-high potential for weed introduction and spread if all SOPs are adopted, and all road construction, reconstruction and closure is implemented. If no noxious weed SOPs are incorporated into the project it is likely that new weeds would be introduced and become established in project created suitable habitat. SOPs and the design of the Proposed Action would decrease the risk associated with habitat alteration expected as a result of the project and increased vectors as a result of project implementation. Habitat vulnerability and non-project dependent vectors would not be changed by the SOPs. However, monitoring during project implementation and post project, avoidance of known sites, and treatment of any weed populations discovered during implementation will greatly reduce the chances of spread of weeds in the project area.

The overall risk of noxious weed establishment as a result of Ingalls project implementation is moderate to high.

Cultural Resources

Introduction

Cultural objects, historic structures and buildings, and archaeological sites are the material remains of our national heritage. The Plumas National Forest is responsible for, and committed to protecting and managing these nonrenewable resources for current and future generations to understand and enjoy.

Analysis Methodology

Three phases of work were completed to understand the significant themes and extent of cultural resources within the Ingalls project area. First, research into the larger geographic history relevant to the project area was conducted to understand historic themes or events that have transpired in time and space. Next, cultural resource field surveys were conducted to identify cultural properties. Finally, the survey methodology and amount and types of cultural resources observed within the project area are discussed in a specialist report.

The entire area of potential effect was previously surveyed during several earlier projects. This includes two contracts specifically for this project (2007 and 2010) as well as work completed by Forest Service Archaeologists. Based on previous studies and the inventories conducted for this undertaking, the entire area has been adequately assessed for cultural resources. All identified cultural resources have been fully recorded and are on file at the Beckwouth Ranger District office. All known cultural resources within the Ingalls project area of potential affect were field visited and the site boundaries have been flagged.

Environmental Consequences

Effects of Alternative 2 (No Action) on Cultural Resources

With no proposed activity, there would be no effect to cultural resources.

Effects of Action Alternatives on Cultural Resources

Cultural Resource site boundaries are flagged and Standard Operating Procedures would be followed during implementation of any of the action alternatives. All artifacts and features would be avoided during project implementation therefore there would be no effect on cultural resources.

Cumulative Effects

There would be no direct or indirect effects to cultural resources from any of the alternatives therefore, there would be no cumulative effects.

Human Health and Safety

Introduction

This report examines the risk to workers and the public from proposed activities in the Ingalls project. Hand (manual), mechanical, prescribed fire treatments, and application of Borax all pose some risk to human health and safety.

Analysis Methodology

Information was reviewed for this project along with proposed mitigations such as hazard tree removal, and experience with similar projects completed in the Region and on the Forest to identify risks.

A considerable body of information for Borax has been compiled in risk assessments completed by SERA (authored by DR. Patrick Durkin, PhD) under contract to the Forest Service (SERA, 2006) and the risk assessment contained in the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Supplemental EIS. Forest Service Worksheet Maker version 5.00.54 was run for application rates of 1lb acid equivalent per acre.

The pesticide risk assessment portion of this analysis consists of comparing doses that people may get from applying the pesticide (worker doses) or from being near and application site (public doses) with the U.S. Environmental Protection Agency's (U.S. EPA) established Reference Doses (RfD), a level of exposure that result in no adverse effect over a lifetime or chronic exposures. One of the primary uses of a risk assessment is risk management. Decision makers can use the risk assessment to identify those herbicides, application methods, or exposure rates that pose the greatest risks to workers and the public. To facilitate this decision-making, acceptable risk levels must be established. For each type of dose assumed for workers and the public, a hazard quotient (HQ) was computed by dividing the dose by the RfD. In general, if HQ is less than or equal to 1, the risk of effects is considered negligible. Because HQ values are based on RfDs, which are thresholds for cumulative exposure, they consider acute exposures. This aspect is discussed below in the evaluation of possible effects.

Environmental Consequences

Alternative 2 (No Action)

Alternative 2 would have no direct effects on human health because no operation of mechanical equipment, application of Borax, hand treatment, or prescribed fire would occur in relation to this project. However, if a wildfire occurs in the project area without fuel treatments, severe wildfire behavior could result in significant adverse indirect and cumulative effects to the health and safety of the public and fire suppression personnel.

Alternative 1 (Proposed Action) and Alternative 3 (Non-commercial)

Mechanical Equipment

Equipment operators can be injured in several ways. Operators can lose control of machines on steep or slippery terrain; however, such accidents are uncommon among experienced operators. Accidents can occur when operators push brush where visibility is poor, a short headwall or road-cut is encountered, or slope steepness or traction is misjudged. A machine that is out of control can roll over its operator or create hazardous flying debris. Operators can also suffer hearing damage.

Other workers are at risk of being struck by falling trees or pieces of wood or rock thrown out by the equipment, especially during tree cutting and mastication operations. Working on large machines that are slippery from oil or are otherwise hazardous also can cause injuries. Workers other than operators are also at risk of damaged hearing.

Risks to the public from use of mechanical equipment should be negligible. Injuries are possible from accidents when the equipment is being moved on public roads or in rare situations when a member of the public ignores safety warnings and enters a treatment area while equipment is operating.

Prescribed Burning

Burning creates risk of smoke and heat injury to both workers and the public. Effects on workers range from eye irritation, coughing, and shortness of breath to severe burns that can leave permanent scars or lead to mortality. In addition, chronic exposure of workers to smoke can lead to long-term adverse health effects, such as emphysema or lung cancer.

Smoke may have local, transitory effects on air quality. Sensitive members of the public may experience irritations of the eye, throat, or lung from even the low-level exposures. Risk of adverse chronic health effects on the public from smoke exposure should be lower than risks to workers, because public exposures would be much less than worker exposures.

Prescribed burns may “escape” (burn outside intend areas) and endanger the public. To reduce risks of burn “escapes” and other adverse effects, the Forest Service imposes special requirements for planning and implementing prescribed burns. All prescribed burn projects require preparation of a burn plan, which includes a burning prescription identifying requisite fuel and weather conditions for ignition, burning procedures, and safeguards. Safeguards are precautions needed to confine the burn to the prescribed area. In addition, the Forest Service has established qualification standards and training requirements for personnel involved in prescribed burning.

Hand Methods

Working with hand tools on steep slopes, and/or unfavorable site conditions is inherently hazardous. Conditions are highly variable, ranging from gentle slopes with vegetation densities to steep slopes with dense tall shrubs or trees. Extremely hot or cold ambient temperatures can occur depending on the time of year. Workers could be cut by tools, struck by falling shrubs or trees, or injured by falling onto sharp stumps or shrub stems. Risk of injuries increases with the amount of work, and are exacerbated when workers are concentrated in areas or fatigued. Injuries can result from minor cuts, sprains, bruises, and abrasions to severe injuries causing major arterial bleeding, compound bone fractures, brain concussions, or mortality.

Hand clearing of vegetation is relatively slow work, with production rates of 2-4 workdays/acre. This exposes workers to the hazards for longer periods in relation to other, more efficient methods of clearing vegetation. Risk of injuries increase as slope, vegetation density, and vegetation height increase.

Other adverse health effects associated with outdoor work in rugged terrain are possible. Examples are extreme fatigue, heat exhaustion or heat stroke, and exacerbation of chronic health conditions.

Proper supervision and effective training for safe use of hand equipment can reduce risks of worker injury. Wearing boots with non-skid soles and snag-resistant long-sleeve shirts and trousers can also reduce risks. Forest Service procedures and normal forestry worker practices involve use of these common safety practices.

Members of the public would not be expected to be at risk from the use of hand methods, because they are not likely to be sufficiently close to work.

Stump Treatment with Borax

This assessment examines the potential health effects on all groups of people who might be exposed to pesticides that are proposed in this project. Those potentially at risk fall into two groups: workers, and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of pesticides. The public includes forest users or nearby residents who could be exposed through the drift of pesticide, through contact with vegetation, or by eating, or placing in the mouth food items or other plant materials, such as berries or shoots growing in or near the forest, by eating game or fish containing to pesticide residues, or by drinking water that contains such residues.

WORKERS- Given the low hazard quotients for both general occupational exposures as well as accidental exposures, the results imply that long-term employment applying this fungicide can be accomplished without toxic effects. All worker occupational exposures for the typical, lower and upper application rate result in an HQ of less than 1.

While accidental exposure scenarios are not the most severe one might imagine they are representative of reasonable accidental exposures. For accidental exposure the highest hazard quotient is a factor of over 1300 below the level of concern.

The hazard quotients for general occupational exposure scenarios are somewhat higher than those for the accidental exposure scenarios. Nonetheless, the upper limit of the hazard quotient is below the level of concern (an HQ of greater than 1). As previously discussed, these upper limits of exposure are constructed using the highest anticipated application rate, the highest anticipated number of acres treated per day, and the upper limit of the occupational exposure rate. If any of these conservative assumptions were modified the hazard quotients would drop substantially. The simple verbal interpretation of this quantitative characterization of risk is that even under the most conservative set of exposure assumptions, workers would not be exposed to levels that are regarded as unacceptable.

GENERAL PUBLIC – Although Borax is not applied in residential areas, it is applied in forested areas that may be used by members of the general public, however, because Borax would be applied to freshly created stumps during logging of the harvest unit, it is highly unlikely that a member of the public would be exposed to either freshly treated stumps, or water containing Borax. All short term and chronic exposure scenarios except the direct consumption of the granules from a tree stump are well below an HQ of 1.

The acute exposure scenario in which a child ingests Borax applied to tree stumps as proposed exceeds an HQ of 1 at the lower, upper, and central exposure estimates. There is no information in the available literature to estimate the amount of Borax that a child could be predicted to consume in one day. The estimated amount of Borax that a child may consume in one day is based on the amount of soil that an average child may ingest per day. For a child ingesting Borax from a tree stump, hazard quotients range from 2 to 16, with a central estimate of 4. The estimated amount of Borax that a child may consume in one day is based on the range for the amount of soil that may be consumed by children and this may not reflect the amount of Borax that a child might consume in a single event. Since the exposure estimate is highly uncertain and not based on empirical data for borate consumption, risk for this exposure scenario may be underestimated or overestimated. Relatively good estimates of lethal and sublethal doses in children are available. Documented lethal doses are in the range 505 mg B/kg/day and 765 mg B/kg/day, factors of about 11 to 135 below the estimated levels of exposure from ingesting borax from a treated stump. A nonlethal dose in children is about 184 mg B/kg/day and this dose is associated with gastrointestinal effects such as vomiting and diarrhea. The estimated levels of exposure for a child ingesting borax from a treated stump are below this nonlethal level by factors of about 4 to 32. Thus, while this exposure scenario raises concern in that the RfD is substantially exceeded, the most likely adverse effects would probably be vomiting and diarrhea.

Legal Regulatory Compliance and Consultation

The Beckwourth Ranger District operates under a diverse array of local, state and federal management guidance and policy as well as various executive orders.

Currently, the Beckwourth Ranger District is guided by the Plumas National Forest 1988 Land and Resource Management Plan (LRMP) as amended by the Herger-Feinstein Quincy Library Group (HFQLG) 1999 Final EIS and Record of Decision (ROD), the 2003 HFQLG Supplemental EIS and ROD and the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) supplemental EIS and ROD.

Principle Environmental Laws

National Environmental Policy Act

The Council on Environmental Quality (CEQ) regulations for implementing the National Environmental Policy Act (NEPA) requires that federal agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 Code of Federal Regulations [CFR] 1502.14).

The Ingalls Project EA meets the CEQ regulations requiring public scoping and a thorough analysis of issues, alternatives and effects.

National Forest Management Act

The National Forest Management Act (NFMA) reorganized, expanded and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on national forest lands. The NFMA Act requires the Secretary of Agriculture to assess forest lands, develop a management plan for each unit of the National Forest System (NFS).

The Forest Service is complying with the provisions of this law by designing the project to meet the Standards and Guidelines of the Plumas Forest Plan and its amendments.

Endangered Species Act

The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered (TE), or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult with the United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service concerning TE species under their jurisdiction. It is Forest Service policy to analyze impacts to TE to ensure management activities are not be likely to jeopardize the continued existence of a TE, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. This assessment is documented in a Biological Assessment (BA) and is summarized or referenced in Chapter 3.

Wildlife and Fisheries

Consultation with USFWS

Section 7 consultation with the USFWS was not required for the Ingalls project. A list of T&E species was provided by the "Federal Endangered and Threatened Species that may be affected by Projects on the Plumas National Forest", updated April 29, 2010, accessed via USFWS county list web page (http://www.fws.gov/sacramento/es/spp_lists/NFActionPage.cfm) (Appendix A of the BA/BE)was used for analysis. Based on the analysis conducted in the BA/BE, it was determined that no effects to listed TE species would occur from implementation of the Ingalls Project, therefore no consultation under Section 7 of the Endangered Species Act of 1973, as amend was required.

California Department of Fish and Game

Input specific to the Ingalls project was solicited from the Department of Fish and Game through the public scoping process. However, since no input was received, all past advice from the Department was considered during the planning of the Ingalls Project.

Botany

The latest US Fish and Wildlife Service (USFWS) species list for Plumas County, in which the project occurs, was accessed from the USFWS website on April 7, 2011 and incorporates the database update of December 1, 2009 (USDI 2009). This list fulfills the requirements to provide a current species list pursuant to Section 7(c) of the Endangered Species Act, as amended.

The only Federally Threatened plant species known to occur on the Plumas NF is *Packera layneae* (Layne's butterweed). This species grows in open rocky areas on gabbro and serpentine-derived soils that are between 650 and 3,300 feet in elevation. The Plumas NF has four occurrences, totaling approximately 12 acres. There is no suitable habitat for this species within or near the Ingalls Project area. Two additional species of federal concern that have the potential to occur on the Plumas NF are the Federally Threatened *Orcuttia tenuis* (slender Orcutt grass) and the Candidate species *Ivesia webberi* (Webber's ivesia). *Orcuttia tenuis* is limited to relatively deep vernal pools with clay soil. *Ivesia webberi* is found in open areas of sandy volcanic ash to gravelly soils in sagebrush and eastside pine. Suitable habitat for these two species within the analysis area has been surveyed by qualified botanists. No individuals of these two species were found during field surveys. Therefore, no Threatened or Endangered species occur within the project area and a Biological Assessment is not needed.

Clean Water Act

Section 208 of the Clean Water Act required the States to prepare non-point source pollution plans, which were to be certified by the State and approved by the Environmental Protection Agency (EPA). In response to this law and in coordination with the State of California Water Resources Control Board (SWRCB) and EPA, Region Five began developing Best Management

Practices (BMPs) for water quality management planning on National Forest System lands within the State of California in 1975.

The Ingalls Project meets the Clean Water Act by implementing the Best Management Practices of the Soil and Water Conservation Handbook. By using BMPs, the Ingalls Project meets this Act according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

Clean Air Act

The Clean Air Act provides the principal framework for national, state and local efforts to protect air quality. Under the Clean Air Act, the Office of Air Quality Planning and Standards is responsible for setting standards for pollutants which are considered harmful to people and the environment. The 1990 Clean Air Act is the most recent version of a law first passed in 1970.

All burning that will be done on the Ingalls Project will be in accordance with an approved smoke management plan approved by the Northern Sierra Air Quality Management District (NSAQMD). The smoke plan requires burning with wind directions that transport smoke away from communities and the amount of acres burned daily are limited. Burns are conducted during approved burn days, when atmospheric conditions favor smoke dispersion. Prescribed burning takes place in spring or fall after the first rains when fuels are relatively moist to reduce the potential for fire escape.

National Historic Preservation Act

Section 101 of the National Environmental Policy Act (NEPA) requires the federal government to preserve important historic, cultural and natural aspects of our natural heritage. To accomplish this, federal agencies utilize the Section 106 process of the National Historic Preservation Act (NHPA). This process has been codified in 36 CFR 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8. Locally, the Plumas National Forest uses a programmatic agreement (PA) between Region 5 of the US Forest Service, the California State Historic Preservation Officer and the Advisory Council on Historic Preservation to implement the Section 106 process.

The Ingalls Project EA meets NHPA by protecting cultural resources through field survey, tribal and historical preservation society consultation and protection of sites in the Ingalls Project area. All known archaeological sites within the Ingalls Project area of potential affect, were field visited and site boundaries were flagged. As outlined in the Programmatic Agreement, protection measures will be implemented, as appropriate, for all cultural resources located within the project area. The application of the protection measures would result in the Ingalls Project having “no effect” on cultural resources and the Forest would have taken into account the effect of the project on cultural resource sites in compliance with the PA and Section 106 of the NHPA.

Executive Orders

Consultation and coordination with Indian Tribal governments, Executive Order 13175 of November 6, 2000

The following tribes were consulted during the NEPA scoping phase of the Ingalls Project on May 10, 2010:

- Washoe Tribe of California and Nevada
- Susanville Indian Rancheria
- Greenville Indian Rancheria

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Through scoping and consulting with local Native American tribes, it was determined by District Archeologist that there were no known Indian sacred sites in the Ingalls Project.

Invasive species, Executive 13112 of February 3, 1999

Executive Order 13112 created the Invasive Species Council (ISC) in order to prevent the introduction of invasive species, provide for their control and minimize the economic, ecological and human health impacts that invasive species cause. Federal agencies are required to:

- Identify actions that may affect the status of invasive species
- Use relevant programs and authorities to prevent the introduction, control and monitoring of invasive species
- Provide for native species restoration as well as their habitats
- Promote public information
- Not condone or carry out actions that may spread invasive species
- Consult with the ISC and other stakeholders as appropriate

The Ingalls Project meets the Executive Order by following the noxious weed management Standards and Guidelines in Appendix A of the ROD for SNFPA. The SNFPA guidelines direct proactive management of noxious weeds that meet with the Executive Order. District botanists carried out the intent of the Executive Order and the noxious weeds Standards and Guides by:

- Consulting with a ISC representative
- Identifying and controlling weed infestation areas
- Preventing the spread of noxious weeds through SOPs and site specific mitigation
- Educating the public regarding the presence and spread of noxious weeds

Floodplain management, Executive Order 11988 of May 24, 1977 and Protection of Wetlands, Executive Order 11990 of May 24, 1977

Executive Orders 11988 and 11990 require Federal agencies to avoid, to the extent possible, short- and long-term effects resulting from the occupancy and modification of flood plains and the modification or destruction of wetlands. These executive orders are intended to preserve the natural and beneficial values served by floodplains and wetlands.

The Ingalls Project meets these executive orders by implementing the Best Management Practices (BMP) of the Soil and Water Conservation Handbook. By using BMPs, the Ingalls Project meets the executive orders according to the ROD of the SNFPA (Section VII, ROD of the SNFPA).

Environmental Justice, Executive Order 12898 of February 11, 1994

Executive Order 12898 requires that Federal agencies make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health and environmental effects of their programs, policies and activities on minority and low-income populations.

Although low-income and minority populations are within the vicinity of the Ingalls Project, activities associated with the Project would not discriminate against them. Proposed activities would not adversely affect community, social, economic and health and safety factors. Public scoping was conducted in accordance with NEPA regulations to identify any potential issues or hazards associated with the Ingalls Project.

Use of off-road vehicles, Executive Order 11644 and 11989, amended May 25, 1977

It is the purpose of these orders to establish policies and provide for procedures that will ensure that the use of off-highway vehicles (OHV) on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands and to minimize conflicts among the various uses of those lands.

On July 15, 2004, the Forest Service published proposed travel management regulations in the Federal Register. The final rule provides a national framework for local units to use in designating a sustainable system of roads, trails and areas for motor vehicle use. The rule's goal is to secure a wide range of recreation opportunities while ensuring the best possible care of the land.

All roads proposed to be closed in the Ingalls Project are consistent with the Plumas National Forest Motorized Travel Management Project signed November 2010 (Appendix D, Table D.3). Roads being proposed for decommissioning, closure, and/or obliteration are guided by the forest wide OHV analysis process and the Riparian Management Objectives, which set forth goals for water quality and soil compaction.

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Research Natural Areas

There are no Research Natural Areas with the Ingalls Project Area.

Inventoried Roadless Areas

There are no Inventoried Roadless Areas within the Ingalls Project Area.

Wilderness Areas

There are no Wilderness Areas within the Ingalls Project Area.

Wild and Scenic Rivers

There are no Wild and Scenic Rivers in the Ingalls Project Area.

Municipal Watersheds (FSM 2540)

There are no Municipal Watersheds in the Ingalls Project Area.

Chapter 4: Consultation and Coordination

Introduction

The US Forest Service operates under the Endangered Species Act, which requires consultation with the US Fish and Wildlife Service regarding impacts to potential endangered species from the Proposed Action and the action alternatives. Consultation is also done with federally recognized tribes to ensure that heritage resources are respected and will not be impacted by any potential project activities.

Federal, State and Local Agencies

- Regional Water Quality Control Board
- City of Portola, California
- Plumas County

Tribal Consultation

- Washoe Tribe of California and Nevada
- Greenville Rancheria
- Susanville Indian Rancheria

Appendix A: References

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Appendix B: Standard Operating Procedures

The following Standard Operating Procedures (SOP) apply unless specifically allowed for in the environmental analysis.

Fire/Air Quality

Compliance with Air Quality: Comply with air quality permits issued by the Northern Sierra Air Quality Management District for all prescribed burning. A prescribed burn plan, including a mandatory smoke management plan (SMP), would be required prior to any prescribed fire. The SMP is reviewed and approved by the local Air Quality Management District office.
Smoke Management: Conduct prescribed burning in a manner that avoids excessive buildup of smoke in any particular air shed**.**
Tree Mortality: No more than 10% mortality in the residual crop trees following the underburning and no areas of mortality greater than 2 acres; Minimize mortality in visual corridors.

Watershed

Protect water quality by using BMPs, employed by the Forest Service and the State of California to prevent water quality degradation and to meet State Water Quality Objectives relating to non-point sources of pollution. In addition, use site-specific mitigation measures that relate directly to these BMPs to minimize erosion and resultant sedimentation.

Apply the Standards and Guidelines identified in the PNF LRMP Streamside Management Zone (SMZ) and SAT Guidelines (as adopted under the HFQLG EIS) relating to timber sale activities in all RHCAs. Activities in RHCAs would improve or maintain the structure and function of the RHCA and fish and wildlife habitat.

Defining Riparian Habitat Conservation Areas, Streamside Management Zones and Sensitive Areas

Fish-bearing Streams: For perennial fish-bearing streams the RHCA consists of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of two site-potential trees, or 300’ horizontal distance, whichever is greatest.
Perennial Non-fish-bearing Streams: For perennial non-fish-bearing streams the RHCA consists of the stream and the area on either side of the stream extending from the edges of the active stream channel to the top of the inner gorge or to the outer edges of the 100-year floodplain, or to the outer edges of riparian vegetation, or to a distance equal to the height of one site-potential tree, or 150 feet, whichever is greatest.

Lakes: For natural lakes the RHCA consists of the body of water and the area to the outer edges of the riparian vegetation, or to the extent of moderately and highly unstable areas, or to a distance equal to the height of two site-potential trees, or 300 feet horizontal distance, whichever is greatest.

Ephemeral or Intermittent Streams, Wetlands Less Than One Acre, Landslides and Landslide-prone Areas: Intermittent and ephemeral streams showing annual scour and deposition, and definable stream channel wetlands, use RHCA widths of a minimum of 100 feet in width (horizontal distance) or the height of one site potential tree, whichever is greater.

Ponds, Reservoirs, and Wetlands Greater Than One Acre: Extend RHCAs around wetlands and perennial non fish-bearing streams to the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of moderately and highly unstable areas, or a 150 feet horizontal distance, whichever is greatest.

Streamside Management Zones: Employ streamside management zone (SMZ) widths that are 50 feet for those stream segments that do not display annual scour and deposition and are not classified as RHCAs.

Treatments in RHCAs & SMZs

Ground Based Harvesting Soil Conditions: See the section in these SOPs on Soil Protection Measures.

Equipment Use in RHCAs/SMZs: Equipment use within RHCAs and SMZs is restricted by the equipment exclusion zones. Equipment exclusion zone widths, measured on each side of the stream from the edge of the active channel, vary depending upon the RHCA and SMZ widths presented above: for 150 ft wide RHCA buffers, the equipment exclusion zone width is 50 ft on each side of the channel; for 300 ft wide RHCA buffers, the equipment exclusion zone width is 100 ft on each side of the channel; and for SMZs, the equipment exclusion zone width is 25 ft on each side of the channel. For seeps, springs, and meadows, the equipment exclusion zone width is 25 ft, measured from the wet perimeter of the soil of facultative wetland species edge, whichever is furthest. Equipment must be excluded from all sensitive areas, unless specifically allowed for in the environmental document. Machinery can work adjacent and reach into the exclusion zone with the extendable boom. Minimize the number of crossings. Crossings would be back-bladed after use, as necessary, to restore the natural relief and reduce erosion.

Slope Restrictions: Mechanical equipment would be restricted to slopes up to 25%.

Bank Stability: Remove no trees adjacent to channels that provide bank stability and/or contribute to channel integrity (except for hazard trees). Along perennial fish-bearing streams where hardwoods are < 12" and insufficient to provide shade to the stream channel conifers would be left to provide shade.

Landing Location: Minimize landing location in RHCAs. Landings would generally not be within 100 feet of the stream course. District hydrologist or soil scientist would approve, on a site-specific basis landings that need to be closer than 100 feet of a stream course.

Skid Trail Location: Skid trails would be allowed within equipment exclusion zones on a case-by-case basis with permission of the District's hydrologist, geologist or soil scientist and would generally only be allowed for crossing stream courses. Skid trails would be perpendicular to the stream course within 50 feet of the stream and spacing of skids would be no closer than 120 feet. Throughout RHCAs and SMZs, skid trails would be restricted to less than 25% slope. Do not locate skid trails parallel to the bottom of swales. Treat swales as stream courses, crossing at right angles and skidding away from these features.

Restoring Landings: Where specified by the District's physical scientist, existing and activity related disruptions in landings would be restored to their natural contour. This would occur during subsoiling operations. These landings would be tilled, seeded, mulched after use and available slash would be spread out across landing to improve infiltration and minimize erosion upon site visit. Mulch and then subsoil landings and other disturbances within 200 feet of stream channels. Areas within 50' of the meadow edges would not be subsoiled. All project subsoiling activities are to be approved by the District physical scientist prior to subsoiling. Reference: BMP 1-12

Restoring Skid Trails & Temporary Roads: Where specified by the District's physical scientist, existing and activity related disruptions in skid trails and temporary roads would be restored to their natural contour. This would occur during subsoiling operations. Areas within 50' of the meadow edges would not be subsoiled.

Slash Near Stream Courses: Remove any slash generated by project activities from stream courses as soon as practicable, not exceeding 48 hours.

Burn Pile Locations: Locate burn piles above the "green line" or at least 25' away from channels having evident scour and deposition, whichever is greater. Burn the piles prior to underburning. Allow backing fire to creep into RHCAs if fuels naturally carry the fire.

Hazard Tree Removal in RHCAs and SMZs: With case-by-case permission of the project Sale or Contract Administrator, hazard trees may be hand-felled and left in place or removed from RHCAs and SMZs in a manner that minimizes disturbance to the RHCA or SMZ. Mechanical entry would be subject to the equipment exclusion zones described above.

Large Woody Debris Retention: Retain at least 90% of large woody debris in channels and leave 50-75% of the ground unburned within the interior 50' of RHCAs. Within these core areas, ensure that burned areas appear intermittent, not concentrated.

Soil Protection Measures

Ground Cover: To control the surface erosion, the 1988 Plumas National Forest Land and Resource Management Plan suggests retaining a minimum of 40% ground cover on soils with a low erosion hazard rating. The minimum ground cover increases to 50%, 60% and 70% for soils with an erosion hazard rating of moderate, high and very high, respectively. These suggested guidelines are adopted as the minimum ground cover standard. If ground cover standards are not met, implement mitigation methods such as leaving chips on site to ensure standards would be met. In addition, retain 5 tons/acre of down woody debris less than 15" in diameter.

Ground Based Harvesting: Conduct ground based harvest operations only when the upper 8" of the soil is essentially dry, or the ground is frozen to a depth of 5", or snow depth is at least 18" or is compacted by equipment to 8". For this measure, soil is defined as "dry" when no portion of the top 8" can be molded by hand compression and hold that shape when the hand is tapped.

Slope Restrictions: Allow low ground pressure (under 8.0 psi when "unloaded") excavators to work on slopes up to 45% to pile excess fuels. All other mechanical equipment would be restricted to slopes that are equal to or less than 35 percent.

Skid Trails: Restrict skidding equipment to designated skid trails, unless, through consultation with the District's hydrologist, geologist or soil scientist, it is determined that departure from skid trails would not likely impair the soil or the operator is using low ground pressure (under 8.0 psi) harvesting equipment to travel off designated skid trails to bring logs to trails. Generally use skid trail spacing averaging120', center to center, when trails are parallel and generally perpendicular to the stream. Reusing existing skid trails, with spacing closer than prescribed, is acceptable.

Subsoiling Landings & Skid Trails: Based upon the soil type, existing landings and skid trails used by the project and newly created skid trails with compacted soil, would be subsoiled using a wingtip subsoiling implement and displaced soil would be leveled and slash scattered. In general, constructed skid trails experiencing *three or more* passes with equipment, would be subsoiled to a minimum depth of 24", water-barred and blocked. However, all project subsoiling activities are to be approved by the District physical scientist prior to subsoiling. Subsoiling skid trails within harvest units on coarse textured soils (USDA texture classes: sands, loamy coarse sands; and coarse sandy loams with less than 5% clay content) that have developed from granitic parent material would generally not be recommended.

Subsoiling Specifications: Where specified by the District's physical scientist, subsoil skid trails, landings, temporary roads, and non-system roads within the project area through the full depth of compaction to restore soil porosity. Selected landings and terminating skid trails would be subsoiled with a winged subsoiler or other equipment capable of lifting and fracturing compacted soil without mixing the soil horizons to a depth of at least 24". The subsoiler would be lifted where substantial root and bole damage to larger trees would occur from subsoiling. Skids with slope over 25% may not be approved for subsoiling but would be frequently water barred per project BMPs. Areas within 50' of ephemeral draws, swales, connected drainages and meadow edges would not be subsoiled. Subsoiling would not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots. When landings and temporary roads are planned for subsoiling, recovery of topsoil displaced during construction would be considered. Block vehicle access to temporary roads and install water-bars prior to subsoiling them.

Transportation

Stream Crossings: Design all new stream crossings to accommodate a 100-year flood and provide fish passage as necessary.

Restore Temporary Roads: Restore temporary roads after use. Design and obliterate temporary stream crossings to protect water quality and adjacent riparian vegetation (see "Watershed" section for additional procedures for protecting riparian vegetation).

Water Bars: Stabilize and strategically place water bars on temporary roads where drainage control issues are evident or expected.

Road Barricades: After use, barricade temporary roads to discourage vehicle traffic, using available natural materials such as rocks, logs, root wads and earth, to appear somewhat natural, have low installation costs and require little to no maintenance.

Dust Abatement: Abate dust from logging traffic with water selected from water drafting sites that have suitable stream flow and access. When water is scarce, use alternative sources such as chlorite, sulfonate or other dust abatement materials.

Drafting Sites: Estimate maximum drawdown volumes prior to using the draft site. Maintain minimum pool levels during drafting using measurements such as staff gauges, stadia rods, tape measures, etc. Construct water-drafting sites so that oil, diesel fuel, or other spilled pollutants would not enter the stream. Maintain stream bank stability and minimize sedimentation by constructing and maintaining back down ramps. Rocking, chipping, mulching, or other effective methods are acceptable in achieving this objective. Suction strainers must contain screen openings with less than 2mm holes and meet the specifications outlined in FSM 5161. The suction strainer shall be inserted close to the substrate in the deepest water available; the suction strainer shall be placed in a bucket to avoid substrate and amphibian disturbance.

Silviculture

Borax Application: Treat all stumps > 14" diameter with a borate compound for the control of *Annosus* root disease. Apply borate compound to all pine and true fir cut stumps within Recreation Areas, within 4 hours of cutting the trees.

Genetic Stock Protection: Protect trees identified or trees being tested as genetically superior or resistant to blister rust or dwarf mistletoe.

Botany

Protection for Plant Species: Protect known Threatened, Endangered, Sensitive and Special Interest plant species according to Plumas National Forest current interim management prescriptions for specific species. If additional protected plant species are found during the life of the project, conduct an assessment and apply appropriate management prescriptions.

Noxious Weed Management

The SOPs are based on the priorities established in FSM 2081.2 which states "where funds and other resources do not permit undertaking all desired measures, address and schedule noxious weed prevention and control in the following order:

- First Priority: Prevent the introduction of new invaders,
- Second Priority: Conduct early treatment of new infestations
- Third Priority: Contain and control established infestations.

1. **Prevention/Cleaning**: Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be weed-free. Clean all equipment and vehicles of all attached mud, dirt and plant parts at a vehicle washing station or steam cleaning facility before the equipment and vehicles enter the project area. Cleaning is not required for vehicles that would stay on the roadway. In addition, clean all off-road equipment prior to leaving areas infested with noxious weeds.
2. **Prevention/Road Construction, Reconstruction and Maintenance:** All earth-moving equipment, gravel, fill or other materials need to be weed free. Use onsite sand, gravel, rock, or organic matter where possible.
3. **Prevention/Revegetation:** Use weed-free equipment, mulches and seed sources. Avoid seeding in areas where revegetation would occur naturally, unless noxious weeds are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds. All activities that require seeding or planting would need to use only locally collected native seed sources. Collect plant and seed material as close to the project area as possible, from within the same watershed and at a similar elevation whenever possible. Avoid persistent non-natives such as timothy, orchard grass, or ryegrass. This would implement the USFS Region 5 policy that directs the use of native plant material for revegetation and restoration for maintaining "the overall national goal of conserving the biodiversity, health, productivity and sustainable use of forest, rangeland and aquatic ecosystems".
4. **Prevention/Staging Areas:** Do not stage equipment, materials, or crews in noxious weed infested areas where there is a risk of spread to areas of low infestation.
5. **Small Infestations:** Small infestations identified during project implementation would be evaluated and hand treated or "flagged and avoided" according to the species present and project constraints. Larger infestations identified after implementation, should be isolated and avoided with equipment (and equipment washed as in # 1 above).

Wildlife

Wildlife Limited Operating Periods: Unless determined to be unnecessary following pre-implementation surveys, limited operating periods (LOPs) to protect key wildlife species listed in the HFQLG FEIS (page 2-8, Table 2.3), 2004 SNFPA ROD (pages 54-62) and the Biological Evaluation/Biological Assessment would apply.

New Wildlife Findings: Where subsequent surveys identify occupied threatened, endangered, or sensitive species habitat, establish PACs, den site buffers, or other protections as described in the SNFPA EIS and HFQLG EIS. Include protections for any additional sensitive species identified in the BE/BA. In the event of a verified TES species occurrence after project award, the appropriate LOPs would apply. Other mitigations may take place as agreed upon by the Sale Administrator and District Wildlife Biologist.

Known Populations: In areas of known populations of TES amphibians, apply direction from the HFQLG FEIS/ROD and the SNFPA ROD. Apply additional protection measures as follows: do not burn slash piles within RHCAs during the LOP and when burned, assure that 1) no fuel is dumped on the pile and fusees or a single torch is used to light the pile and 2) light piles from a single location rather than multiple locations, allowing sheltering amphibians to escape.

Down wood and snags

Down wood and snag retention would follow the Standards and Guides in Table 2 of the 2004 SNFPA ROD.

Down Wood: Within westside vegetation types, generally retain an average of 10-15 tons (> 15' diameter) of large down wood per acre over the treatment unit. Within eastside vegetation types, an average of 3 large down logs would generally be retained per acre. In areas considered deficient in large woody debris, wherever possible leave cull logs at the stump rather than being skidded to the landing. The Sale Administrator and the District Wildlife Biologist would agree upon the location and amount.

Snags: Snag retention levels would be determined on an individual, project basis; however, they would consider the guidelines set forth in the Standards and Guides (USFS 2004). The Guidelines state that projects would retain 4 of the largest snags per acre in westside mixed conifer and ponderosa pine types; 6 of the largest snags per acre in the red fir forest type; 3 of the largest snags per acre in the eastside and eastside pine types; and 4 of the largest snags in westside hardwood ecosystems. Wherever possible, use snags larger than 15"dbh to meet these guidelines.

Cultural Resources

The proposed project has the potential to affect cultural resources. As outlined in the Programmatic Agreement, the following protection measures would be implemented, as appropriate, for all cultural resources located within the project area. The application of the following protection measures would result in the project having "no effect" on cultural resources and the Forest would have taken into account the effect of the project on cultural resource sites in compliance with the Programmatic Agreement and Section 106 of the NHPA.

If any unrecorded cultural resources (artifacts, features, or sites) are encountered as a result of project operations, all activities in the vicinity of such finds would immediately cease pending an examination by the District Archaeologist.

- At a minimum, cultural resource sites shall be excluded from areas where activities associated with the project would occur.
  1. All proposed activities, facilities, improvements and disturbances shall avoid cultural resource sites. Avoidance means that no activities associated with the project that may affect cultural resource sites shall occur within a site's boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid cultural resource sites.
  2. All known cultural resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect cultural resource sites.
  3. Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of cultural resource sites (e.g., historic buildings or structures; historic or cultural properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
  4. When any changes in proposed activities are necessary to avoid cultural resource sites, e.g., project modifications, these changes shall be completed prior to initiating any activities.
  5. Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.
  6. Upon approval of the Forest or District Archaeologist, low intensity underburning may be allowed over selected prehistoric sites as long as fuel loads are relatively light.
  7. The Forest or District Archaeologist may approve the use of mechanical equipment to remove brush or woody material from within specifically identified areas within site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with the Archaeologist's authorization of certain equipment types within site boundaries.
  8. Upon approval of the Forest or District Archaeologist, existing breaches within linear sites may be designated on the ground and reused for project activities.
  9. Roads and trails that currently overlie historic linear sites may continue to be used as transportation routes without notification. However, if there are activities that would change the morphology of the existing road or trail (that is overlaying a historic linear site), these activities need to be reviewed by the Forest or District Archaeologist.
  10. Roads proposed to be restored that extend through archaeological sites would need to be blocked instead of sub-soiled.
  11. Vegetation may be removed within sites using hand tools, so long as ground disturbance is minimized and features are avoided. The removed vegetation shall not

be piled within site boundaries unless the location has been specifically approved by the Forest or District Archaeologist.

Visual Quality Management (Immediate Foreground of Visual Corridors)

Landing & Skid Trail Locations: To the extent feasible, locate landings and primary skid trails away from the immediate foreground of Sensitivity Level I and II travel corridors. Limit size of landings so that they are not visually evident from the sensitive travel routes following completion of treatment activities.
Stump Heights: Minimize stump heights in both mechanical and hand thinning units adjacent to sensitive travel corridors, typically resulting in stumps 6" or less in height within 300' of the travel corridor.
Tree Marking: During tree marking, open and enhance views of residual old growth trees near the visual corridor where possible.
Burn Piles & Underburning: Target consumption of burn piles to 95% or greater. Target underburn mortality levels of 5% or less.

Implementation

NEPA and Implementation: Within the project contract area, allow minor adjustments in boundaries of units if compatible with Forest Plan direction, the desired conditions and anticipated environmental effects disclosed by the project's NEPA document.

Range

Maintenance of Range Improvements: Range improvements would be protected from damage caused by the project. Contracts and burn plans would display where range improvements are located and include provisions to rebuild to standard any range improvements, which are damaged by the contractor. Range improvements for each allotment are listed in Part 3 of the permittee's Term Grazing Permit.
Coordination with Range Conservationist: The Forest Service Contract Administrator and the Forest Service Prescribed Burn Manager should coordinate with the Forest Service Range Conservationist early each spring to discuss the portions of the project that would be implemented that year. The Forest Service Range Conservationist should discuss those project activities in the Annual Operating Instructions meeting with the permittee prior to the District Ranger's approval of that year's Annual Operating Instructions.

Appendix C: Cumulative Effects Analysis displaying present and future foreseeable projects on the Ingalls Project area.

Introduction

According to the Council on Environmental Quality (CEQ) NEPA regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and alternatives, this analysis, with the exception of hydrology relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects. This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the Proposed Action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions may ignore the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." For these reasons, the analysis of past actions in this section is based on current environmental conditions.

Most of the specialists use the aforementioned cumulative effects analysis rationale, with the exception of watershed, where past actions over a 30-year period are used as an input to the Equivalent Roaded Acre analysis model. A list of past treatment types, year and acres are provided in a separate table.

The cumulative effects analysis areas vary depending on the specialist doing the analysis (Appendix C, Figure C.1). Botany, Soils, Cultural Resources, Fuels and Forest Vegetation use the Project area. Hydrology uses the combined Watershed boundaries. Wildlife goes out two PACs away from the project area. Noxious weeds are analyzed using a one-mile buffer around the project area.

Additionally, the potential for Defensible Fuel Profile Zone maintenance would not be analyzed in the present and future foreseeable cumulative effects analysis. There are no current plans to maintain the DFPZ, therefore any discussion of such activities would be qualitative, in other words, we have no knowledge of which acres or types of maintenance treatment would need to be performed. Moreover, the Forest has no idea how budgets would look in the future and whether we would be able to afford to maintain the DFPZ network. Any future work would require a new decision, since this environmental analysis only covers one entry.

Ingalls Project area (17,866 acres) —The boundary was used to assess impacts that extend beyond areas of actual treatment but do not extend outside the assessment area. The effects considered at this level include snags, down wood levels, seral stage distribution, stream condition, road density and condition, threatened and endangered species, archeological sites, noxious weed presence and fuel loading.

Extended Area —The boundary is used to assess impacts at the landscape scale and varies by the resource being analyzed (Figure 9 of the Ingalls EA). These projects are adjacent to the Project Area, falling outside the project area. The typical effects considered at this level are the amount and distribution of wildlife habitat, watershed and fishery condition, the potential for large fires and noxious weed spread. Acreages in this portion of the table reflect the combined geographic boundary between the various specialists.

Table C.1 is a compilation of the present and future-foreseeable actions that may be occurring within the largest combined extent of all of the cumulative effects analysis areas combined (Appendix C, Table C.1).

Table C 1. Present and future foreseeable projects within the Ingalls Project area and extended boundary. The extended boundary is the largest combined extent of all the cumulative effects analysis area.

Project Name	Year	Acres	Treatment Type	Misc
Ingalls Project area				
Present and Future-Foreseeable Projects				
Grizzly Valley Allotment	On-going		Active range allotment	
Grizzly Valley Community Allotment	On-going		Active range allotment	
Chase Allotment	On-going		Active range allotment	
Great Gray Owl Treatment Unit		146 acres	Improve habitat for great gray owl	
Fuelwood Gathering	2009	Entire District	153 commercial woodcutting permits for 1,228 cords of wood. 983 personal woodwoodcutting permits for 3,051 cords of wood.	No Hardwood Removal. Typically cord wood consists of down logs within the forest, along forest roads, and within cull decks created by past logging

				operations, or as standing snags.
Christmas Tree Cutting Program	2009	Entire District	5,443 permits	This consists of the trees ≤ 6 inches in diameter (measured at the ground) being removed generally along or within a short distance from open roads.
Lightening Tree Campground			campground	
Recreation				Dispersed camping, hunting, fishing, hiking, mining and OHV use.
Lake Davis Trail Phase 2	2011-2012	4.7 miles	Trail segment starting at Lightening tree campground to	
Red Clover Poco Watershed Project	2011-2012		Maintenance and road work.	
Red Clover Poco Pond and Plug Repair	2011		Stream channel repair	
Red Clover Prop 50 watershed restoration work	2011		Stream channel stabilization	
Blakeless underburn	2011	135 acres	Underburn	
Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement	2010	0.58 miles	Route addition: 12M07 13M36	
Extended Boundary				
Present and Future Foreseeable Projects				
Grizz Project EA	Not under contract	359 acres		
Walker Timber Sale (Grizz Project EA)	Under Contract 2010	684 acres	Mechanical Thinning	
Grizz Stewardship (Grizz Project EA)	Under Contract 2010	572 acres	Mechanical Thin, Masticate/Grapple Pile	
Freeman Project EIS	Not under contract	489 acres		
Freeman Timber Sales (Decision 2006, Freeman Project EIS)	Started 2006, not all implemented	256 acres	DFPZ, Area Thin and Group Selection	
Freeman Stewardship	2010 and 2011	423 acres	DFPZ and Area Thin	
Fuelwood Gathering	2009	Entire District	153 commercial woodcutting permits for 1,228 cords of wood. 983 personal woodwoodcutting permits for 3,051 cords of wood.	No Hardwood Removal. Typically cord wood consists of down logs within the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags.
Christmas Tree Cutting Program	2009	Entire District	5,443 permits	This consists of the trees ≤ 6 inches in diameter (measured at the ground) being removed generally along or within a short distance from open roads.

Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement	2010	1.3 miles	Route addition: 12M35 12M08 13M04	

Appendix D. Unit Descriptions and Proposed Transportation Activities

Appendix D 1. Unit by unit descriptions for the Ingalls Project Alternative 1 (Proposed Action).

Unit Number	Type	Prescription	Groups	Acreage
001	Area Thin	Mechanical Thin	yes	264.3
002	Area Thin	Mechanical Thin	yes	31.1
003	Aspen/Cottonwood	Mechanical Thin		11.2
004	Area Thin	Mechanical Thin	yes	46.3
005	Aspen/Cottonwood	Mechanical Thin		12.0
006	Area Thin	Mechanical Thin	yes	28.1
007	Area Thin	Mechanical Thin	yes	38.9
008	Aspen/Cottonwood	Mechanical Thin		1.5
009	Aspen/Cottonwood	Mechanical Thin		1.5
010	Area Thin	Mechanical Thin	yes	50.9
011	Area Thin	Mechanical Thin	yes	16.0
012	Aspen/Cottonwood	Mechanical Thin		9.5
013	DFPZ	Mechanical Thin		53.5
014	DFPZ	Hand Thin with Underburn		50.6
015	DFPZ	Mastication		82.4
15A	DFPZ	Mechanical Thin		12.2
15B	DFPZ	Mechanical Thin		34.9
016	DFPZ	Underburn		50.3
017	DFPZ	Hand Thin with Underburn		48.4
018	DFPZ	Grapple Pile with Hand Thin		30.3
18A	DFPZ	Mechanical Thin		8.6
18B	DFPZ	Mechanical Thin		3.3
18C	DFPZ	Mechanical Thin		3.0
019	Aspen/Cottonwood	Mechanical Thin		35.1
020	DFPZ	Mechanical Thin		16.1
021	DFPZ	Mechanical Thin		83.7
022	DFPZ	Mechanical Thin		94.4
023	DFPZ	Mastication		83.6
024	DFPZ	Mechanical Thin		118.7
025	DFPZ	Hand Thin with Underburn		90.9
026	DFPZ	Mechanical Thin		30.3
027	DFPZ	Mechanical Thin	yes	92.6
028	DFPZ	Grapple Pile with Hand Thin		32.9
029	DFPZ	Mechanical Thin		30.6
030	DFPZ	Mechanical Thin		48.0
031	DFPZ	Grapple Pile with Hand Thin		46.4
032	DFPZ	Mechanical Thin		44.2
033	DFPZ	Mechanical Thin	yes	60.5
034	Area Thin	Mechanical Thin		52.5
035	Area Thin	Mechanical Thin		58.6
036	DFPZ	Underburn		84.8
037	Aspen/Cottonwood	Mechanical Thin		11.1
038	Aspen/Cottonwood	Mechanical Thin		4.0
039	Aspen/Cottonwood	Mechanical Thin		2.3
040	DFPZ	Hand Thin with Underburn		165.7
041	Aspen/Cottonwood	Mechanical Thin		18.8

Unit Number	Type	Prescription	Groups	Acreage
042	DFPZ	Mechanical Thin		107.1
043	DFPZ	Hand Thin with Underburn		117.6
044	DFPZ	Underburn		35.1
045	DFPZ	Hand Thin with Underburn		186.4
046	DFPZ	Mechanical Thin		30.2
047	DFPZ	Underburn		172.8
048	DFPZ	Mechanical Thin		59.3
049	DFPZ	Hand Thin with Underburn		120.3
050	DFPZ	Mechanical Thin		263.3
051	DFPZ	Mechanical Thin		18.8
052	DFPZ	Mechanical Thin		18.3
000	DFPZ	No Treatment		156.5
000	DFPZ	No Treatment		81.8
000	DFPZ	No Treatment		13.4
000	DFPZ	No Treatment		38.9
000	DFPZ	No Treatment		30.0
000	DFPZ	No Treatment		152.3
000	DFPZ	No Treatment		1.7
000	DFPZ	No Treatment		38.8
000	DFPZ	No Treatment		85.2
000	DFPZ	No Treatment		61.5
000	DFPZ	No Treatment		26.8
000	DFPZ	No Treatment		83.9

Appendix D 2. Unit by unit description for the Ingalls Project Alternative 3.

Unit Number	Type	Prescription	Groups	Acreage
001	Area Thin	No Treatment		264.3
002	Area Thin	No Treatment		31.1
003	Aspen/Cottonwood	No Treatment		11.2
004	Area Thin	No Treatment		46.3
005	Area Thin	No Treatment		12.0
006	Area Thin	No Treatment		28.1
007	Area Thin	No Treatment		38.9
008	Aspen/Cottonwood	No Treatment		1.5
009	Aspen/Cottonwood	No Treatment		1.5
010	Area Thin	No Treatment		50.9
011	Area Thin	No Treatment		16.0
012	Aspen/Cottonwood	No Treatment		9.5
013	DFPZ	Mechanical Thin		53.5
014	DFPZ	Hand Thin with Underburn		50.6
015	DFPZ	Mastication		82.4
15A	DFPZ	Mechanical Thin		12.2
15B	DFPZ	Mechanical Thin		34.9
016	DFPZ	Underburn		50.3
017	DFPZ	Hand Thin with Underburn		48.4
018	DFPZ	Grapple Pile with Hand Thin		30.3
18A	DFPZ	Mechanical Thin		8.6
18B	DFPZ	Mechanical Thin		3.3
18C	DFPZ	Mechanical Thin		3.0
019	Aspen/Cottonwood	No Treatment		35.1
020	DFPZ	Mechanical Thin		16.1
021	DFPZ	Mechanical Thin		83.7

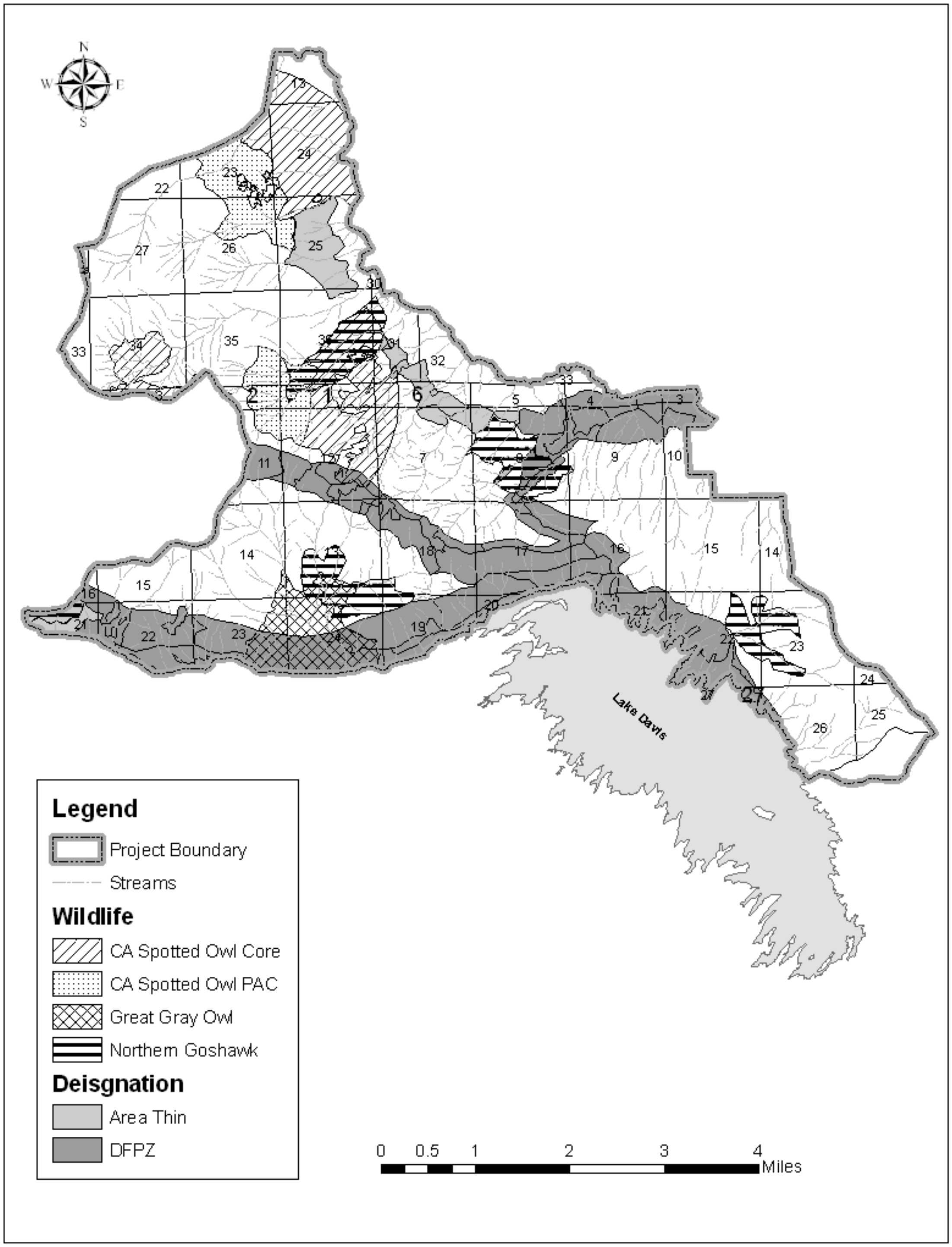
Unit Number	Type	Prescription	Groups	Acreage
022	DFPZ	Mechanical Thin		94.4
023	DFPZ	Mastication		83.6
024	DFPZ	Mechanical Thin		118.7
025	DFPZ	Hand Thin with Underburn		90.9
026	DFPZ	Mechanical Thin		30.3
027	DFPZ	Mechanical Thin	yes	92.6
028	DFPZ	Grapple Pile with Hand Thin		32.9
029	DFPZ	Mechanical Thin		30.6
030	DFPZ	Mechanical Thin		48.0
031	DFPZ	Grapple Pile with Hand Thin		46.4
032	DFPZ	Mechanical Thin		44.2
033	DFPZ	Mechanical Thin	yes	60.5
034	Area Thin	No Treatment		52.5
035	Area Thin	No Treatment		58.6
036	DFPZ	Underburn		84.8
037	Aspen/Cottonwood	No Treatment		11.1
038	Aspen/Cottonwood	No Treatment		4.0
039	Aspen/Cottonwood	No Treatment		2.3
040	DFPZ	Hand Thin with Underburn		165.7
041	Aspen/Cottonwood	No Treatment		18.8
042	DFPZ	Mechanical Thin		107.1
043	DFPZ	Hand Thin with Underburn		117.6
044	DFPZ	Underburn		35.1
045	DFPZ	Hand Thin with Underburn		186.4
046	DFPZ	Mechanical Thin		30.2
047	DFPZ	Underburn		172.8
048	DFPZ	Mechanical Thin		59.3
049	DFPZ	Hand Thin with Underburn		120.3
050	DFPZ	Mechanical Thin		263.3
051	DFPZ	Mechanical Thin		18.8
052	DFPZ	Mechanical Thin		18.3
000	DFPZ	No Treatment		156.5
000	DFPZ	No Treatment		81.8
000	DFPZ	No Treatment		13.4
000	DFPZ	No Treatment		38.9
000	DFPZ	No Treatment		30.0
000	DFPZ	No Treatment		152.3
000	DFPZ	No Treatment		1.7
000	DFPZ	No Treatment		38.8
000	DFPZ	No Treatment		85.2
000	DFPZ	No Treatment		61.5
000	DFPZ	No Treatment		26.8
000	DFPZ	No Treatment		83.9

Appendix D 3. Road actions for the Ingalls Project Proposed Action.

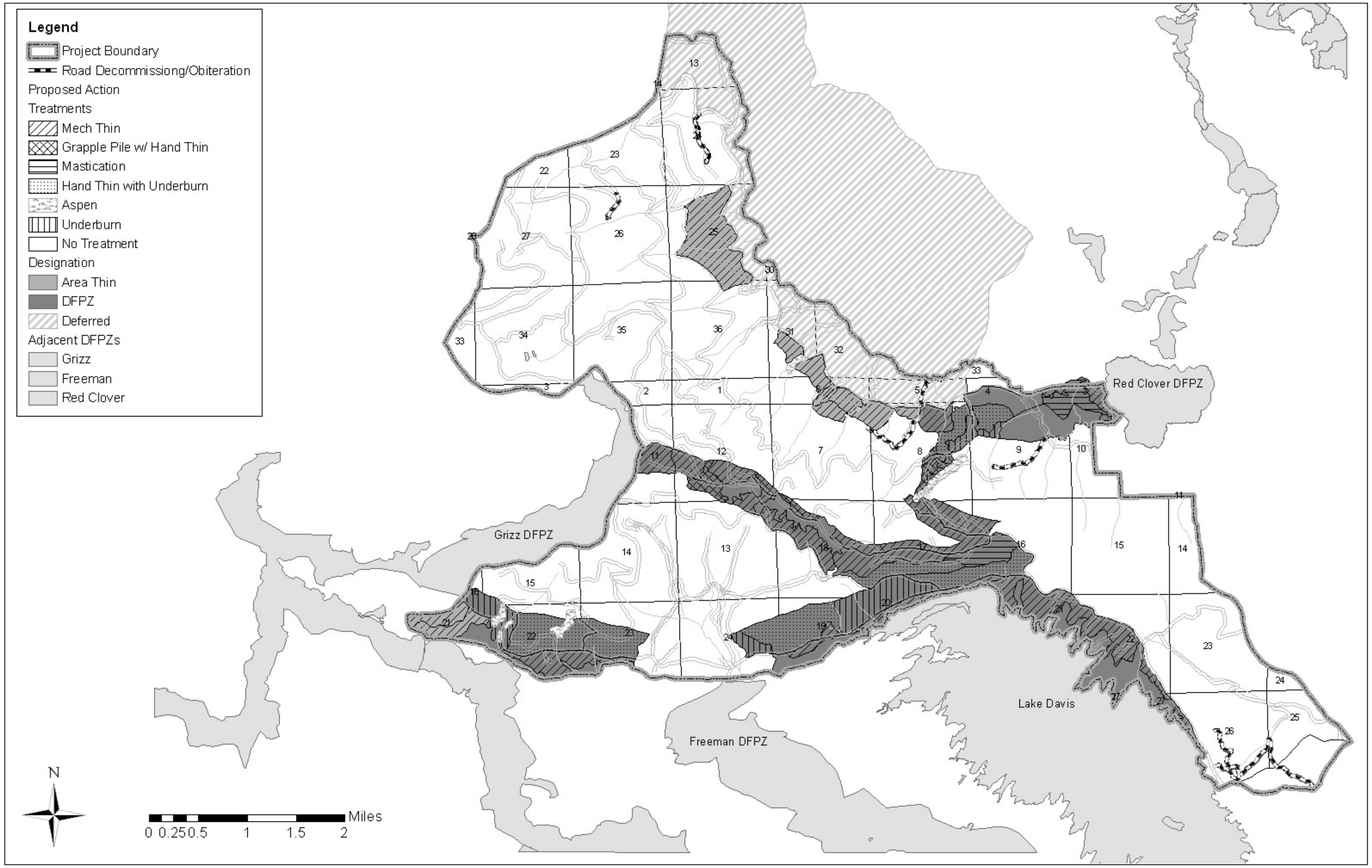
Road Number	Type	Length (Miles)
111A	Obliterate	0.7
111B	Obliterate	0.5
111C	Leave Open	0.6
Non-system road off 25N90	Obliterate	0.3
24N61Y	Decommission	1.7
25N49A2	Decommission	0.3

25N90	Restore	0.3
25N95B	Decommission	0.7
25N97	Decommission	0.6
Non-system	Reuse Temporary Road	6.9
Non-system	New Temporary Road	2.4

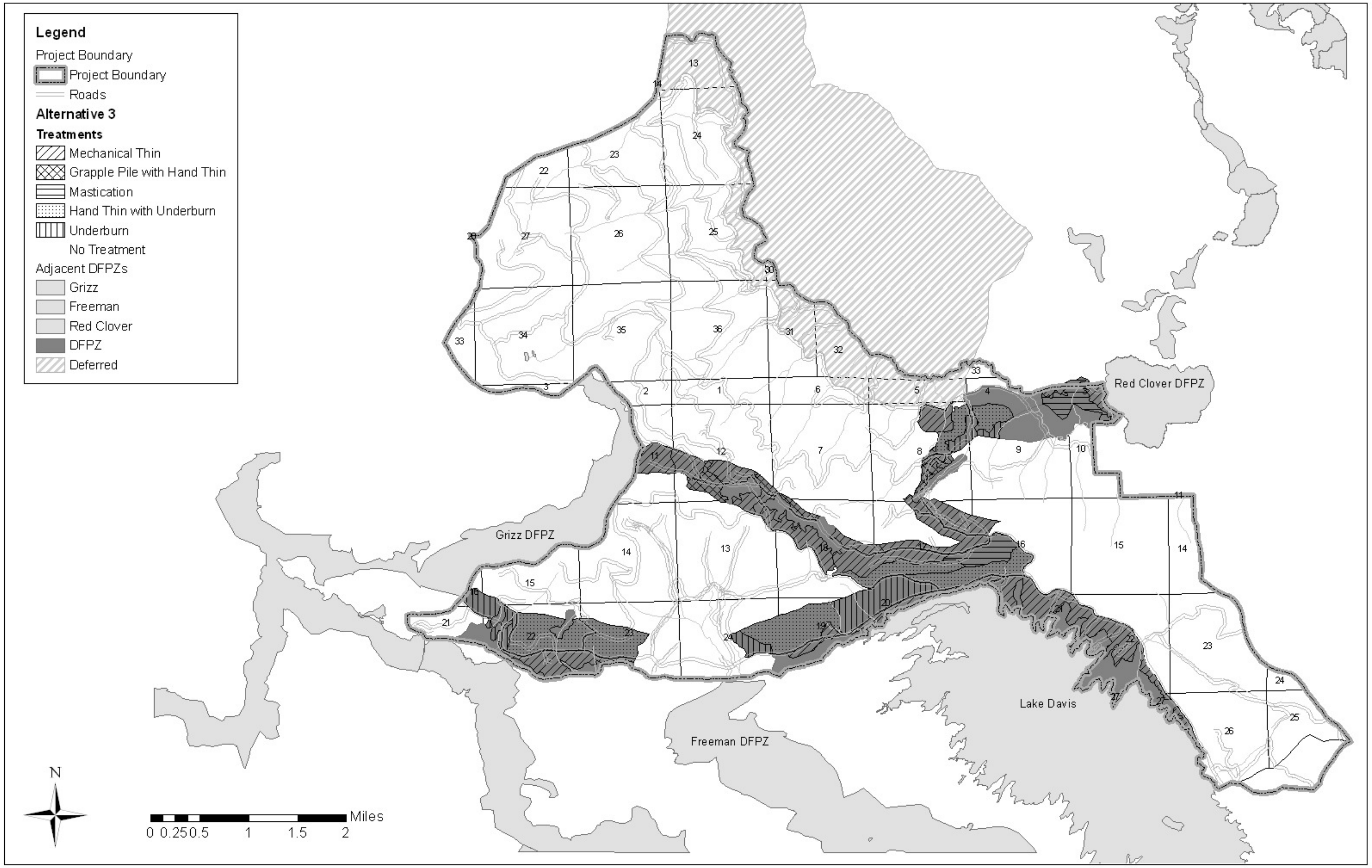
Appendix E. Maps and Figures



Appendix E-1. Wildlife map for Ingalls Project Area: Northern goshawk, California spotted owl protected activity center (PAC) and home range core area (HRCA), and great gray owl PAC, Plumas County.



Appendix E-2. Proposed Action for Ingalls Project.



Appendix E-3. Alternative 3 for Ingalls Project

Keddie Ridge Hazardous Fuels Reduction Project

Final Environmental Impact Statement

Mt. Hough Ranger District, Plumas National Forest

Plumas County, California

R5-MB-236a

Lead Agency:	**USDA Forest Service**
Responsible Official:	**Alice B. Carlton, Forest Supervisor** **P.O. Box 1150** **159 Lawrence Street, Quincy, CA 95971**
For Information Contact:	**Katherine Carpenter, Project Leader** **39696 Highway 70, Quincy, CA 95971** **(530) 283-7619**

Abstract: The *Keddie Ridge Hazardous Fuels Reduction Project Final Environmental Impact Statement* documents the analysis of the proposed action (alternative A), the no action alternative (alternative B), and three other action alternatives for modifying fire behavior, improving forest and watershed health, protecting and enhancing habitat for sensitive plants and wildlife, and reducing the spread and introduction of noxious weeds. To meet the purpose and need the following treatments have been proposed: Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments in the Indian Valley area. The preferred alternative, alternative A (proposed action) and collaboration alternative, is planned utilizing the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD), incorporating ideas and recommendations from interested parties, and includes ideas from the General Technical Report PSW–GTR-220 (USDA 2009). Within the 103,000 acre project area, alternative A proposes to construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs); implement 494 acres of area thinning (AT) outside of DFPZs, where 34 acres of area thinning treatments would occur within a bald eagle territory; construct 284 acres of group selection (GS) within DFPZ and AT units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. Alternative B proposes no action. Alternative C (non-commercial funding alternative) is required in all projects with purpose and needs that include fuels reduction and excludes any activities other than fuels reduction to meet the proposed purposes and needs. Alternative C proposes 5,431 acres of DFPZ construction and 522 acres of AT outside of DFPZs, while retaining all live trees greater than or equal to

12 inches diameter at breast height (DBH) in both DFPZs and AT units. Alternative D (2001 SNFPA ROD consistent alternative) was suggested for analysis during the scoping process; this alternative follows the direction and standards and guidelines in the 2001 SNFPA ROD. Alternative D would construct 4,976 acres of DFPZ; construct 467 acres of AT outside of DFPZ units, where 34 acres of area thinning treatments would occur within a bald eagle territory; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. Alternative E (2004 SNFPA ROD consistent alternative) was also requested for analysis during scoping and follows the direction and standards and guidelines in the 2004 SFNPA ROD. Alternative E would construct 5,112 acres of DFPZs; construct 513 acres of AT outside of DFPZ units; construct 328 acres of GS within DFPZ and AT units, where 34 acres of area thinning treatments would occur within a bald eagle territory; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 89 acres of noxious weed infestations using a combination of hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicide use is proposed under alternative E.

Objections will only be accepted from those who have previously submitted written comments specific to the project during scoping or other opportunity for public comment. Written, facsimile, hand-delivered, and electronic objections will be accepted for 30 calendar days following publication of a legal notice in the *Feather River Bulletin* (anticipated July 13, 2011). The publication date in the newspaper of record is the exclusive means for calculating the objection period for this proposal. Those wishing to object should not rely on dates or timeframe information provided by any other source. It is the responsibility of persons providing objections to submit them by the close of the objection period. Written objections must be submitted to: Randy Moore, Reviewing Official, USDA Forest Service, Regional Office R5, 1323 Club Drive, Vallejo, CA, or via facsimile to (707) 562-9229. The office business hours for those submitting hand-delivered objections are: 8:00 a.m. to 4:00 p.m., Monday through Friday, excluding holidays. Electronic objections must be submitted in a format such as an email message, plain text (.txt), rich text format (.rtf), portable document format (.pdf), or Word (.doc) to the following email address: appeals-pacificsouthwest-regional-office@fs.fed.us.

An objection must include: objector's name, address and phone number; signature or other verification of authorship upon request (scanned signature for electronic mail is acceptable); identification of the lead objector if multiple names are listed; the name of the proposed project; name and title of the Responsible Official, and name of the National Forest and/or Ranger District on which the proposed project will be implemented. It is the objector's responsibility to provide specific issues related to the project and to suggest remedies which would resolve the objection. Incorporation of documents by reference is not allowed.

Summary

The Plumas National Forest (PNF) proposes to implement the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) in order to modify fire behavior, improve forest and watershed health, protect and enhance habitat for sensitive plants and wildlife, and reduce the spread and introduction of noxious weeds through the following activities: Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments. The area affected by the proposal is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye. The Keddie Ridge Project boundary encompasses all or portions of T. 25 N., R. 9 E., sec. 1-4, 8-12; T. 25 N., R. 10 E., sec. 1-6, 8-16, 22-24; T. 25 N., R. 11 E., sec. 5-8, 17-19; T. 26 N., R. 8 E., sec. 1, 2, T. 26 N., R. 9 E., sec. 1-17, 20-29, 32-36, T. 26 N., R. 10 E., sec. 1-36; T. 26 N., R. 11 E., sec. 2-10, 15-20, 30-32; T. 27 N., R. 8 E., sec. 1, 12, 14-15, 26-27, 34-36; T. 27 N., R 9 E., sec. 5-11, 13-36; T. 27 N., R. 10 E., sec. 2-5, 8-10, 14-36; T. 27 N., R. 11 E., sec. 27, 28, 31-34; T. 28 N., R. 10 E., 33-35, MDBM.

The Mt. Hough Ranger District has designed the project proposal to move the landscape from current toward desired conditions. There is a need for fire behavior to be modified in specific stands in order to reduce high fuel loading and resulting increased risks to people, structures, and resources. There is a need for forest health to be improved because current high stand densities in the Keddie Ridge Project area are leading to mortality from drought, insects, and fire. Overcrowded stands and high fuel loads reduce the quality of the habitat for three Region 5 Forest Service sensitive plant and wildlife species (clustered lady's-slipper orchid, Constance's rock cress, and bald eagle) and increase the risk of high severity, stand-replacing wildfire. There is a need to improve watershed health. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat. The presence of highly invasive noxious weeds, including Canada thistle, Scotch broom, medusahead, yellow starthistle, and hoary cress, greatly increases the need for control measures to reduce the risk of weed introduction, establishment, and spread.

The desired conditions for fuels and forest health include an uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. This forest structure has a lower probability of crown fire initiation and spread under 90th percentile weather conditions. The desired condition within clustered lady's slipper sites is a fire-resilient forest with sufficient canopy cover that allows for filtered light conditions on the forest floor; a diversity of plants in the understory; adequate soil moisture and duff levels; and the maintenance of soil mycorrhizal (fungal) relationships. The desired condition for Constance's rock cress is a habitat characterized by serpentine soils, open tree canopy, and reduced levels of litter and duff; these conditions promote the expansion of individuals into sites that are currently unsuitable. The desired condition for bald eagles is to provide uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches DBH with overstory canopy cover of 40-60 percent. National Forest System (NFS) roads should ensure safe travel for forest users, and provide a transportation system that is adequate for all resource management needs. The desired condition for noxious weeds is to prevent the introduction and

establishment of new weeds and to contain and control established infestations so that high priority noxious weed species are reduced or eliminated.

The proposed action is designed to meet the standards and guidelines for land management activities described in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b).

The Keddie Ridge Project was originally scoped in December 2006 and was being planned under authorization of the Healthy Forest Restoration Act (HFRA) (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process). At the time, the direction for HFRA projects was to use The Healthy Forests Initiative and Healthy Forests Restoration Act Interim Field Guide (USDA Forest Service and DOI Bureau of Land Management, FS-799, February 2004). The HFRA field guide included a decision diagram that helped determine whether a project meets the definition of “authorized” or “covered” by the HFRA. It was difficult to discern from this field guide and the associated decision models if HFRA was the correct authority to use. Portions of the Keddie Ridge Project overlap with Wildland Urban Interfaces (WUIs), the project is within a municipal watershed, and there are no areas of blowdown, wind throw, or damage by ice storms. Originally portions of the project did not qualify for HFRA authority.

The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

Individuals and organizations that expressed interest during previous scoping efforts (December 2006) were contacted to schedule collaboration meetings. Twelve individuals and organizations continued to express interest in the Keddie Ridge Project. Meetings were held from July 31 through September 1, 2009 and included the following organizations: Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman’s Association, Sierra Access Coalition, and Sierra Forest Legacy. Collaboration efforts continued with the Quincy Library Group (QLG), Sierra Forest Legacy, and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association through April 2010.

An open house was held September 15, 2009 at the Mt. Hough Ranger District and nine individuals attended.

A Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register on April 1, 2010. Thirteen scoping letters were received.

A second open house was held June 16, 2010 at the Greenville Town Hall and seven individuals attended.

The Forest Service hosted a public field trip for all interested parties on May 26, 2010 and three individuals attended.

The Forest Service initiated an official 45 day comment period once the Notice of Availability was published in the Federal Register on February 4, 2011. A comment period notice was also published in the *Feather River Bulletin* on the following Wednesday, February 9, 2011. Ten comments were received from three agencies and seven organizations. A response to comments can be found in appendix G of this EIS. A compilation of comments received during the comment period is located in the project record at Mt. Hough Ranger District in Quincy, CA.

There were no significant issues that led the agency to develop alternatives to the proposed action. The three action alternatives, in addition to the proposed action, are required by court order or were requested during scoping.

Major conclusions include:

- Alternative A provides about 189 direct and indirect jobs and approximately $6.8 in employee related income. However, alternative A has a potential value to the US government 11 percent less than alternative E.
- Large woody debris guidelines would be met in areas proposed for treatment.
- Alternative A treatment activities would not cause any subwatersheds to exceed the Threshold of Concern.
- Alternative A may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the mountain yellow-legged frog, bald eagle, California spotted owl, Northern goshawk, American marten, or Pacific fisher.
- Alternative A would have no effect on two Federally listed species present on the Plumas National Forest, *Desmoceras californicus dimorphus* (valley elderberry longhorn beetle) or *Rana aurora draytonii* (California red-legged frog).
- Alternative A may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress). *Cypripedium fasciculatum* (clustered lady's-slipper), or *Lupinus dalesiae* (Quincy lupine).
- The proposed noxious weed treatments under alternatives A and D, which include manual removal, prescribed burning, and herbicide application, are expected to reduce or eliminate infestations of hoary cress, yellow starthistle, Canada thistle, and Scotch broom.
- Under alternative A, 100 percent of the stands treated would meet the desired condition for the reduction of fuels.
- Alternative A would enhance landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral conditions, and promoting the development of later seral conditions.

Given the purposes and needs, the Responsible Official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, select a different alternative, or take no action at this time.

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters, and includes appendices and an index:

- **Chapter 1. Purpose and Need for Action:** This chapter briefly describes the proposed action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a detailed description of the agency's proposed action as well as alternative actions that were developed in response to comments raised by the public during scoping. The end of the chapter includes a summary table comparing the proposed action and alternatives with respect to their environmental impacts.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- **Index:** The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of resource specific impacts, may be found in the project record located at the Mt. Hough Ranger District office, 39696 Highway 70, Quincy, CA 95971.

Introduction

This chapter describes the need for resource management activities in the proposed Keddie Ridge Hazardous Fuels Reduction Project area and identifies the project's geographical locations. This chapter also discusses the purposes, objectives, needs, and desired condition buffer widths based on stream types (USDA 1999b, page 2-11) for each proposed activity and the measurement indicators used in the analysis for each objective. The applicable laws, policies, and direction that influence the scope of this analysis are described in this chapter. This chapter also includes information about public involvement, scoping, and the concerns that guided the development of alternatives and the analyses of effects.

Background

Recent high-intensity wildfires fueled by overcrowded stand conditions have caused concern in local communities due to the potential for loss of life and property, timber values, water quality, and wildlife habitat. In the Moonlight and Antelope Complex fires of 2007, over 54,000 acres burned with stand-replacing high severity fire. Approximately 20 California spotted owl protected activity center (PACs) and their associated home range cores areas (HRCAs) were lost due to high severity wildfire effects and were removed from the Plumas National Forest PAC network. The resource values lost were tremendous and much of the existing landscape in the Keddie Ridge Project area resembles the conditions leading up to the fire season of 2007. The Keddie Ridge Project surrounds the communities of Crescent Mills, Greenville, Taylorsville, and all of Indian Valley. The landscape conditions coupled with the proximity of adjacent communities makes the Keddie Ridge Project a priority for treatment.

To address these concerns, the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD) allows for full implementation of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project. The HFQLG Act established certain vegetation management activities to be implemented in order to test their effectiveness in: reducing the potential size of wildfires, reducing risk to firefighters, and supplying timber for the economic stability of rural communities, while promoting ecological health of a forest through uneven-aged timber management.

Through collaboration with a wide array of stakeholders including the Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman’s Association, Sierra Access Coalition, Sierra Forest Legacy (SFL), Quincy Library Group (QLG), and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association, the Forest Service has identified the following project purposes and needs for action.

Purpose and Need for Action

Purpose 1: Reduce Hazardous Fuel Accumulation

Objective: Modify fire behaviorby reducing hazardous fuels to protect communities, fire fighters, and biological resources.

Need for Action: There is a need for the reduction of hazardous fuelaccumulations within the Keddie Ridge Project area. High densities of small and intermediate-sized trees and heavy fuel loads within forested stands contribute to hazardous accumulations of surface, ladder, and canopy fuels within the project area. These conditions are highly susceptible to crown fire initiation and spread under fire weather conditions, and increase the potential for high-severity stand-replacing fire events. This potential fire behavior leads to increased risk to communities and forest and riparian ecosystems within and adjacent to the Keddie Ridge Project area.

In areas where roads and landings are absent, construction of temporary roads and landings are needed to permit the removal and utilization of material.

Desired Condition: The desired condition is an uneven-aged , multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. This forest structure has a lower probability of crown fire initiation and spread under 90th percentile weather conditions.

Measures of modifying fire behavior include: predicted flame length s (feet), fire type (surface versus crown fire), and predicted mortality (percent basal area).

Purpose 2: Improve Forest Health

Objective: Modify forest structure, density, and species composition to improve forest health and promote the growth and development of a heterogeneous, uneven-aged, multistoried, fire-resilient forest.

Need for Action: There is a need for the improvement of forest health. The landscape within the project area is dominated by homogeneous, closed canopy mid-seral forests. These forests are characterized by high densities of small and intermediate-sized trees which contribute to stressed stand conditions due to competition for water, light, and nutrients. Growth of trees into larger diameters is limited due to competition and dense forested stands are more susceptible to mortality caused by drought, insects, disease, and fire.

In addition, these high stand densities create closed canopy conditions that are not favorable for regeneration, growth, and development of shade-intolerant and fire resistant species such as ponderosa pine. These shade-intolerant species require more sunlight from open canopy stands and gaps to regenerate successfully.

In areas where roads and landings are absent, construction of temporary roads and landings are needed to permit the removal and utilization of material.

Desired Condition: The desired condition is an uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Stand densities would generally be low, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrences. In addition, low density, open canopy forest conditions would promote the regeneration, growth, and development of fire-resistant shade intolerant species such as ponderosa pine and black oak, and would contribute to landscape heterogeneity.

Measures of modifying forest structure and species composition include: stand structure attributes (Trees per acre, basal area per acre, relative stand density, species composition (relative abundance of shade-intolerant species), and landscape structure (distribution of CWHR size class and density, average stand diameter, and percent of open canopy forest conditions created).

Purpose 3: Protect and Enhance Habitat for Region 5 Forest Service Sensitive Plant and Wildlife Species

Objective 1: Reduce the threat of high-severity, stand-replacing wildfire within clustered lady's-slipper orchid (*Cypripedium fasciculatum*) and bald eagle nesting habitats.

Objective 2: Modify forest conditions to enhance habitat and support the long-term viability of clustered lady's-slipper and Constance's rock cress (*Arabis constancei*).

Need for Action: Dense stands and high fuel loads increase the risk of high-severity, stand-replacing wildfire in both (a) the primary nesting zone of the Round Valley bald eagle territory and (b) the fourteen clustered lady's-slipper orchid sites located within project treatment units. High-severity wildfires decrease the quality of bald eagle nesting habitat by removing overstory nest structures. In addition, clustered lady's-slipper orchids are intolerant of high-severity fires that eliminate the duff layer or damage the orchid's underground stems. Closed canopy conditions created by high densities of small trees also contribute to a decline in habitat quality for clustered lady's-slipper and Constance's rock cress through decreased light to the forest floor and an increase in leaf litter and duff.

Desired Condition: The desired condition within clustered lady's slipper sites is a fire-resilient forest with sufficient canopy cover that allows for filtered light conditions on the forest floor; a diversity of plants in the understory; adequate soil moisture and duff levels; and the maintenance of soil mycorrhizal (fungal) relationships. The desired condition for Constance's rock cress is a habitat characterized by serpentine soils, open tree canopy, and reduced levels of litter and duff; these conditions promote the expansion of individuals into sites that are currently unsuitable. The desired condition for bald eagles is to provide uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches diameter at breast height (DBH) with overstory canopy cover of 40-60 percent. Protection and enhancement of nesting habitat by thinning smaller conifers would improve the growth of the residual ponderosa and sugar pines, while surface and ladder fuel reduction would protect the larger tree component for future nest trees.

Measures of reducing threat of high severity wildfire and habitat enhancement include: Region 5 Forest Service sensitive plants (number of occurrences and acres of habitat protected and enhanced) and Region 5 Forest Service sensitive wildlife (stand structure attributes—relative stand density, trees per acre by size class, basal area per acre, canopy cover, average stand diameter and species composition—relative abundance of shade-intolerant species).

Purpose 4: Improve Watershed Health

Objective: Reduce the number of improperly constructed or unmaintained roads.

Need for Action: There is a need for improved watershed health. Roads are the largest single human-caused source of sedimentation and habitat degradation within the project area. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat. The interdisciplinary team (IDT) process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A—Administration of the Forest Transportation System, 16 U.S.C. 551, 23 U.S.C. 205).

Desired Condition: Roads that are needed are maintained and improved to accommodate vehicle traffic. The proposed treatments would provide roads that would ensure safe travel for forest users, and provide a transportation system that is adequate for all resource management needs. Unneeded roads would be eliminated, closed, or obliterated in accordance with the 1988 Forest Plan, as amended, and Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD) (September 2010). Roads that are causing a high level of resource damage would be decommissioned or improved. Poorly located roads would be relocated to stable areas. Aquatic species would have access to suitable habitat and would not be restricted from that habitat by roads. Open road densities would be reduced to lessen the impact of roads on wildlife.

Measures of improving watershed health: number of stream crossings, miles of road decommissioned, and miles of road drainage disconnected from streams.

Purpose 5: Reduce Noxious Weed Infestations

Objective: Control the spread and introduction of noxious weeds.

Need for Action: Five invasive plant species of high management concern have been documented within the Keddie Ridge Project area. These include approximately 0.2 acre of hoary cress (*Cardaria draba*), 4 acres of Canada thistle (*Cirsium arvense*), 58 acres of yellow starthistle (*Centaurea solstitialis*), 0.1 acre of Scotch broom (*Cytisus scoparius*), and 45 acres of medusahead (*Taeniatherum caput-medusae*). Past efforts to control these weeds using manual treatment methods have not been effective. Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure. The large existing area occupied by weed species, coupled with the proposed ground-disturbing activities, greatly increase the potential for introduction and spread of noxious weeds.

Desired Condition: The desired condition is to prevent the introduction and establishment of new weeds and to contain and control established infestations so that high priority noxious weed species are reduced or eliminated.

Measures for controlling the spread and introduction of noxious weeds: risk of invasion and spread; effectiveness of the proposed weed treatments; number and acres of noxious weed infestations treated.

Proposed Action

The actions proposed by the Forest Service to meet the purposes and needs are to construct 5,148 acres of Defensible Fuel Profile Zones (DFPZs) through a combination of mechanical thinning, hand thinning, masticating, and prescribed underburning treatments; construct 518 acres of area thinning (AT) outside of DFPZs; construct 287 acres of group selection (GS) within DFPZ and AT units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The proposed action is described in more detail in Chapter 2, Alternative A.

Decision Framework

Given the purposes and needs, the Responsible Official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, select a different alternative, or take no action at this time.

Forest Plan Direction

Forest Plan

The proposed action and alternatives are guided by the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b). In addition, the HFQLG/SNFPA Implementation Consistency Crosswalk, revised December 2007, provides clarification for applying standards and guidelines for 2004 SNFPA FSEIS and ROD (USDA 2004a, 2004b) and for HFQLG FEIS and ROD (USDA 1999a, 1999b, 2003a 2003b) (HFQLG/SNFPA Implementation Consistency Crosswalk and cover letter, December 12, 2007) (USDA 2007a). This project is being planned under authorization of the Healthy Forest Restoration Act (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process).

Land allocations within the Plumas National Forest have been allocated to certain primary uses through three planning processes: the original PNF LRMP (USDA 1988) development process, the HFQLG FEIS, FSEIS, and RODs (USDA 1999a, 1999b, 2003a, 2003b), and the SNFPA ROD (USDA 2004a, 2004b). Each of these plan components includes standards and guidelines for land and resource management unique to each land allocation. Many of these allocations overlap. During the life of the HFQLG Act Pilot Project, HFQLG land allocations are to be employed for vegetation management projects, with one exception (SNFPA ROD allocation for Northern goshawk PACs).

Certain allocations (called prescriptions) in the PNF LRMP are still applicable in whole or in part, because they were not superseded by three amendments. Those allocations still in effect for the Keddie Ridge Project area are included in appendix J of this EIS and discussed further below.

The PNF LRMP (USDA 1988) displays management areas, which include descriptions, standards and guidelines, prescription allocations, and management objectives specific to each management area (page 4-113). Management areas that overlap with the Keddie Ridge Project area include: Rich (#20), Grizzly Ridge (#23), Butt Lake (#26), Indian Valley (#27), Lights Creek (#28), Antelope (#29), and Ward (#30). Management areas that overlap with proposed treatment units within the Keddie Ridge Project area include: Indian Valley (#27) and Lights Creek (#28). Because Rich, Grizzly Ridge, Butt Lake, Antelope, and Ward do not overlap with treatment units and very small portions of the management areas overlap with the Keddie Ridge Project area, these management areas are removed from further discussion. Of the management areas that overlap with proposed treatment units, prescription allocations that apply include: Rx5-Recreation Area Prescription; Rx3-Special Interest Areas Prescription; Rx6-Developed Recreation Site Prescription; Rx7-Minimal Management Prescription; Rx8-Semi-Primitive Area Prescription; Rx10-

Visual Retention Prescription; Rx13-Goshawk Habitat Prescription; Rx14-Visual Partial Retention Prescription; Rx 15-Timber Emphasis Prescription; and Rx16-Intensive Ranger. Areas of general direction and standards and guidelines are located on pages 4-274 – 4-293 and in appendix J of this EIS.

Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the Department of the Interior and Related Agencies Appropriations Act, including section 401—the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of group selection across the Pilot Project Area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA 1999b). The Record of Decision amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG Final Supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA 2003b). In February 2003, the Department of the Interior and Related Agencies Appropriations Act was signed and extended the HFQLG Pilot Project legislation by another five years. The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

The 1999 HFQLG Record of Decision (pages 8-10) displays the changes in management direction applicable to the HFQLG Pilot Project Area. Amendments to the PNF LRMP are discussed in detail in the HFQLG Final Environmental Impact Statement on pages 2-6 – 2-18. Land allocations that apply to the Pilot Project area include offbase and deferred lands, late-successional old-growth stands (ranks 4 and 5), California spotted owl protected activity centers (PAC), spotted owl habitat areas (SOHA), riparian habitat conservation areas (RHCAs), and the National Forest System (NFS) lands outside these allocations that are available for vegetation and fuels management activities.

NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 8-10 of the HFQLG ROD, pages 2-6 – 2-18 of the HFQLG FEIS, and appendix J of this EIS.

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA Final Supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA Final Supplemental EIS.

The 2004 Record of Decision on the SNFPA Final Supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires would lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

The 2004 SNFPA Record of Decision (pages 68 and 69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposal, in addition to the PNF LRMP and HFQLG ROD and FEIS, include California spotted owl home range core areas (HRCAs), Northern goshawk PACs, wildland urban interface (WUI), and extended WUI.

NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 68 and 69 of the SNFPA ROD (Table 2) and appendix J of this EIS.

Public Involvement

The Keddie Ridge Project has been listed in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) since December 6, 2006. A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Keddie Ridge Project was published in the Federal Register on Thursday, April 1, 2010. The notice asked that comments on the proposed action be received by Friday, April 16, 2010. The purpose of the scoping process was to inform the public about the proposed action and purpose and need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period. In addition, as part of the public involvement process and collaboration requirements under the Healthy Forest Restoration Act (HFRA), the Forest Service held two open houses – September 15, 2009 at Mt. Hough Ranger District in Quincy, California and June 16, 2010, at Greenville Town Hall in Greenville, California. Announcements for each open house were published in the *Feather River Bulletin* and informational flyers were sent to the Plumas National Forest key contacts, including media. The Forest Service also held individual collaboration meetings with interest groups from July throughout April 2010 and hosted a field trip for all interested parties on May 26, 2010.

One verbal and thirteen written comments on the proposed action were received during the scoping period. The scoping comments and issues presented in the comments are summarized in appendix G of this EIS. A compilation of scoping comments is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The following individuals, organizations, and agencies provided scoping comments on the proposed action and/or comments during the official 30 day scoping period:

- Darca Morgan, Craig Thomas, and Pat Gallagher, Sierra Forest Legacy
- Michael DeSpain, Mechoopda Indian Tribe of Chico Rancheria
- Tom Downing, Sierra Pacific Industries
- Melany Johnson, Susanville Indian Rancheria
- Ren Reynolds, Estom Yumeka Tribe of Enterprise Rancheria
- Stephanie Skophammer, U.S. Environmental Protection Agency
- Frank Stewart, Counties' Quincy Library Group Forester
- Hank Alrich
- Vanessa Vasquez, Californians for Alternatives to Toxics
- Dixie Dursteler-Harrington
- Chad Hanson, John Muir Project
- Steven Brink, California Forestry Association
- Rex Fisher
- Jerry Hurley, Plumas County Fire Safe Council

The Forest Service initiated an official 45 day comment period once the Notice of Availability was published in the Federal Register on February 4, 2011. A comment period notice was also published in the *Feather River Bulletin* on the following Wednesday, February 9, 2011. Ten comments were received from three agencies and seven organizations. A response to comments can be found in appendix G of this EIS. A compilation of comments received during the comment period is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The following individuals, organizations, and agencies provided comments during the official 45 day comment period:

- Tom Downing, Sierra Pacific Industries
- Kathleen Goforth, U.S. Environmental Protection Agency
- Bill Wickman, American Forest Resource Council
- Karina Silvas-Bellanca, Craig Thomas, Pat Gallagher, and Darca Morgan, Sierra Forest Legacy
- Chad Hanson, John Muir Project
- Bill Wickman, Plumas County Economic Recovery Committee
- John Sheehan, Plumas Corporation
- Frank Stewart, Counties' Quincy Library Group Forester
- Patricia Sanderson Port, United States Department of the Interior

The final EIS (FEIS) will be sent to agencies, organizations, and individuals that submitted comments throughout the project planning process, individuals who requested a copy, and thirteen reviewing agencies (listed in chapter 4 of this EIS).

Issues

Comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. Issues are phrased as cause-effect relationships, the concept of describing a specific action and the environmental effect(s) expected to result from that action applies whether one is using an EA or an EIS. Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. The Mt. Hough Interdisciplinary Team (IDT) separated the issues into two groups: significant and non-significant. Significant issues were defined as those where there may be a cause-effect relationship between a proposed action and a significant effect and the disclosure of that effect is documented in an EIS. Non-issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. Non-significant issues were identified as those not resulting in a significant effect. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…". A list of non-significant issues and reasons why they were found non-significant may be found in the project record located at the Mt. Hough Ranger District in Quincy, CA.

As for significant issues, the Forest Service did not identify any significant issues during scoping. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. A list of issues and non-significance determinations from comments is available in appendix G of this EIS. Two alternatives, D and E, were requested by commenters who submitted scoping comments during the scoping period.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project). It describes both alternatives considered in detail and those eliminated from detailed study. The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

Alternatives Considered in Detail

Based on requests identified through public comment on the proposed action, the Forest Service developed two alternative proposals that achieve the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a no action alternative and a non-commercial funding alternative. The proposed action, other action alternatives, and the no action alternative are described in detail below.

Alternative A

The Proposed Action – Collaboration Alternative (Preferred Alternative)

Collaboration is required under the Healthy Forest Restoration Act. Collaboration should occur when developing the proposed action. In collaboration, stakeholders work together to: 1) identify and better understand each other's interests, and 2) refine project design so as to better meet all interests within the Responsible Official's decision space and criteria. Ideas and suggestions received during the scoping period were applied to this alternative where appropriate and applicable.

Individuals and organizations that expressed interest during previous scoping efforts (December 2006) were contacted to schedule collaboration meetings. Twelve individuals and organizations expressed interest in the Keddie Ridge Project. Meetings were held from July 31 through September 1, 2009 and included the following organizations: Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman's Association, Sierra Access Coalition, and Sierra Forest Legacy. Collaboration efforts continued with the Quincy Library Group (QLG), Sierra Forest Legacy, and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association through April 2010.

Many variables were considered in developing the proposed action and associated treatment unit specific prescriptions, such as purpose and need, proposed treatment, California Wildlife Habitat Relationship (CWHR) system type, size, and density, land allocation, visual quality objectives, and guidance from the General Technical Report PSW–GTR-220, *An Ecosystem management Strategy for Sierran Mixed-Conifer Forests* (USDA 2009).

Unit specific prescriptions and maps are located in appendix B, and address Riparian Habitat Conservation Areas (RHCAs), and California Wildlife Habitat Relationship (CWHR) system specific canopy cover (CC), general retention size for trees, and post-treatment underburning.

Each prescription is unique and the variables that change are: canopy cover (CC), general retention size for trees, and the land allocation for which these variables apply. Overall, the proposed action applies more restrictive prescriptions to RHCAs, CWHR 5M/5D, and California spotted owl home range core area (HRCA) land allocations, as they relate to CCs and general retention size for trees.

Under alternative A, Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments, would be implemented to accomplish the purpose and need. All live trees greater than or equal to 30 inches diameter at breast height (DBH) would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within specific units, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease. Approximately 5,175 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance’s rock cress habitat and five acres of clustered lady’s slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent canopy cover (CC), retain all live trees greater than or equal to 30 inches DBH; **except** in **CWHR 5M/5D**, thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (824 acres).
    - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (255 acres).

  - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (870 acres).
  - Thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH, and underburn (180 acres).
  - Thin to 30-50 percent CC, generally retain live trees greater than or equal to 12 inches DBH, and underburn (206 acres).
  - In units 45, 46, 49, and 50, apply borax to pine stumps greater than 14 inches diameter within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 494 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-24 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
  - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (262 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Group Selections (GSs)

Group selection is proposed in mechanical thinning units within DFPZs and AT units (284 acres) using mechanical equipment. Group selection involves harvest of trees less than 30 inches in diameter in small (0.5 to 2 acres) patches. All live trees greater than or equal to 30 inches DBH would be retained. Healthy, vigorous, undamaged, shade intolerant trees 20 inches in diameter and greater would be considered for retention for seed tree and forest structure purposes, where appropriate. Within units 45, 46, 49, and 50, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, would be proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: out sloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips to sufficiently disconnect the road drainage system from nearby stream channels would be determined by District watershed staff. Refer to appendix C for a list of these roads.

Noxious Weeds

Five noxious weed species would be treated using a combination of herbicide applications, manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The number of acres proposed for each treatment (or combination of treatments) is provided in Table 1. It is important to note that the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years). Species specific noxious weed treatments proposed under alternative A are included in Table 2.

Table 1. Noxious Weed Treatments and Acres Proposed under Alternatives A and D

Treatment	Acres
Rx 1: aminopyralid	16
Rx 1: aminopyralid / Rx 3: spring underburn	45
Rx 2: glyphosate	0.8
Rx 2: glyphosate / Rx 3: spring underburn	0.2
Rx 3: spring underburn	45
Rx 4: hand pull	0.2
Total	107

Table 2. Proposed Treatments for Noxious Weeds under Alternatives A and D

Noxious Weed Species	Proposed Treatments
Centaurea solstitialis **(yellow starthistle)**	Approximately 58 acres would be treated with the herbicide aminopyralid. Spring underburning and/or revegetation using native seed would be considered within treatment units at a site-specific level. Follow-up treatments would include a combination of hand pulling, cutting with a hand-held string trimmer (i.e. weed whacker), or flaming with a propane torch. Revegetation of treated sites using native seed would be considered at a site-specific level.
Taeniatherum caput-medusae **(medusahead)**	Spring underburning would be used as a treatment on approximately 45 acres. Infestations that are considered to be a high risk for spread (i.e. on roads and landings) may be treated by flaming with a propane torch. Revegetation of treated sites using native seed would be considered at a site-specific level.
Cirsium arvense **(Canada thistle)**	Treatment would include the application of two herbicides: approximately 3.5 acres of aminopyralid (in upland areas) and 0.8 acre of glyphosate (in lowland areas). Underburning and/or revegetation of treated sites using native seed would be considered at a site-specific level.
Cardaria draba **(hoary cress)**	Approximately 0.2 acres would be treated with the herbicide glyphosate. Manual methods, such as hand pulling and digging, would be used as a follow-up treatment. Revegetation of treated sites using native seed would be considered at a site-specific level.
Cytisus scoparius **(Scotch broom)**	Treatment of approximately 0.1 acres would consist of manual methods, primarily hand pulling and removal using a weed wrench.

Alternative B

No Action Alternative

Under the no action alternative, the proposed action would not take place. No DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, or noxious weed treatments would be implemented to accomplish the purpose and need.

Alternative C

Non-Commercial Funding Alternative

A recent court ruling requires that all projects with a singular purpose and need for fuels reduction, or with multiple purposes and needs that include fuels reduction, must have a non-commercial funding alternative. A non-commercial funding alternative is an alternative where the sole purpose is to achieve the fuels reduction element of the purpose and need and where all the proposed treatments are solely directed at reducing hazardous fuels. In a non-commercial funding alternative, there can be no additional timber harvesting added beyond that needed to meet the fuel reduction purpose and need (*Sierra Forest Legacy v. Mark Rey*, Case 2:05-cv-00205-MCE-GGH, Morrison C. England, Jr., United States District Court Judge, United States District Court, Eastern District of California, November 4, 2009).

Alternative C includes DFPZ and AT treatments, which would be implemented to accomplish the purpose and need for modifying fire behavior only. No other treatments proposed under any other action alternative would be proposed under this alternative. All live trees greater than or equal to 12 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 12 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Approximately 5,431 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance’s rock cress habitat and five acres of clustered lady’s slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 12 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-12 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent canopy cover (CC), retain all live trees greater than or equal to 12 inches DBH; **except** in **CWHR 5M/5D**, thin to 40-50 percent CC, generally retain all live trees greater than or equal to 12 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 12 inches DBH; and underburn (2,591 acres). Spring underburn in areas infested with noxious weeds (3.6 acres).
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity. Approximately 80 acres, which are infested with noxious weeds, would be burned in the spring to reduce the risk of spread.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 522 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat. Underburning would occur in the spring within areas of noxious weed infestations (4.6 acres).
- Mechanically thin trees less than 12 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-12 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent CC, retain all live trees greater than or equal to 12 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, retain all live trees greater than or equal to 12 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, retain all live trees greater than or equal to 12 inches DBH; in **RHCAs**, thin to 50 percent CC, retain all live trees greater than or equal to 12 inches DBH; and underburn (290 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Alternative D

2001 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) Consistent Alternative

This alternative was developed under the 2001 SNFPA ROD (USDA 2001a, 2001b) in response to scoping comments. Under the 2001 SNFPA ROD consistent alternative, DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments would be implemented to accomplish the purpose and need. There are fewer acres proposed under this alternative because the 2001 SNFPA ROD incorporates different prescriptions and applies retention levels for specific land allocations compared to the 2004 SNFPA ROD (alternatives A and E). All live trees greater than or equal to 20 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 20 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within specific units, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of

Heterobasidion root disease. Approximately 4,976 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,464 acres). Hand thin, pile, and burn within approximately 76 acres of Constance's rock cress habitat and five acres of clustered lady's slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing. Retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 20 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-20 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn (71 acres).
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 15 percent of the stand untreated; and underburn (709 acres).
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; **except** in **CWHR 5M/5D** thin to 50 percent CC retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (574 acres).
    - Thin to minimum 50 percent CC while only reducing the CC less than 10 percent, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (346 acres).
    - In units 45, 46, 49, and 50, apply borax to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 467 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (301 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 20 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-20 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:

- Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn (26 acres). This would occur within the primary nesting zone of the Round Valley bald eagle territory.
- Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; **except** in **CWHR 5M/5D**, thin to 50 percent CC, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (140 acres).

Group Selection (GS)

No group selection would occur under this alternative.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, is proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips to sufficiently disconnect the road drainage system from nearby stream channels would be determined by District watershed staff. Refer to appendix C for a list of these roads.

Noxious Weeds

Five noxious weed species would be treated using a combination of herbicide applications, manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The noxious weed prescriptions proposed under alternative D are identical to those listed under the proposed action and can be found in Table 1 and Table 2.

Alternative E

2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) Consistent Alternative

This alternative was developed under the 2004 SNFPA ROD in response to scoping comments. Under alternative E, DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and limited noxious weed treatments would be implemented to accomplish the purpose and need. This alternative follows the direction and standards and guidelines for the HFQLG Pilot Project Area and 2004 SNFPA ROD land allocations (USDA 2004b, Table 2, pages 68 and 69). All live trees greater than or equal to 30 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Approximately 5,134 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance's rock cress habitat and five acres of clustered lady's slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **CWHR 5M/5D**, thin to 40 percent CC, retain all live trees greater than or equal to 30 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (2,242 acres).
    - Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (53 acres).
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburn treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 493 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:

- Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (261 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Group Selection (GS)

Group selection is proposed in mechanical thinning units within DFPZs and AT units (326 acres) using mechanical equipment. Group selection involves harvest of trees less than 30 inches in diameter in small (0.5 to 2 acres) patches. All live trees greater than or equal to 30 inches DBH would be retained.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, would be proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips would be determined by district watershed staff in order to sufficiently disconnect the road drainage system from nearby stream channels. Refer to appendix C for a list of these roads.

Noxious Weeds

Three noxious weed species would be treated using a combination of manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicides are proposed in alternative E. The number of infested acres proposed for each treatment (or combination of treatments) is provided in Table 3. It is important to note that all of the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years). An overview of the noxious weed treatments proposed under alternative E is included in Table 4.

Table 3. Noxious Weed Treatments and Acres Proposed under Alternative E

Treatment	Acres
Rx 3: spring underburn	88.6
Rx 4: hand pull	0.4
Total	89

Table 4. Treatments for Noxious Weeds under Alternative E

Noxious Weed Species	Proposed Treatments
***Centaurea solstitialis* (yellow starthistle)**	Approximately 44 acres would be treated with spring underburning. Approximately 0.3 acres would be treated with hand-pulling alone. Revegetation using native seed would be considered within treatment units at a site-specific level. Follow-up treatments would include a combination of hand pulling, cutting with a hand-held string trimmer (i.e. weed whacker), or flaming with a propane torch.
***Taeniatherum caput-medusae* (medusahead)**	Spring underburning would be used as a treatment on approximately 45 acres. Infestations that are considered to be a high risk for spread (i.e. on roads and landings) may be treated by flaming with a propane torch. Revegetation using native seed would be considered within treatment units at a site-specific level.
***Cirsium arvense* (Canada thistle)**	No treatments are proposed under this alternative due to feasibility and effectiveness constraints.
***Cardaria draba* (hoary cress)**	No treatments are proposed under this alternative due to feasibility and effectiveness constraints.
***Cytisus scoparius* (Scotch broom)**	Treatment of approximately 0.1 acres would consist of manual methods, primarily hand pulling and removal using a weed wrench.

Design Criteria Common to All Action Alternatives

This section presents a series of tables (Table 5 through Table 13) that contain the design criteria for the treatments proposed in the action alternatives. The design criteria are part of the project design, apply to the proposed treatments, and were developed to reduce or avoid adverse environmental effects of the proposed treatments.

Table 5. Design Criteria for DFPZs and Area Thinning

Criterion	Actions
Ground-based Harvesting and Yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100’) within the interior of units where slopes exceed these limits. When units have inaccessibly steep

Criterion	Actions
	inclusions of steeper ground, sawlog and biomass products may be end-lined.
Skyline Harvesting and Yarding	In units 46, 50, 54, 55, 95, and 99a: Skyline yarding would be used to remove commercial sawlogs. Trees greater than or equal to 10 inches DBH would be removed as sawlog product. Harvested trees would be limbed, topped, and this activity slash would be hand piled. Trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. In units 2, 4, 5, 21, 27, 28, 29 56, and 59: Whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as a sawlog product. Trees less than 10 inches DBH would be removed as a biomass product. Tops and limbs would be yarded to the landing and removed as a product. Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams. The corridor would not be wider than 20 feet. The width for lateral yarding to the skyline corridor would be 75 feet on either side of the mainline. Lateral yarding would not require lift. When there are short inclusions of side hill within the corridor, allow side hill yarding. The top 100 feet of the skyline corridor would be rehabilitated with weed-free straw mulch and native seed.
Residual species preference	Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain large woody debris (greater than 12 inches diameter), where they exist, at 10 to 15 tons per acre of the largest down logs. Where needed, jackpot burn, or machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
TES treatment areas and control areas	Bald Eagle: Within 12 acres immediately surrounding the nest tree (unit 75a) hand thin, pile, and burn trees less than or equal to 8 inches DBH. Clustered Lady's Slipper: (9 acres within units 51, 52, 54, 55, 66, 67, and 68): Within TES treatment areas, hand thin, pile, and burn trees less than or equal to 8 inches DBH. Within control areas, hand thinning would be allowed, but

Criterion	Actions
	piles must be located outside of the control area. Surface fuels would be manipulated within clustered lady's slipper occurrences to reduce direct impacts from prescribed fire treatments. Constance's Rock Cress: (76 acres within units 64 and 71): Within TES treatment areas, hand thin, pile, and burn trees less than or equal to 8 inches DBH. Piling would occur in designated areas away from sensitive plants.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Treatment of Stumps	Pine stumps 14 inches and greater in diameter would be treated with borax within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease, in units 45, 46, 49, and 50.

Table 6. Design Criteria for Group Selections

Criterion	Actions
Group size	0.5 acre to 2.0 acres.
Group location	Group selections would primarily be located in CWHR size class 4 stands (average DBH of 11 to 24 inches). Locate groups outside of Riparian Habitat Conservation Areas.
Ground-based Harvesting and Yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100') within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined.
Skyline Harvesting and Yarding	In units 46, 50, 54, 55, 95, and 99a: Skyline yarding would be used to remove commercial sawlogs. Trees greater than or equal to 10 inches DBH would be removed as sawlog product. Harvested trees would be limbed, topped, and this activity slash would be hand piled. Trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. In units 2, 4, 5, 21, 27, 28, 29 56, and 59: Whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as a sawlog product. Trees less than 10 inches DBH would be removed as a biomass product. Tops and limbs would be yarded to the landing and removed as a product. Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams. The corridor would not be wider than 20 feet. The width for lateral yarding to the skyline corridor would be 75 feet on either side of the mainline. Lateral yarding would not require lift. Side-hill setups would not be allowed. The top 100 feet of the skyline corridor would be rehabilitated with weed-free straw mulch and native seed.
Diameter constraints	All trees greater than or equal to 30 inches DBH would be retained, except where removal is required to allow for operability. Minimize damage to trees greater than or equal to 30 inches DBH as much as practicable.
Slash treatment / Site Preparation	Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn, to treat natural and activity generated fuels, and shrubs.
Regeneration strategy	Regenerate groups with native shade-intolerant conifers, indicative of the ecological habitat type in which the group is located, using a combination of natural and planted seedlings to achieve desired stocking levels. Plantation performance would be monitored after the 1st and 3rd years, and regeneration actions would be undertaken, if needed, to ensure successful regeneration within five years after harvest. Control competing brush and grass by grubbing or mastication, if necessary, to assure survival and growth of conifers.

Criterion	Actions
Residual species preference	Retain all sugar pine tagged as resistant to white pine blister rust. Where black oak is present, retain black oaks greater than or equal to 6 inches DBH.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain Large Woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Snag retention	Retain two of the largest snags per acre exceeding 15 inches DBH and 20 feet tall, unless removal is required to allow for operability.
Fireline	Construct firelines using hand crews or mechanical equipment around groups to be underburned and around machine piles or hand piles, as needed. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Treatment of Stumps	Under alternative A, Pine stumps 14 inches and greater in diameter would be treated with borax within a day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease, in units 45, 46, 49, and 50.

Notes:

a. Group selections are **not** included in alternative C (non-commercial funding alternative) and alternative D (2001 SNFPA ROD Consistent Alternative).

b. Herbicide treatments are not included in alternatives C and E.

Table 7. Design Criteria for RHCAs

Criterion	Actions
RHCA Equipment constraints	No mechanical equipment operations on slopes steeper than 25 percent. Establish equipment exclusion zones adjacent to stream channels according to Table 9 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.
Diameter constraints	Within mechanical harvest areas, implement a 20-inch upper diameter limit, except where needed for operability. Minimize damage to trees larger than 20 inches DBH as much as practicable. In equipment exclusion zones, implement an 8-inch upper diameter limit on hand thinning treatments.
Residual species preference	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees.Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
Burn constraints	Establish pile burning exclusion zones (Table 10) adjacent to stream channels. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.
Fireline	Construct firelines using hand crews around areas to be underburned or pile burned, as needed, Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.

Criterion	Actions
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain Large Woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Fish passage improvement	Reclaim fish passage and habitat by improving or replacing culverts at specific locations where roads cross streams.

Table 8. Scientific Assessment Team (SAT) Guidelines for RHCA Buffer Widths Based on Stream Type (USDA 1999b, page 2-11)

Stream Type	Prescribed Stream Buffer Widths
Perennial, fish bearing[1]	300 feet
Perennial, non-fish bearing[2]	150 feet
Intermittent[3]	100 feet
Ephemeral[3]	100 feet

[1]-Perennial fish bearing streams and lakes.
[2]-Perennial non-fish bearing streams, ponds, wetlands greater than 1 acre, and lakes.
[3]-intermittent and ephemeral streams, wetlands less than 1 acre, and landslides.

Table 8 displays the Scientific Assessment Team guidelines for RHCA buffer widths based on stream type. For the Keddie Ridge Project, the above listed widths would be the maximum buffer width identified for each stream type. Table 9 below displays an additional buffer (inner buffer or equipment exclusion zone) within the RHCA and within the SAT guideline buffer identified above.

For example, there is a perennial fish bearing stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 150 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 150 feet. Equipment can enter the remaining 150 feet of the 300 foot maximum buffer.

When the slope within the SAT guideline buffer is greater than 25 percent, no mechanical equipment is allowed to enter the RHCA. For example, there is a perennial stream with a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 100 feet from the edge of the active channel, the slope is 32 percent; no equipment is allowed within any portion of the 300 foot buffer.

Table 9. Equipment Exclusion Zones in RHCAs

Stream Type	Slope Class		
	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial, fish bearing	100	150	No mechanical equipment allowed
Perennial, no fish	50	100	No mechanical equipment allowed
Intermittent	25	50	No mechanical equipment allowed
Ephemeral	25	25	No mechanical equipment allowed
Reservoirs/wetlands greater than 1 acre	50	75	No mechanical equipment allowed

Within the SAT guideline buffer, a project specific distance (feet) is applied to the placement of piles for future burning (Table 10). For example, there is an ephemeral stream with a treatment unit; a 100 foot buffer is applied. Within that 100 foot buffer, approximately 70 feet from the active stream channel, the slope is 26 percent. First, no mechanical equipment is allowed within any portion of the 100 foot buffer (Table 9). Second, piles must be placed 15 feet from the center of the stream bed (Table 10).

Table 10. Pile Burning Exclusion Zones in RHCAs

Stream Type	Slope Class	
	0–15% (feet)	Greater Than 15% (feet)
Perennial	25	40
Intermittent	15	25
Ephemeral	15	15
Reservoirs/wetlands greater than 1 acre	15	25
Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.		

Table 11. Design Criteria for Noxious Weeds

Criterion	Actions
Frequency	1-2 times per season for 2-5 years.
Manual weed treatments	Includes techniques such as hand pulling, digging, cutting (i.e. with a weed whacker), or covering. Would be used to treat small infestations (i.e. less than 50 plants) and as a follow-up method to herbicide or prescribed fire treatments.
Prescribed fire and flaming treatments	Prescribed fire treatments would be conducted in the spring and early summer. Flaming with a propane torch may be used to control weed infestations in areas that are a high risk for spread (i.e. on roads or landings).
Herbicide treatments	Two herbicides would be used to treat noxious weeds: aminopyralid (i.e. Milestone® or an equivalent formulation) and glyphosate (i.e. Accord™ or an equivalent formulation).
Timing of herbicide applications	*Yellow starthistle*: Early spring through summer *Canada thistle*: Early summer and/or fall *Hoary cress*: Early spring to early summer
Aminopyralid treatments	Where: upland infestations Use limitations: aminopyralid applications would be limited to areas that are greater than 15 feet from the water's edge Application: selectively, using a backpack sprayer Rate: 0.05 to 0.11 acid equivalent (a.e.) pounds per acre (lbs/acre)
Glyphosate treatments	Where: Lowland infestations Use limitations: glyphosate applications would be limited to infestations that are between 0 - 15 feet from the water's edge; the one exception to this is the single hoary cress infestation, which will be treated in its entirety with glyphosate Application: wick applicator or backpack sprayer Rate: 1 - 3 acid equivalent (a.e.) pounds per acre (lbs/acre)
Wind speed limitations	Herbicide application using a backpack sprayer would not occur when wind speed exceeds 10 miles per hour or when drift is visually observed.
Herbicide guidelines	All applicable pesticide laws and label restrictions would be followed to ensure human health and safety.
Herbicide Additives [a]	The following additives may be added to herbicide formulations to increase efficacy of treatments: non-ionic modified vegetable oil surfactant [b] (i.e. Competitor® or an equivalent) and water soluble colorant [c] (i.e. Hi-Light™ Blue or an equivalent).

Notes:
[a]. Spray solution additives are mixed with an herbicide solution to improve performance of the spray mixture. Examples include surfactants, wetting agents, sticker-spreaders, or penetrants.
[b.] Surfactants are substances that facilitate and enhance the absorbing, emulsifying, spreading, sticking, wetting, or penetrating properties of herbicides.
[c.] Colorants are added to herbicide mixtures prior to application to help identify the treated area, prevent skips and overlaps, and to help reduce human exposure to recently treated vegetation.
Herbicide treatments are **not** included in alternatives C (non-commercial funding alternative) or E (2004 SNFPA ROD

Criterion	Actions
consistent alternative).	

Table 12. Design Criteria for Access and Transportation

Criterion	Actions
NFS road maintenance	Maintain approximately 50 miles of NFS roads.
NFS road reconstruction	Reconstruct 1.1 miles of NFS roads.
Non-system road reconstruction	Reconstruct 8.1 miles of non-system roads.
Non-system road construction	Construct approximately 6.8 miles of new temporary non-system roads. Decommission these roads upon project completion.
Harvest landings	Landings would be utilized to remove sawlog and biomass products. The Keddie Ridge Project is planned to accommodate product removal with one landing per 40 acres. Per FSH 2409.15, a project should have no more than one landing per 20 acres except when there is a need for more landings to limit resource protection problems. Existing landings shall be reconstructed and utilized considering the location and effects to resources. Would construct new landings where existing landings are not present or are inadequate due to the location and effects to resources. Number and location of landings would be subject to agreement and would conform to direction as specified in FSH 2409.15, SMRs and BMPs. For existing landings supporting cull decks, identify and relocate individual hollow log structures prior to cull deck construction. Relocate hollow logs to forest stand outside of landing disturbance area. Landing spacing for skyline units would be 150 feet. Skyline units may require more landings in order to process biomass. Removal of green trees would occur to allow for temporary non-system road and landing construction.
Notes: a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b).	

Table 13. Design Criteria for Watershed Improvements

Criterion	Actions
NFS road improvement	Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvement for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary

Criterion	Actions
	depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips would be determined by district watershed staff in order to sufficiently disconnect the road drainage system from nearby stream channels. Refer to appendix C for more details.
NFS road decommissioning	Decomission approximately 0.6 mile of NFS road 28N38A upon project completion.
Non-system road decommissioning	Decomission approximately 0.4 mile of non-system roads upon project completion.
Notes: a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b). Watershed improvements are **not** proposed under alternative C (non-commercial funding alternative).	

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purposes and needs. Some of these alternatives may have been outside the scope of the need for the proposal, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, two alternatives were considered, but dismissed from detailed consideration for reasons summarized below:

Alternative F

John Muir Project Alternative

The John Muir Project alternative, alternative F, was suggested during scoping comments. Alternative F is a non-commercial alternative (one that would not sell wood products for timber or biomass) with a 12 inch upper diameter limit and no group selection. This alternative would implement relatively more prescribed fire than thinning, and incorporate some mixed-severity effects into the desired condition for prescribed fire. In this alternative, the priority for treatment would be areas within 100-200 feet of individual homes. On the private lands portion of the 100-200 foot zone around individual homes, the Forest Service should offer to thin small trees and brush for willing homeowners, especially those who cannot afford to do it themselves.

Alternative F was eliminated from detailed study for the following reasons:

- Alternative C (non-commercial funding alternative), an alternative studied in detail, incorporates all live trees greater than or equal to 12 inches DBH being retained throughout all treatments and prescriptions, except to allow for operations.

- Alternatives C and D (2001 SNFPA ROD consistent alternative), two alternatives studied in detail, do not include group selections.
- Prescribed fire treatments in all action alternatives include low to moderate severity underburning. Desired conditions presented in the 2004 SNFPA ROD for fire and fuels management emphasize reducing fire intensity, rate of fire spread, crown fire potential, and mortality of dominant and codominant trees (page 49). The 2004 SNFPA ROD does not include the incorporation of high severity effects within prescribed fire treatments.
- In addition, one of the primary purposes of the Healthy Forest Restoration Act is to "reduce wildfire risk to communities, municipal water supplies, and other at-risk Federal land" (HR 1904, section 2 "Purposes," page 3).
- The Keddie Ridge Project proposes to treat 5,669 acres by constructing DFPZs and AT units, plus 284 acres of group selections. There are approximately 97,376 acres within the identified Keddie Ridge Project area that would remain untreated and provide for a mixed severity effect if a wildfire were to burn these untreated areas.
- The Forest Service doesn't have the authority to conduct activities on private land, unless the Forest Service entered into a cooperative agreement with another entity (Wyden Amendment (Public Law 105-277, Section 323 as amended by Public Law 109-54, Section 434). The Plumas County Fire Safe Council (PCFSC), however, has implemented approximately 294 acres of a combination of hand thinning, piling, and burning; masticating; and some removal of commercial and non-commercial forest products on private lands surrounding homes (appendix F). PCFSC has an application, agreement, and implementation process in effect for Plumas County residents. For more information, visit their website at http://plumasfiresafe.org/.

Alternative G

Alternative G was developed in response to a request from the public that the Forest Service consider an alternative that focuses on non-herbicide treatment methods to control noxious weed infestations in the Keddie Ridge Project area. Alternatives C and E, which include only non-herbicide treatment measures, were also developed in response to this request and were analyzed in detail in Chapter 3. The treatment methods described below were excluded from Alternatives C and E and dropped from detailed analysis due to cost, infeasibility, or failure to adequately contain and control noxious weed infestations within the project area.

Manual Treatment

The manual treatment of all weed infestations was not considered in detail due to cost and feasibility constraints. Manual methods are generally only recommended for small or newly established occurrences. They are most effective on annual species and tap-rooted plants and are considered much less effective for weeds with deep underground stems and roots, such as Canada thistle or hoary cress, due to their ability to re-sprout following treatment (Tu et al. 2001). One example within the Keddie Project area is the single infestation of hoary cress, which was hand-pulled and mowed on an annual basis between 2002 and 2005; over this time period, the infestation increased from an estimated 300 plants to approximately 3,000 individuals.

The number of repeat applications required for manual methods to be effective often ranges from two to four treatments per site per season (Tu et al. 2001), which can significantly increase the estimated per acre cost of treatment. Out of the five weeds that occur within the project area, only two (yellow starthistle and Scotch broom) can be effectively treated with manual methods. Of these, only six sites are considered small (i.e. less than 0.1 acres) and isolated enough to treat with manual methods alone. Under action alternatives A, D, and E, manual methods would be utilized whenever feasible to treat small infestations and as a follow-up within larger infestations.

Biological Control

Biological control methods are used to reduce weed infestations by introducing host-specific organisms that are imported from within the native range of the target species (Holloran 2004). The success of this method is highly dependent upon the biology and ecology of both the target weed species and the biological control agent. Unfortunately, despite numerous attempts, most efforts to control weeds with biological control agents have failed (DiTomaso et al. 2006).

To date, several biological control organisms have been introduced into California in an attempt to control yellow starthistle, Canada thistle, and Scotch broom (Villegas 2009, personal communication); however, very few have established viable populations or shown effective levels of control. In Plumas County, two biological control agents, the false peacock fly and the hairy weevil, were introduced to control yellow starthistle and although they have been observed on flower heads their impact has not been considered adequate for control. At this time, biological control organisms are not considered a viable option for reducing the spread of medusahead or hoary cress (CDFA 2009a).

Plowing, Disking, or Tilling

In agricultural settings, repeated plowing, disking, or tilling can be effective at reducing weed infestations (e.g. Bayer 2000); however, this method is not often recommended in natural areas because it can exacerbate the problem by spreading seed or root fragments to new locations and can severely damage native vegetation (Willard and Lewis 1939 *in* Nuzzo 1997). Within the Keddie Ridge Project area, terrain limitations, as well as rocks, logs, and other native materials, make these treatments impractical for weed control.

Grazing

The use of grazing to control noxious weeds can produce variable results and has been shown to both promote and reduce weeds. Grazing alone will rarely, if ever, completely eradicate infestations (Tu et al. 2001). Grazing animals are not selective and if they are not properly controlled, can cause significant impacts to an ecosystem. Grazing animals can also act as vectors for weed spread as they are moved from site to site. The terrain, as well as the abundance and spatial extent of noxious weed infestations within the Keddie Ridge Project area, makes grazing an impractical option for control.

Comparison of Alternatives

The comparison of alternatives focuses on objectives and issues that provided measureable elements to the proposed action and emphasized the most important environmental effects. These are elements of the ecosystem that can be measured to indicate an increase or decrease in trends in ecosystem health. To compare these elements, measurement indicators were developed to show the differences between the alternatives and provide a clear basis for the decision to be made by the Responsible Official. The measurement indicators are used in the analysis to quantify and describe how well the proposed action and alternatives meet the project objectives.

Table 14 shows the difference between all alternatives by using measurement indicators, Table 15 compares effects of all alternatives by resource, and Table 15a displays acres of treatment for each alternative.

Table 14. Comparison of Measurement Indicators for Each Alternative.

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Reduce Hazardous Fuel Accumulation	Predicted Flame Lengths (less than 4feet)	100% of stands would meet desired conditions	0% of stands would meet desired conditions	96% of stands would meet desired conditions	96% of stands would meet desired conditions	100% of stands would meet desired conditions
	Fire Type (Surface fire)	100% of stands would meet desired conditions	4% of stands would meet desired conditions	96% of stands would meet desired conditions	96% of stands would meet desired conditions	100% of stands would meet desired conditions
	Predicted Mortality (percent basal area less than 25%)	100% of stands would meet desired conditions	0% of stands would meet desired conditions	96% of stands would meet desired conditions	86% of stands would meet desired conditions	100% of stands would meet desired conditions
Improve Forest Health and Protect and Enhance R5 Forest Service Sensitive Wildlife	Trees Per Acre (Percent retention of trees >20 inches DBH)	All stands would retain 73-100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 73-100% of trees > 20 inches DBH
	Basal Area Per Acre (less than or equal to 150 ft^2)	68% of stands would meet desired conditions	7% of stands would meet desired conditions	36% of stands would meet desired conditions	11% of stands would meet desired conditions	61% of stands would meet desired conditions

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Improve Forest Health and Protect and Enhance R5 Forest Service Sensitive Wildlife	**Relative Stand Density (25-40 percent post treatment)**	68% of stands would meet desired conditions	7% of stands would meet desired conditions	36% of stands would meet desired conditions	14% of stands would meet desired conditions	61% of stands would meet desired conditions
	Species Composition Relative Abundance of Shade-Intolerant Species	61% of stands would improve species composition	No improvement across any stand	35% of stands would improve species composition	21% of stands would improve species composition	61% of stands would improve species composition
	Average Stand Diameter >24 inches DBH in 30 years (Growth into late seral conditions-CWHR 5)	25% of stands would grow into CWHR 5 in 30 years	4% of stands would grow into CWHR 5 in 30 years	7% of stands would grow into CWHR 5 in 30 years	7% of stands would grow into CWHR 5 in 30 years	25% of stands would grow into CWHR 5 in 30 years
	Post-treatment Canopy Cover (Percent of Open Canopy Forest Condition Created)	50% open canopy stands, 50 % closed canopy stands	18% open canopy stands, 82% closed canopy stands	25% open canopy stands, 75% closed canopy stands	18% open canopy stands, 82% closed canopy stands	43% open canopy stands, 57% closed canopy stands
	Distribution of CWHR Size Class and Density (Increase in diversity)	Increase in diversity	No Change in diversity	Little change in diversity	Little change in diversity	Increase in diversity
Protect and enhance habitat for	**Number of Occurrences**	7	0	7	7	7

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Region 5 Forest Service sensitive plant	**Acres of Habitat Protected and Enhanced**	85	0	85	85	85
Improve Watershed Health	**Number of Stream Crossings Improved**	4	0	0	4	4
	Miles of Road Decommissioned	1.0	0	0	1.0	1.0
	Miles of Road Drainage Disconnected From Streams	5.0	0	0	5.0	5.0
Reduce Noxious Weed Infestations	**Risk of Invasion and Spread**	Moderate	Low	High	Low	High
	Effectiveness of Proposed Weed Treatments	High	None	Variable	High	Variable
	Number of Noxious Weed Infestations Treated	87	0	53	87	53
	Approximate (maximum) Acres Treated	107	0	89	107	89

Table 15. Comparison of Effects for Each Alternative.

	Alternative A – Collaboration Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Fuels	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions. Open forest canopy conditions created	Potential for Crown fire initiation and spread under 90th percentile weather conditions exists	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions Open forest canopy conditions created
Forest Veg	Low stand density conditions created Promotes growth and development of large diameter trees Promotes establishment, growth and development of shade intolerant species Improves forest resiliency to drought, fire, and insects and disease Enhances landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral condtions, and promoting the development of later seral conditions	No reduction in stand density No improvement in growth and development of large diameter trees No improvement in species composition No enhancement of forest resiliency to drought, fire, insects and disease Maintains homogeneous, closed canopy mid seral conditions on landscape	Reduces stand density to moderate levels Little growth and development of large diameter trees No promotion of establishment of shade intolerant species and little improvement in growth and development of shade intolerant species Little enhancement of forest resiliency to drought, fire, insects and disease Generally maintains homogeneous, closed canopy mid seral conditions on landscape	Reduces stand density to moderate levels Little growth and development of large diameter trees No promotion of establishment of shade intolerant species and little improvement in growth and development of shade intolerant species Little enhancement of forest resiliency to drought, fire, insects and disease Generally maintains homogeneous, closed canopy mid seral conditions on landscape	Low stand density conditions created Promotes growth and development of large diameter trees Promotes establishment, growth and development of shade intolerant species Improves forest resiliency to drought, fire, and insects and disease Enhances landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral condtions, and promoting the development of later seral conditions

	Alternative A – Collaboration Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Wildlife	Reduces 25% of stands suitable to old-forest dependent species (CWHR size-density classes 4M4D/5M5D) to an unsuitable condition (open forest canopy or early seral) High risk reduction of potential habitat loss due to wildfire	No change in wildlife habitat conditions High risk of potential habitat loss due to wildfire	Reduces 5% of CWHR size-density class 4M stands suitable to old-forest dependent species to an unsuitable condition (open forest canopy) Moderate risk reduction of potential habitat loss due to wildfire	Retention of all stands considered suitable to old-forest dependent species (i.e. no open forest canopy or early seral conditions created) Moderate risk reduction of potential habitat loss due to wildfire	Reduces 32% of stands suitable to old-forest dependent species (CWHR size-density classes 4M4D/5M5D) to an unsuitable condition (open forest canopy or early seral) Greatest risk reduction of potential habitat loss due to wildfire
Noxious Weeds	High amount of project-related disturbance; highly effective weed treatments; moderate risk of weed introduction and spread	No project-related disturbance; no weed treatments proposed; low risk of weed introduction and spread	Moderate amount of project-related disturbance; weed treatment effectiveness variable; high risk of weed introduction and spread	Moderate amount of project-related disturbance; highly effective weed treatments; low risk of weed introduction and spread	High amount of project-related disturbance; weed treatment effectiveness variable; high risk of weed introduction and spread
Visual Quality	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	No direct effects to visual quality. However, the lack of treatments would perpetuate existing dense forest canopy.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.
Watershed Cumulative Effects	Upper Wolf Cr-Hauns Cr—87% of TOC, Upper Cooks Cr—98% of TOC	Upper Wolf Cr-Hauns Cr—81% of TOC, Upper Cooks Cr—90% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—97% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—96% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—98% of TOC

Table 15a. Comparison of Economic Effects by Action Alternative

Revenue/Cost Employment	Alternatives			
	Alternative A	Alternative C	Alternative D	Alternative E
Sawlog Volume	10.37 mmbf	231 mbf	1.9 mmbf	15.48 mmbf
Biomass Volume	21,000 gt	24, 000 gt	13,000 gt	18,000 gt
Sawlog and Biomass Value (cost deducted)	$2,127,902	$556,180	$580,450	$3.001,415
Additional Operation Cost	$2,186,298	$1,442,220	$1,184,091	$2,453,130
Potential Advertised Value to the Government	$130,301	$2,772	$22,800	$202,488
Percent Above Value	-3%	-160%	-104%	18%
Fuels Reduction Project Costs	$5,496,675	$5,496,675	$5,334,351	$5,496,675
Potential Direct and Indirect Jobs	189	60	66	252
Potential Employee Income	$6,799,620	$2,161,134	$2,374,303	$9,082,986
Receipt Act Plumas County Estimate Collections	$32,575	$693	$5,700	$50,622

Table 15b. Summary of Acres by Treatment.

Alternative	Acres of Treatment				
	DFPZ	Area Thinning	Group Selection	Watershed Improvements	Noxious Weed Treatment
Alternative A – Collaboration Alternative (Preferred Alternative)	5,175 acres	494 acres	284 Acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	107 acres
Alternative B – No Action Alternative	0 acres	0 acres	0 acres	No improvements	0 acres
Alternative C – Non-Commercial Funding Alternative	5,431 acres	522 acres	0 acres	No improvements.	0 acres
Alternative D – 2001 SNFPA ROD Consistent Alternative	4,976 acres	467 acres	0 acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	107 acres
Alternative E – 2004 SNFPA ROD Consistent Alternative	5,134 acres	493 acres	326 acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	89 acres

Chapter 3. Affected Environment and Environmental Consequences

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or alternative. Together, these descriptions form the scientific and analytical basis for the comparison of effects in Chapter 2.

The following resource specialist analyses are incorporated by reference: Keddie Ridge Hazardous Fuels Reduction Project Forest Vegetation, Fire, Fuels, and Air Quality Report (Ryan Tompkins and Ryan Bauer)(USDA 2011a); Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment/Biological Evaluation (Chris Collins)(USDA 2011b); Management Indicator Species Report for the Keddie Ridge Hazardous Fuels Reduction Project (Chris Collins)(USDA 2011c); Keddie Ridge Hazardous Fuels Reduction Project Wildlife Supplemental Information Migratory Birds Report (Chris Collins)(USDA 2001d); Keddie Ridge Hazardous Fuels Reduction Project Watershed Report (Kelby Gardiner)(USDA 2011e); Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (Michelle Coppoletta)(USDA 2011f); Keddie Ridge Hazardous Fuels Reduction Project Heritage Resource Inventory Report ARR# 02-28-2011 (Cristina Weinberg, January 2011)(USDA 2011g).

Past, Present and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR §1508.7).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR §220.4(f)) (July 24, 2008), which state, in part:

> “CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR §1508.7)”

In determining cumulative effects, the past, present, and future actions displayed in appendix F were added to the direct and indirect effects of the proposed action and alternatives.

Affected environment sections have been divided by resource areas, where as environmental consequence sections have been divided by resource areas and then by alternative, where is some cases, action alternatives are grouped.. Further, effects analyses that are required by law are discussed per alternative.

Forest Vegetation, Fuels, Fire, and Air Quality

Introduction

Ecologically, the dynamics between vegetation and fire and fuels are inherently linked because vegetation type, structure, and development have a profound effect on fuel accumulations and fire behavior, and conversely, fuel accumulations and fire behavior can have a profound effect on vegetation establishment, development, and structure. Consequently, forest vegetation, and fuels and potential fire behavior are examined with an integrated approach for the purposes of this analysis. This section includes complete discussions of possible effects of the proposed project and alternatives and presents a summary of the Forest Vegetation, Fuels, Fire, and Air Quality Specialist Report for the Keddie Ridge Hazardous Fuels Reduction Project which is on file at the Mt. Hough Ranger District office and available upon request.

The forested landscape in the Keddie Ridge Project area consists primarily of pine-dominated Sierra mixed conifer forests with some ponderosa pine, true fir forests, and plantations established over the last 40 years in burned areas and clear-cut timber harvest units. Forests in the project area range from 3,000 feet to 7,500 feet in elevation with an annual precipitation ranging from 30 to 50 inches.

The Keddie Ridge Project area lies along the crest of the Northern reach of the Sierra Nevada range. These forests are within the transition zone—an ecological zone used to describe the transition between the wet productive westside forests of the Sierra Nevada and the relatively dry, less productive eastside forests of the Sierra Nevada (USDA 1999a, b). Consequently, the forests in the project area tend to be drier and occur on less productive sites. The Forest Survey Site Class (FSSC) in the project area ranges from 4 to 7 (based on an index where FSSC 7 represents the least productive site class); however more than half of the project area is classified as Forest Survey Site Class 6 which represents a mean annual increment – growth rate – of 20 to 46 cubic feet per acre per year (USDA SCS 1988).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

The Keddie Ridge Hazardous Fuels Reduction Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental environmental impact statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, b; USDA 2003a, b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, b). Fuel and vegetation management activities are designed to comply with the standards and guidelines as described in the SNFPA FSEIS and ROD (USDA 2004a, b).

National Forest Management Act

The National Forest Management Act (NFMA) of 1976, including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 state that it is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. Both acts also state “insure that timber will be harvested from National Forest System land only where – (ii) there is assurance that such lands can be adequately restocked within five years of harvest.”

Plumas National Forest Land Management Plan (1988) as Amended by the Herger-Feinsten Quincy Library Group FSEIS and ROD (1999, 2003) and the Sierra Nevada Forest Plan Amendment FSEIS and ROD (2004)

The desired condition as described in Alternative 2 of the HFQLG Final Environmental Impact Statement (USDA 1999a) is an “all-aged, multistory, fire-resistant forest,” of open forest stands dominated by large, fire tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Riparian ecosystems would be resilient to impacts caused by naturally occurring disturbance processes such as wildfire, flood, and drought.

The 2004 SNFPA provides management direction for the HFQLG pilot project area in appendix E of the Record of Decision (USDA 2004b). Appendix E directs the Plumas National Forest to “implement the HFQLG Forest Recovery Act Pilot Project, consistent with the HFQLG Forest Recovery Act and Alternative 2 of the HFQLG EIS. The HFQLG Forest Recovery Act Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel reduction objectives. Fuels and vegetation management activities include constructing a strategic system of defensible fuel profile zones (DFPZs), group selection, and individual tree selection. A management program for riparian areas is also included in the pilot project.”

Sierra Nevada Forest Plan Amendment: Final Supplemental Environmental Impact Statement Record of Decision: Forest-wide Standards and Guidelines (2004)

The standards and guidelines for fuels and vegetation management projects for the HFQLG Pilot Project are shown in Table 2 of the 2004 SNFPA Record of Decision (USDA 2004b). This table includes direction for designing and implementing fuels and vegetation management activities within the various land allocations of the HFQLG pilot project area for the life of the pilot project.

Effects Analysis Methodology

Geographic and Temporal Bounds

The approximate 106,000-acre boundary of the watersheds in the Keddie Ridge Project area forms the geographic boundary of the analysis area used to analyze the direct, indirect, and cumulative effects on forest vegetation and fuels and fire. The analysis area is comprised of twelve watersheds: Taylorsville, Mt. Jura, Peters Creek, Upper Cooks Creek, Lower Cooks Creek, Upper Wolf Creek, Upper Wolf Creek-Haun’s Creek, Lower Wolf Creek, Lower Wolf Creek-Greenville, Round Valley, Crescent Mills, and Indian Falls. The analysis area includes the vegetation occurring within the treatment areas as well as the vegetation outside of the treatment areas within the affected watersheds. The analysis considers the twelve watersheds because, when combined, they represent the furthest measurable extent that effects on forest vegetation would occur as a result of implementing any of the proposed alternatives. With respect to fire, these watersheds, as a group, are geographically bounded by high-elevation ridgelines that are sparsely vegetated in places. Because of this, most of the fires that have occurred in these watersheds have been managed at the watershed level or smaller. Ecologically, the dynamics between vegetation and fire and fuels are inherently linked; vegetation treatments (and absence thereof) have a profound effect on fuels accumulations and fire behavior, and conversely, fire has a profound effect on vegetation establishment and development.

The analysis area considers this relationship on the landscape level by including the vegetation and past large wildfires and contains all National Forest System lands available for and subject to proposed treatments under the Keddie Ridge Project, as well as the vegetation within the watersheds outside treatment areas. This allows for a congruent analysis of forest vegetation, fuels, and fire at the stand and landscape levels.

The direct, indirect, and cumulative effects analyses are based on a temporal scale. Documented past projects including timber harvesting, wildfires, watershed improvements, and other activities described in appendix F ranging as far back as 1980 were considered past actions within the analysis area. In a broader sense, current vegetation structure and composition reflects the historical management regimes prior to 1980. This vegetation structure and composition includes attributes of the current landscape including existing vegetation types, fuel treatments, burned areas, past sanitation harvest, and plantations.

For the purpose of the vegetation analysis, the temporal bounds include a 30-year horizon for future effects. Within 30 years, the treated stands would approach current levels of stocking and would approach the typical entry cycle for managed stands. This timeframe allows for examining general trends and trajectories of stand development under no further management beyond those documented in “Appendix F: Past, Present, and Reasonably Foreseeable Future Actions,” which is located in this EIS.

The potential fire behavior and effects of alternatives were modeled pre treatment and post-treatment, with the latter reflecting treatments after completion. Fuel treatments are expected to remain effective for at least 10 years—this is based on experience with existing fuel treatments on the Mt. Hough Ranger District. Fuel treatments would likely require entry for burning and other maintenance prior to the 30-year horizon modeled for tree stand growth (USDA 2004a). Future maintenance activities are discussed in appendix F (Past, Present, and Reasonably Foreseeable Future Projects of this document).

With respect to air quality; the towns, communities, and national parks within 20 miles of the project area boundary are listed in Table 22. It is important to note that unknown or unanticipated future wildfires, disease outbreaks, or mortality may occur in the analysis area prior to completion of implementation of this project—these potential future disturbance events are not included as part of this analysis.

Analysis Methodology

Field inventories were conducted to measure attributes of existing vegetation in the analysis area. Stands in the analysis area were inventoried using the Common Stand Exam protocols for the Pacific Southwest Region (U.S. Department of Agriculture [USDA] Forest Service Region 5). These stands are representative of the analysis area and the areas to be treated in all action alternatives. Data was collected on live and dead trees and fuels.

For analysis purposes, the stand data was loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development (Dixon 2002). The model was used to quantify existing stand conditions and to predict the effect of alternative treatments on forest development. Stand growth, mortality, regeneration, and development by stand were simulated to predict the effects of treatments over time. The FVS model output predicts average stand conditions and attributes by stand. The stand attributes analyzed include trees per acre, basal area, quadratic mean diameter, stand density index, canopy cover, and species composition. Model outputs by stand were utilized to examine the effects of treatment over the larger landscape scale. Model outputs have unknown variances that may sometimes be large; however, this is normal for modeling efforts, and model outputs are best evaluated in a relative rather than an absolute sense. In addition, model simulations have limited capacity to predict mortality due to drought or insect and disease outbreaks. Considering this, model outputs such as stand density and basal area provide useful metrics for determining relative risk of these effects. This further underscores that interpretation of model outputs are best evaluated in a relative sense in conjunction with professional judgement, firsthand knowledge of stand conditions, forest health evaluations, and pertinent scientific research, studies, and literature. For more information regarding FVS modeling by alternative, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

A Geographic Information System (GIS) was used to analyze forest vegetation on the landscape scale for the analysis area. Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after the Moonlight Fire of 2007, which affected a small portion of the analysis area. The Vestra vegetation data also did not include a portion of the analysis area. The HFQLG 2005 Vegetation Mapping Project mapped areas on the Plumas National Forest not covered by Vestra. These data were combined in a GIS to provide a complete map of the existing vegetation within the analysis area. All vegetation information is displayed using CWHR vegetation typing and serves as the baseline acres for analysis. The distribution of CWHR size class and density was analyzed relative to the stand-level effects modeled by CWHR size class. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

Fire Behavior and Effects

The effects of all alternatives were analyzed at the stand and landscape level using widely accepted models: 1) Fire Family Plus and 2) Fire and Fuels Extension of the Forest Vegetation Simulator (FFE). The output data reflects fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the common stand exam plots. These models are extensively described and documented in their accompanying user manuals; general assumptions and outputs of these models are summarized below:

1. Fire Family Plus (Main et al. 1990): Fire Family Plus is a widely used software program for summarizing and analyzing historical daily fire weather observations and computing fire danger indices based on the National Fire Danger Rating System (NFDRS). For this analysis, the modeling of potential fire behavior was done under 90th percentile weather conditions (Table 16) that were calculated using Fire Family Plus (Main et al. 1990). The 90th percentile weather is defined as the severest 10 percent of the historical fire weather conditions occurring during the fire season. Ninetieth percentile weather conditions are the specified weather standard for fuel treatment design (USDA 2004b). Weather data used in fire modeling were obtained from the Quincy, Pierce, and Cashman Weather Stations, which are the closest and most representative weather stations to the analysis area.

The Pierce and Cashman Weather Stations are located on south-facing open slopes in areas that typically reflect the hottest, driest, and windiest weather conditions.

2. Fire and Fuels Extension (Reinhardt and Crookston 2003): The Fire and Fuels Extension (FFE) of the Forest Vegetation Simulator (FVS) were used to model predicted fuel loading and potential fire behavior. Modeling was done using the 90th percentile weather calculated using Fire Family Plus and displayed in Table 16. The Fire and Fuels Extension utilizes stand specific surface fuel and stand inventory data and was used to model and assess the effects of different treatments on potential flame length, probability of torching, potential fire type, and predicted tree mortality at the stand level. The output data reflect fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the Common Stand Exam plots. Model outputs have unknown variances that may sometimes be large; however, this is normal for modeling efforts, and model outputs are best evaluated in a relative rather than an absolute sense. Fuel model selection logic based on expert opinion (Duncan, pers. comm., 2010) and time-since-disturbance was developed similar to Collins et al (In press) to determine fuel model succession post-treatment. For more information regarding FVS modeling by alternative, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

Table 16. Fire Weather Parameters Used in Fire Modeling

Weather Variable	Value	Weather Variable	Value
Weather Station Names and Numbers Years 2000-2010	Quincy (#040910) , Pierce (#040915), and Cashman (#040916)	1-hour fuel moisture	1.0%
		10-hour fuel moisture	2.0%
Time of Year	June 1 to September 15	100-hour fuel moisture	5.5%
Temperature (Fahrenheit)	93°	1,000-hour fuel moisture	6.0%
Relative Humidity	10%	Herbaceous fuel moisture	29%
Probable maximum 1 minute 20-foot wind speed[a]	9 mph	Woody fuel moisture	69%

Sources:
a. Crosby and Chandler 1966

Measurement Indicators

Forest Vegetation: Stand Structure and Composition and Landscape Heterogeneity

The effects of treatment on stand structure, compositional structure, and landscape structure of forest vegetation are evaluated for each alternative. These measurement indicators focus on residual post-treatment attributes of forest vegetation structure, density, species composition, and landscape diversity and heterogeneity as residual post-treatment conditions are the best indicator of how well desired conditions as described in Chapter 1 would be met for the project purposes and needs.

Stand Structure—Stand structure is analyzed using three measures of stocking and density: (1) trees per acre and their distribution by diameter class, (2) basal area per acre, and (3) relative stand density.

Table 17. Diameter Class and Tree Size by Forest Product

CWHR Tree Size	Sapling to Pole Size Trees	Small-sized trees	Intermediate-sized trees (small to medium)	Medium to Large-sized trees
Forest Product	Biomass Trees	Sawlog Trees		Reserve Trees
Diameter Class	0-10 inches DBH	10-20 inches	20-30 inches	+30 inches
Note: DBH = diameter at breast height				

*Trees per Acre and Their Distribution by Diameter Class***:** The number and distribution of trees per acre by diameter class (Table 17) is an important unit of measure because it shows the effect of treatments on different size trees. High density stands also slow the rate of fire line construction by hand crews and mechanical equipment. The four diameter classes are based on diameter classes for forest products (biomass and sawlog products), ecological importance for fire behavior and wildlife habitat, and guidelines for reserve trees upon which silvicultural prescriptions are based. The sawlog-sized trees are split into two 10-inch diameter classes to track the effect of treatments on the intermediate-sized tree class as described in the GTR 220 (North et al. 2009). The percent reduction of trees per acre is used to show the effects of treatments on reducing stocking and the percent retention of trees greater than 20 inches in diameter is used to show the effects of treatments on the intermediate and large tree size classes which are valued for ecological structure and function for wildlife habitat.

Basal area per acre: Basal area per acre is “the cross-sectional area of all stems in a stand measured at breast height and expressed per unit land area” (in this case, per acre) (Helms 1998). Basal area per acre is commonly used as a measure of stand density. This measure has been used by Oliver (1995) to describe the threshold for ponderosa pine (150 square feet per acre), above which bark beetle related mortality is expected to occur. This threshold is related to Sartwell’s work (Sartwell 1971, Sartwell and Steven 1975, Sartwell and Dolph 1976) with mountain pine beetle outbreaks as described by Powell (1999) where these “outbreaks could be attributed to two primary factors: second-growth ponderosa pine stands were even-aged and ecologically simplified when compared with the uneven “virgin” forest; and man’s intentional suppression of wildfire effectively removed an important landscape-level thinning agent, which in turn caused an unnatural accumulation of stand density (basal area) as compared to virgin conditions.” Both of these conditions occur within the Keddie Ridge Project landscape as described in the affected environment

For true fir stands, Oliver’s research (1988) found that “plots with 200 square feet per acre or more basal area suffered the bulk of the mortality.” This may allow for leaving slightly higher densities in pure true fir stands, however, Powell (1999) recommends for mixed species stands (which are prevalent in the analysis area) that the “lowest stocking-level recommendations could be selected” because other species (such true fir species) would develop acceptably under the lower densities established for the limiting species (pine species). “This is the strategy recommended by Cochran and others (1994).”(Powell 1999)

In addition, basal area per acre has also been used by Landram (2004) to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (where the Keddie Ridge Project is primarily located), the insect risk thinning guides for the Plumas suggest thinning to 150 square feet per acre. For more information regarding basal area and forest health, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Relative stand density: The concept of stand density index was first developed for even-aged stands by Reinecke (1933) to compare "the density of stocking of various stands." The relative density concept describes a stand's density relative to the maximum possible density and may serve as a proxy for a stand density relative to its carrying capacity. In general, the concept of stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Curtis 1970; Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Helms and Tappeiner 1996; Jack and Long 1996; Powell 1999; Woodall et al. 2002).

A relative density between 55 and 60 percent has been described as the lower limit of the "Zone of Imminent Competition Mortality" above which trees begin to die due to competition related stress (Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Smith et al. 1997; Powell 1999; Long and Shaw 2005). For the purpose of this analysis, 60 percent was used as a measure of the onset of competition-related mortality because stress induced by competition increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health because stands managed below this threshold are less likely to incur mortality due to the agents mentioned above.

The desired relative densities immediately post-treatment are between 25 and 40 percent, the lower bounds of which correspond with the onset of competition and crown closure. These levels are substantially below the threshold of imminent competition mortality, and treatments within the desired range should have a reasonable "lifetime" before reaching densities at which mortality is expected to occur. Desired relative densities within 20 to 30 years would be below the 60 percent threshold of imminent competition mortality (Blackwell 2004) as this longer time frame would be representative of a reasonable cutting or entry cycle.

Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California. The calculation of this maximum stand density is largely dependent on the mix of species. A more site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For the purpose of this analysis, relative density based on the maximum stand density index as calculated by FVS is used. For more information regarding relative stand density, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Compositional Structure—Compositional structure is measured by calculating the percent of species composition pre and post-treatment. Species composition is analyzed because silvicultural prescriptions, particularly group selection treatments, may have an effect at the stand level on differing species dependent on shade tolerance and species biology. Residual species composition post-treatment is an important measure because these trees represent the seed bank of the future, which is one factor that affects species diversity over time. The shift in species composition in the northern Sierra Nevada forests from shade-intolerant species, such as ponderosa pine, to shade-tolerant species, such as white fir, has been well documented in scientific literature (McKelvey and Johnston 1992, Skinner and Chang 1996, Ansley and Battles 1998). Therefore, treatments that improve the percentage of pine species in forested stands would be beneficial. Percent change in pine species composition is used to show the effects that treatments within the alternatives would have on species composition. For more information regarding desired species composition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Landscape Structure— For the purposes of this analysis, landscape structure refers to the distribution of relative successional (seral) stages on the landscape, and the relative distribution of closed-canopy and open canopy stands. This is an important indicator because it may be used as a measure of landscape heterogeneity and diversity, and as a measure of cumulative effects to forest vegetation on the landscape scale. Landscape structure is measured by calculating the distribution of these seral stages within the vegetation analysis area. The relative distribution of seral stages within the landscape is measured by using CWHR size class as a proxy for seral stage. Table 18 displays the CWHR tree size and density class categories. CWHR size class serves as an effective proxy for seral stage because it classifies forest vegetation by ranges of average tree size which represent discrete developmental stages of tree growth. CWHR density class serves an effective proxy for open and closed-canopy conditions because it classifies canopy cover. In addition, this allows for a congruent analysis of effects on forest vegetation and wildlife habitat. Forest stands were aggregated by CWHR size class because the proposed treatments, stand structure, and effects of treatments on stand structure would not substantially vary by forest vegetation type (as classified by CWHR habitat type). For more information regarding desired landscape structure and heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and Appendix C.

Table 18. CWHR Tree Size and Density Class Crosswalk with Seral Stage and Canopy Closure Condition

CWHR Tree Size Categories				CWHR Density Class Categories			
CWHR Size Class	**Tree Sizes (average)**	**Description**	**Seral Stage**	**CWHR Density Class**	**Tree Canopy cover**	**Description**	**Canopy Conditions**
1	< 1” DBH	Seedlings, but definite forest habitat	Early Seral	n/a	< 10%		Open canopy Stands
2	1 -6 “ DBH	Sapling		S	10 - 24%	Sparse	
3	6 -11” DBH	Pole-sized tree		P	25 - 39%	Open	
4	11 – 24” DBH	Small Tree	Mid-seral	M	40 - 60%	Moderate	Closed-canopy Stands
5	> 24” DBH	Medium/Large tree	Later Seral	D	> 60%	Dense	
6	> 24” DBH	Multilayered canopy with dense cover		n/a	> 60%		

Fuels and Potential Fire Behavior and Effects

The measurement indicators for potential treatment effects on fuels, potential fire behavior, and severity include: (1) flame length, (2) probability of torching, (3) fire type, and (4) predicted percent mortality. These indicators are described below. For more information regarding fuels reduction, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B.

Flame Length (feet): The predicted length of flame measured in feet. Flame length is influenced in part by fuel type, fire type (surface or crown fire), and weather conditions. Together, flame length and fuel type influence the rates at which firelines can be safely and effectively constructed by different fire resources, including fire fighters, bull dozers, and aerially delivered fire retardant (Table 19). Increased flame lengths can increase the likelihood of crown fire and the amount of suppression resources (fire fighters, fire engines, and aircraft) needed to contain a wildfire. Flame lengths above 4 feet may present serious control problems—they are too dangerous to be directly contained by fire crews (Schlobohm and Brain 2002; Andrews and Rothermel 1982). Flame lengths over 8 feet are generally not controllable by ground-based equipment or aerial retardant and present serious control problems including ignition of multiple spot fires and uncontrollable crown fire activity. The 2004 SNFPA ROD provides direction that the desired condition for fuel treatments include flame lengths at the head of the fire less than 4 feet (USDA 2004b).

Table 19. Relationship between Flame Length and Potential Success of Active Suppression

Flame Length	Description
Less than 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. A hand line should hold the fire.
4 to 8 feet	Fires are too intense for direct attack at the head with hand tools. A hand line cannot be relied on to hold the fire. Bulldozers, engines, and retardant drops can be effective.
8 to 11 feet	Fire may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
Greater than 11 feet	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.
Source: NWCG 2004	

Probability of Torching : The potential probability of torching occurring under 90th percentile weather conditions as predicted by FFE. This is the probability of finding an area of the stand where torching can occur. A torching situation is generally defined as one where tree crowns of large trees can be ignited by a surface fire or flames from burning crowns of small trees that reach the larger trees. Probability of torching is the proportion of areas where trees are present and torching is possible (Rebain et al. 2010).

Fire Type (Surface or Crown Fire): The predicted fire type (surface or crown fire) occurring under 90th percentile weather conditions as predicted by FFE. Crown fire includes both active and passive crown fire (Stratton 2004). Fire type will affect the difficulty of controlling a fire, fire fighter and public safety, and fire-related tree damage and mortality. Generally speaking, it is more difficult and more expensive to safely contain crown fires because they burn with high heat intensity and move extremely quickly. Crown fires typically lead to more tree damage than surface fires. Surface fires, with flame lengths less than 4-feet, are easier to safely contain and result in less tree damage than a crown fire (Table 19). For this reason, surface fires with flame lengths less than 4 feet within treated stands are the desired post-treatment condition.

Predicted Percent Mortality: The potential tree mortality as measured by the percent of basal area that would be killed in a fire event occurring under 90th percentile weather conditions as predicted by FFE (Reinhardt and Crookston 2003, Rebain et al. 2010). “The probability of mortality is based on bark thickness and percent crown volume scorched, which are derived from scorch height, tree height, crown ratio, species, and tree diameter” (Carlton 2004) . The mortality calculation uses established calculation methods (Reinhart et al. 1997).

Air Quality

The measurement indicator for alternatives effects on air quality include smoke and dust emissions from proposed treatments.

Predicted Particulate Matter (PM) in Tons: Predicted amounts of particulate matter emitted from the project is measured by PM10 (county wide) and PM 2.5 (Portola Valley only) as forest management activities such as pile burning and underburning contribute to these levels.

Types and Duration of Effects

Direct Effects

These are effects on forest vegetation, fuels, and air quality that are directly caused by treatment implementation or, as with Alternative B (no action), a lack of treatment.

Indirect Effects

These would be effects on forest vegetation and fuels, potential fire behavior, and air quality that are in response to the direct effects of treatment implementation or, as with Alternative B (no action), a lack of treatment.

Duration of Effects

Direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis described above in “Geographic and Temporal bounds”.

Cumulative Effects Analysis

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions.

Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

Forest Structure, Composition, Fuels, and Fire

As with many areas in the Sierra Nevada, the landscape in the analysis area has been heavily influenced over the last 150 years by past management activities that include mining, grazing, timber harvesting, fire exclusion, large high-severity fires (Young 2003; Beesley 1996; McKelvey and Johnston 1992), and more recent drought-related mortality during the late 1980s and early 1990s (Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994).

Past harvest activities on the Keddie Ridge Project landscape were primarily focused on overstory removal and sanitation or salvage harvest, with a shift toward even-aged systems in the 1980s. Past use of these harvest systems is consistent with well-documented overall management practices that occurred over vast areas of the Sierra Nevada during the 20th century (UC 1996; Leiberg 1902). With respect to the removal of ponderosa and Jeffrey pine, and the resulting increase in the occurrence of white fir in the watershed of the North Fork of the Feather River, John Leiberg (1902) noted:

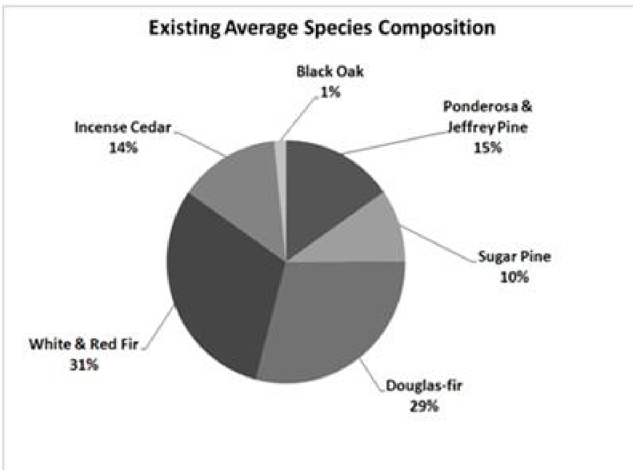


Figure 1. Existing Average Species Composition

> *"It [yellow pine] has been more exhaustively logged than any other species in the type except the sugar pine, and the restocking has not kept pace with the cutting," (page 29)* and
> *"White fir is increasing its ratio in the restocking, partly at the expense of the yellow pine, partly as an offset to a lessened percentage of sugar pine. On the Pacific side of the main range there is a steady increase of the species, both in reforestation on the logged areas and on the tracts denuded by fire. Its [white fir] increase throughout the region examined is due to exhaustive logging of yellow and sugar pine and sparing of white fir" (page 50).*

Currently, shade-tolerant species dominate most of the analysis area stands; however conditions range stand by stand which have varying levels of shade-tolerant versus shade-intolerant species. Those stands on lower elevation south and west facing slopes have greater amounts of shade-intolerant species, yet many mixed species stands have very high proportions of shade-tolerant species. Figure 1 displays the existing average species composition for all stands. Currently, shade-tolerant species including white fir, incidental amounts of red fir, Douglas-fir, and incense cedar account for 74 percent of tree species present in project area stands. Desired shade-intolerant tree species such as black oak, ponderosa pine, Jeffrey pine, and sugar pine only account for 26 percent of the trees species present in project area stands.

Past harvest activities described above have resulted in 1) the reduction of large dominant and codominant overstory trees, 2) the retention of smaller diameter intermediate and suppressed trees and 3) a shift in species composition from shade-intolerant pine dominated stands to shade-tolerant, white fir dominated stands; all of which have largely decreased landscape level forest heterogeneity (diversity) (McKelvey and Johnston 1992). In addition, a near absence of landscape level, low-intensity surface fires has contributed to increased stand densities in smaller diameter classes, particularly in shade-tolerant species (Skinner and Chang 1996).

At the stand level, similar to what has occurred at the landscape level, the combination of past management activities, fire exclusion, and extensive drought-related mortality has created relatively homogeneous areas typified by small even-aged trees existing at high densities (Oliver et al. 1996). High-density stands are also more susceptible to density-dependent mortality driven by drought and insect and disease infestations (Cochran et al.1994; Guarin and Taylor 2005; Macomber and Woodcock 1994, Powell 1999). Extensive drought in the late 1980s and early 1990s, combined with high stand density, resulted in extensive mortality of white fir (Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994). Much of this material has fallen over in the last 20 years and become dead and down fuel. The high densities of small trees and high fuel loads contribute to:

- overstocked stand conditions in which trees become stressed due to competition for water, light, and nutrients; this can lead to a higher potential for mortality due to drought, insects, or disease (Powell 1999; Ferrell 1996; Guarin and Taylor 2005; Fettig 2007);
- Conditions that favor the recruitment of shade-tolerant species such as white fir, which promotes a shift in species composition from pine-dominated to fir-dominated forests (Oliver et al. 1996; McKelvey and Johnston 1992); and
- large accumulations of ground fuels, ladder fuels, and canopy fuels which increase the potential for stand-replacing, high-severity fire events (Weatherspoon and Skinner 1996).

As a result of past management activities described above, conditions across the Sierra Nevada have been described as “generally younger, denser, smaller in diameter, and more homogeneous” (McKelvey et al. 1996); this condition is typical of forests in the analysis area. Such conditions are best characterized by California Wildlife Habitat Relationship (CWHR) size class 4 where diameter at breast height (DBH) ranges between 11 and 24 inches. Analysis of CWHR size class distribution for forest types in the analysis area shows a relative overabundance of CWHR size class 4, indicating a departure from desired distributions of seral stages (Figure 2). Taylor (2004) observed in his study of the Lake Tahoe Basin that “pre-settlement forests were more structurally diverse than contemporary forests” and consisted of larger trees at lower densities — the would be more characteristic of open canopy, later seral stands such as

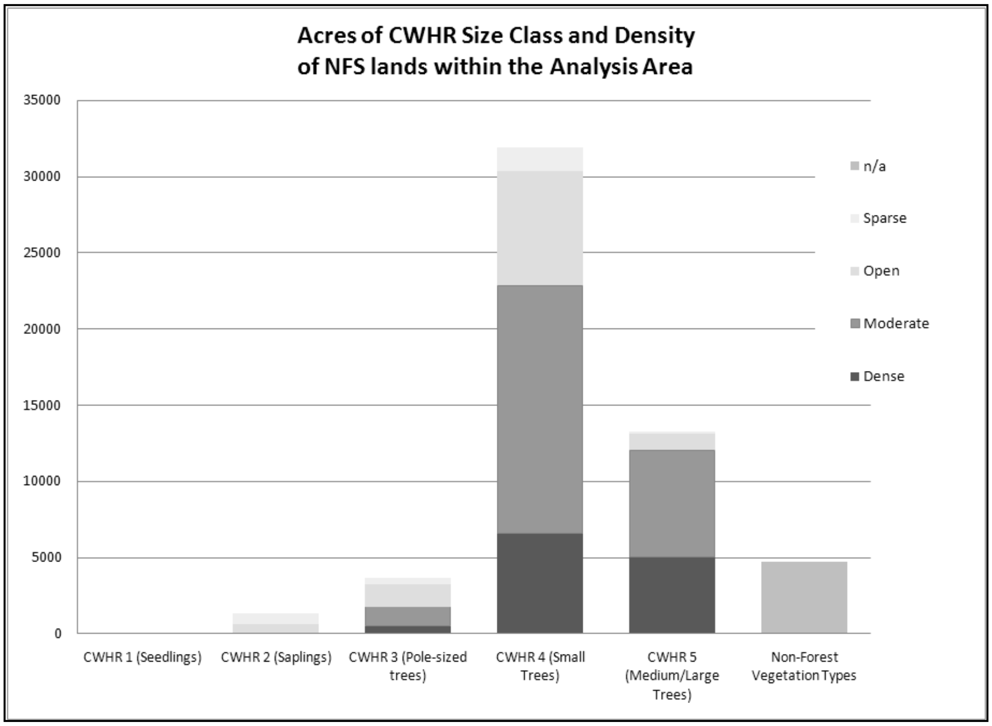


Figure 2. Existing Size Class and Density Distribution of Forest Vegetation Occurring on NFS Lands within the Analysis Area

CWHR5P. In contrast, the relative dominance of CWHR size class 4 likely developed as a result of overstory removal and salvage harvest systems in concert with fire suppression policies.

Because such stand structure has increased vulnerability to high-severity fires, insect outbreaks, and landscape level drought-induced mortality, a homogenous (same species or structure) occurrence of this seral stage across the landscape is unstable (McKelvey and Johnston 1992, Millar et al. 2007). A more diverse distribution of seral stages, characterized by heterogeneous stand structures, may be more resilient to disturbance events such as fire, drought, and insect and disease infestations and more characteristic of desired conditions (Stephens and Fule 2005, Millar et al. 2007, Collins and Stephens 2010). For more information regarding desired conditions for forest and landscape structure, density, and heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Fire Regimes and Condition Class

Historically, the average number of years between fires in the mixed conifer forests adjacent to the analysis area has been reported as 8 to 14 years (the range is 1 to 46 years) in the Antelope Lake watershed (Moody and Stephens 2002). In higher elevation red and white fir-dominated forests (up to approximately 6,400 feet in elevation), the average number of years between fires has been reported as 33.8 years (the range is 18 to 54 years) (Beatty and Taylor 2001). Prior to fire exclusion and intensive timber harvest of the early to mid-20th century, the relative frequent occurrence of fires generally contributed to open stands dominated by large-diameter fire-resistant trees with relatively low surface fuel loads with interspersed areas of young seral stands (Weatherspoon 1996). Prior to fire suppression policy in 1902, John Leiberg (1902) described the surface fuels in similar unharvested forests on the Plumas National Forest types as follows:

> *"There is no humus; the forest floor is bare, or at the most is covered with a layer of pine needles rarely exceeding 2 inches in depth, most commonly an inch or less."*

Given the spatial and temporal extent of past fires well documented in scientific literature (Taylor 2000; Moody and Stephens 2002; Skinner and Chang 1996), this type of surface fuel loading would have been much more common prior to fire exclusion than the ubiquitous high surface fuel loading found today. Overall, the historical vegetation structure, species composition, and surface fuels reflected, in part, past fire regimes as well as land management practices of both the Northern Maidu (Anderson 2005; Stewart 2003) and land uses of the thousands of settlers who moved to the Plumas County region after the gold rush (Young 2003).

The overall conditions in the analysis area are, in part, also described by the Fire Regime Condition Class (Table 20). The current conditions in the analysis area as described above are similar to those conditions which have led to high-severity fires within the vicinity of the analysis area, such as the Moonlight and Antelope Complex Fires of 2007, the Rich Fire of 2008, and the Stream Fire of 2001 (Duncan, personal communication 2010; Raley 2001). Of particular note, 71 percent of the NFS lands within the analysis area are in condition class 3 where "vegetation composition, structure, and fuels have a high departure from the natural fire regime and predispose the system to high risk of loss of key ecosystem components." (Hann and Strohm 2003).

Table 20. Fire Regime Condition Classes within the Keddie Ridge Analysis Area

Fire Regime Condition Class	Acres in the Analysis Area	Acres of NFS lands within the Analysis Area	Description
1	8,124 (8%)	4,132 (8%)	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
2	24,898 (23%)	10,445 (19%)	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
3	61,342 (58%)	39,020 (71%)	Vegetation composition, structure, and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
9	11,537 (11%)	1,227 (2%)	Agriculture, Barren, Water, or Urban vegetation types.

Source: Hann and Strohm (2003)

Extensive development of residential homes in the Wildland Urban Interface (WUI) surrounding Indian Valley poses a continued risk of human-caused ignitions throughout dry summer months. The ignition risk puts residences on private lands in the analysis area at risk of wildfires that may occur on adjacent NFS lands; likewise, NFS lands are at risk from fires ignited on these private lands. In addition, large undeveloped areas of the forested wildlife habitat in the analysis area are at continued risk of high-severity fire and drought-related mortality. For more information regarding fuels within the project area, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

Forest Insect and Disease

Forest insects and disease currently occur in many stands in the analysis area and is well documented in the Forest Health Evaluation performed for the project (Cluck and Woodruff 2010). With the exception of white pine blister rust (*Cronartium ribicola*), an introduced disease, forest pathogens are endemic to forests as part of the natural disturbance regime. However, due to the interaction of past management activities (such as fire exclusion, unnaturally high stocking levels of shade-tolerant species, and drought) as well as climate change trends, populations of insects and disease may increase beyond endemic levels associated with forest health.

Bark beetles are the primary insects of concern found in the analysis area and are associated primarily with ponderosa and Jeffrey pines and true fir. Ponderosa and Jeffrey pines are susceptible to the western pine beetle, *Dendroctonus brevicomis,* and *Ips* species. The western pine beetle is the most aggressive and contributes to direct tree mortality, particularly in moisture-stressed trees within high-density stands where density driven competition is greatest. The primary prevention measure for this species is to maintain healthy vigorous trees in low stand densities where competition for water, light, and nutrients is minimized. The *Ips* species breed in activity slash and may grow beyond endemic levels in areas where logging slash is not properly treated. When populations build to sufficient numbers, the *Ips* beetle can attack mature trees.

The fir engraver bark beetle also occurs within the analysis area. The fir engraver bark beetle attacks true fir species and is associated with direct and indirect tree mortality, in combination with drought and disease occurrences in high-density stands (Ferrell 1996).

The primary pathogen of concern found in the analysis area is *Heterobasidion* root disease, caused by *Heterobasidion occidentale* and *Heterobasidion irregulare*. *Heterobasidion* root disease is known to occur throughout the forests of northern California and southern Oregon (Schmitt et al. 2000) and there are well-documented occurrences in both pine and fir species on the Plumas National Forest and neighboring Lassen National Forest (Kliejunas 1989; Woodruff 2006). The occurrence of *Heterobasidion* root disease has been confirmed in true fir and is suspected to occur in pine stands in the analysis area (Woodruff and Kliejunas 2005). There is the potential for new infection in any harvest area because spores can travel up to 100 miles (Goheen and Otrosina 1998).

While all western conifers are susceptible to this pathogen, ponderosa and Jeffrey pines and true fir tend to be most susceptible to adverse effects from the disease. This root disease is spread via spores infecting fresh wounds or stumps and from root-to-root contact (Sinclair et al. 1987). Stands with repeated entry in the analysis area have a higher incidence of the disease than un-entered stands. The effects of this disease range from reduced individual tree vigor, root and bole decay, windthrow, root mortality, and in the worst-case scenario, tree mortality.

Existing Conditions

Existing conditions of forested stands within the analysis area range depending on factors such as ownership, past management activities, and CWHR size class and density. In general, forested stands proposed for thinning treatments within the Keddie Ridge Project are primarily CWHR 4 and CWHR 5 size class stands. The average existing conditions and the range for each attribute are shown in Table 21.

Table 21. Existing Conditions of Forested Stands

Stand Attributes and Predicted Fire Behavior	CWHR 4 Stands				CWHR 5 Stands			
	Average	Range			Average	Range		
		Min	-	Max		Min	-	Max
Total Trees per acre	**479**	72	-	1475	**418**	135	-	741
Trees per acre 1-10 inches DBH	**395**	20	-	1300	**328**	56	-	621
Trees per acre10-20 inches DBH	**63**	0	-	167	**67**	15	-	107
Trees per acre 20-30 inches DBH	**14**	5	-	31	**16**	2	-	31
Trees per acre >30 inches DBH	**5**	0	-	16	**6**	1	-	17
Snags per acre >15 inches DBH	**3**	0	-	9	**3**	0	-	12
Snags per acre > 30 inches DBH	**0.3**	0	-	1.1	**0.4**	0	-	2.8
Basal area per acre (ft^2 per acre)	**190**	93	-	313	**208**	132	-	291
Relative Density (%)	**57**	29%	-	85%	**61%**	33%	-	80%
Quadratic Mean Diameter (inches)	**14.7**	10.5	-	22.6	**15.0**	11.6	-	22.6
Total Canopy Cover	**48**	31	-	73	**51**	35	-	66
Surface Fuel Load (tons per acre)	**26**	2	-	46	**33**	12	-	52
Predicted Total Flame Length (feet)	**21.6**	5.4	-	70.9	**20.4**	11.4	-	45.0
Predicted Probability of Torching	**80%**	30%	-	100%	**80%**	20%	-	100%
Predicted Fire Type	**Passive Crown Fire**	Surface Fire	-	Active Crown Fire	**Passive Crown Fire**	Passive Crown Fire	-	Passive Crown Fire
Predicted Percent Basal Area Mortality	**84%**	33%	-	93%	**85%**	67%	-	90%

These stands have high densities of trees, particularly in the 1-10 inch diameter class range, and some stands have high densities in the 10-20 inch range. These stands have high accumulations of ladder fuels and vertical continuity with canopy fuels, which in combination with the high surface fuel loads, are predicted to have large flame lengths, high amounts of tree torching, and primarily passive crown fire behavior resulting in large amounts of mortality under 90th percentile weather conditions. These high stand densities also increase stresses on larger more desirable retention trees due to increased inter-tree competition for finite site resources – particularly water during extended drought periods – which is interconnected to increases in bark beetle populations and subsequent tree mortality. For more information regarding forest health, existing conditions, and desired conditions, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

Air Quality

The analysis area is located in Plumas County, California. Nearby towns and communities are shown in Table 22. The entire project area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin.

Table 22. Communities Within the Vicinity of the Keddie Ridge Project Area

Community	Distance and Direction from Keddie Ridge Project Boundary
Greenville, Taylorsville, Crescent Mills, and Canyon Dam	Within the Keddie Ridge Project
Lake Almanor Basin communities (Chester, Prattville, Hamilton Branch)	~ 1 - 10 miles northwest
Susanville	~ 15 miles northeast
Genesee Valley	~ 1 - 3 miles east
Quincy	~ 7 miles south
Lassen National Park	~ 20 miles northwest

The air quality attainment status for ozone, carbon monoxide, sulfur dioxide, and other compounds is listed in Table 23. The attainment status was derived directly from the NSAQMD "2004 Annual Air Monitoring Report."

Table 23. Attainment Designations for Plumas County

Compound	National Attainment Status	State Attainment Status
Ozone (1 hour)	Attainment	Unclassified
Ozone (8 hour)	Attainment	Not applicable
Carbon monoxide	Attainment	Attainment
Nitrogen dioxide	Attainment	Attainment
Sulfur dioxide	Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Unclassified	Nonattainment – only the Portola Valley is in nonattainment for the state $PM_{2.5}$ annual standard

Source: NSAQMD (2004 Annual Air Quality Report)

Currently, Plumas County is in nonattainment status for particulate matter (PM)10 (county wide) and $PM_{2.5}$ (Portola Valley only). The project area is approximately 26 miles northwest of Portola Valley at its closest point. According to the NSAQMD 2004 report, the major contributors to both PM_{10} and $PM_{2.5}$ levels include forestry management burns, residential woodstoves, residential open burning, vehicle traffic, and windblown dust. These problems can be relieved or made worse by local meteorology, winds, and temperature inversions. In addition, large areas in and adjacent to local communities can be heavily impacted by smoke for extensive summer periods (several weeks to months) due to wildfires such as in the 2007 Moonlight fire which occurred in the project area, and the 2008 Canyon Complex and Rich Fires, which occurred west of the project area.

The community of Quincy is subject to strong inversions and stagnant conditions in the wintertime. Those conditions, coupled with intensive residential wood burning, can result in very high episodic $PM_{2.5}$ levels. Levels of PM_{10} have been greatly decreased due to a reduction of non-EPA (Environmental Protection Agency) approved woodstoves in existing residences. The NSAQMD report noted four key points relating to current air quality within the NSAQMD:

1. The NSAQMD's state and federal nonattainment status for ozone is due to overwhelming air pollution transport from upwind urban areas, such as the Sacramento and Bay areas.
2. Improvements in air quality, with respect to ozone, will depend largely on the success of air quality programs in upwind areas.
3. Anticipated growth in local population will add to locally generated pollution levels. Therefore, local mitigations are needed to prevent further long-term air quality degradations. Otherwise, the local contribution may increase to the point where the transport excuse will become less viable, and more emphasis will then be placed on mandated local controls.
4. State and federal land managers anticipate a marked increase in prescribed burning within the next 5 years. This may have a tremendous impact on local PM_{10} and $PM_{2.5}$ levels, unless appropriate mitigations are employed.

Current sources of particulate matter from the analysis area include smoke from residential wood burning, large wildfires, smoke from underburning and pile burning, emissions and dust from standard and off-highway vehicles, dust and emissions from harvest activities occurring on private lands, smoke from campfires, and wind-generated dust from exposed soil surfaces. The amount and duration of these emissions vary by season, with most emissions from residential wood burning occurring from October to April, emissions from wildfires, timber harvest, and recreational activities occurring between May and September, and emissions from prescribed burning occurring from October through mid-November.

Environmental Consequences

Alternative B – No Action

Under alternative B, no actions would be implemented to address the areas of concern identified in the 2006 Keddie Ridge Project area Landscape Assessment (located in the project record) or objectives and desired conditions identified in the purpose and need sections in chapter 1.

Direct and Indirect Effects

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Existing stand conditions would persist and develop unaltered by active management, with the exception of continued fire suppression activities. Wildfire, drought, disease, and insect-related mortality and recruitment would continue to occur. Table 24 displays average stand attributes under the No action Alternative. *Under alternative B, there would be no reduction in trees per acre, basal area per acre or relative stand density*. *Under alternative B, stands would have, on average, 218 square feet of basal area and a relative stand density of 64 percent.* Stands would remain dense, particularly in the smaller diameter classes in terms of trees per acre and basal area.

Table 24. Average Stand Attributes under Alternative B.

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-Treatment Relative Stand Density	Post-Treatment QMD	Average Increase in Diameter
No Action	446	0%	100%	192	0%	57	14.9	0%

Oliver (1995) observed that northern California even-aged ponderosa pine stands whose densities exceeded Sartwell's (1971) basal area threshold of 150 square feet per acre were susceptible to *Dendroctonus* bark beetle attack. *Under alternative B, 74 percent of the stands are over this basal area threshold and pine species within these stands are at elevated risk of bark beetle mortality* (Fiddler et al. 1989; Oliver 1995). True fir species (white and red fir) may exist at higher stand densities. However, at high stand densities, root disease and drought increase the susceptibility of true fir species to mortality caused by the Scolytus fir-engraver beetle (Oliver et al. 1996; Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994).

These high tree densities would persist under alternative B, thereby reducing growth rates and tree vigor, and increasing risk of mortality due to inter-tree competition and increased incidence of insect activity (Ferrell 1996; Oliver et al. 1996; Oliver 1995). High densities of small trees may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees (Dolph et al. 1995). *Under alternative B, 51 percent of the stands have relative stand densities that are at or greater than the "lower limit of the zone of imminent competition mortality"* (Drew and Flewelling 1977; Drew and Flewelling 1979; Smith et al. 1977). Within 10 years, approximately 69 percent of stands would have relative stand densities that exceed this threshold, within 20 years, approximately 77 percent of the stands would exceed this threshold, and within 30 years approximately 89 percent of the stands would exceed this threshold.

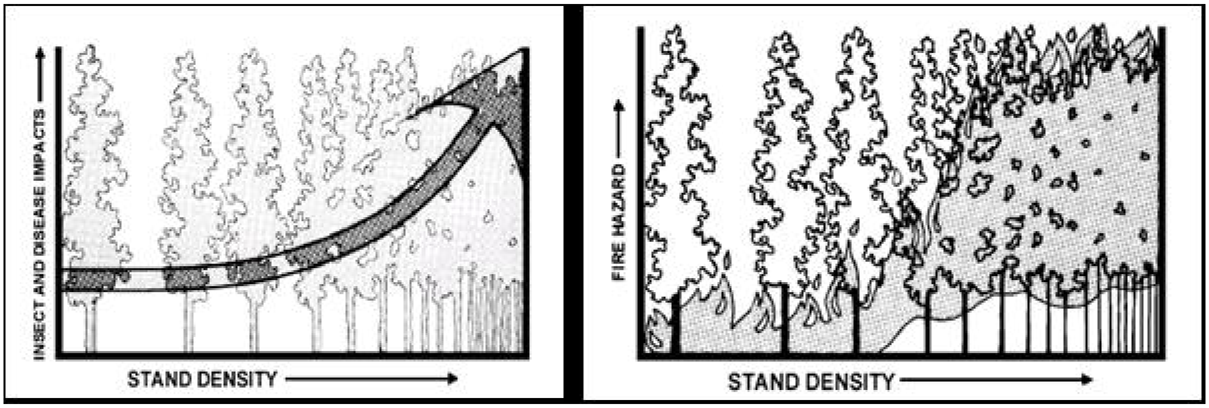


Figure 3. General Effects of Increasing Stand Density on (a) Insect and Disease Impacts, and (b) Fire Hazard as Described by Powell (1999)

The increasing stand density and consequent mortality due to inter-tree competition and increased incidence of insect activity may have a major adverse effect on forest health by decreasing tree vigor and growth; increasing susceptibility to insects, disease, and drought; and increasing susceptibility to intense fire behavior. The resulting stand structure would be characterized by a dense understory and midstory with interlocking crowns. These general trends, in relation to forest health and fire hazard, have been described by Powell (1999) and are shown in Figure 3.

Compositional Structure: Species Composition

Under alternative B there would be no change in species composition. The existing stand structure promotes a low light environment, which strongly influences species composition by favoring the regeneration, growth, and development of shade-tolerant species such as white fir, incense-cedar, and, to a lesser degree, Douglas fir. Overall, shade-tolerant species collectively account for 74 percent of trees and shade-intolerant tree species such as ponderosa pine, sugar pine, and black oak, account for only 26 percent, on average; however, this varies by stand, aspect, and elevation. Shade-tolerant species currently exist at high densities, particularly in trees less than 20 inches DBH while pine species (Ponderosa and sugar pines) generally occur as overstory trees (greater than 20 inches DBH); the number of pine regeneration in the understory is much lower relative to shade-tolerant species. These large dominant overstory pines are “legacy” trees that may be indicative of species composition in historical reference conditions. However, existing stand structure and high densities clearly favor the regeneration, growth, and development of shade-tolerant species. Currently, most mixed species stands in the analysis area are becoming more occupied by the shade-tolerant species mentioned above, and this trend would be expected to continue.

Such high densities of shade-tolerant species compete with shade-intolerant species for resources (nutrients, light, and water), increase shade in the understory, and discourage the regeneration of shade-intolerant pine species (Oliver et al. 1996). Consequently, over the longer temporal scale, a shift in species composition would be expected to occur, giving preference to regeneration of shade-tolerant species over shade-intolerant species (Minnich et al. 1995; Ansley and Battles 1998; Oliver et al. 1996;

McKelvey and Johnston 1992). Shade-tolerant species, white fir in particular, can be more susceptible to fire-related scorch mortality than shade-intolerant species such as ponderosa pine and Jeffrey pine (Skinner 2005; Stephens and Finney 2002; Mutch and Parsons 1998; Leiberg 1902). This susceptibility to mortality can lead to more trees being killed by wildfire-related scorch and damage to the cambium.

Landscape Structure and Heterogeneity: Tree Size and Canopy Cover

Currently, relative stand density in CWHR size classes 4 and 5 is at or just below the 60 percent threshold thereby increasing the risk for competition-related mortality. Over time, diameter growth and an increase in trees per acre due to ingrowth would contribute to an increase in stand density. In the absence of treatment or naturally occurring disturbance, such as fire, stand density would continue to increase beyond the threshold of 60 percent relative stand density into the “zone of imminent mortality”. This would have an adverse effect on tree growth and vigor and resistance to insects, disease, drought, fire behavior, and fire-related tree mortality.

The analysis area would continue to be dominated by closed-canopy mid-seral forested stands. These stands, best characterized by CWHR size class 4 and canopy density classes of Moderate (M) and Dense (D), contribute to landscape homogeneity due to its ubiquitous abundance and connected arrangement. Because such stand structure has increased vulnerability to high-severity fires, insect outbreaks, and landscape level drought-induced mortality, a homogenous (same species or structure) occurrence of these closed-canopy, mid-seral stages across the landscape is unstable and less resilient to the aforementioned forest disturbances (McKelvey and Johnston 1992).

Fuels and Potential Fire Behavior: Fuel Load and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Surface, ladder, and canopy fuels would remain untreated under the no action alternative, and, as a result, potential fire behavior including predicted flame length, probability of torching, fire type, and basal area mortality would remain unchanged. Table 25 displays the average fuel and potential fire behavior attributes under Alternative B.

Table 25. Average Fuel and Potential Fire Behavior Attributes under Alternative B

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
No Action	28	18	5	74%	22	Passive Crown Fire	85

Surface fuel loading would be 28 tons per acre, on average, and would range from 5 to 52 tons per acre, depending on individual stand conditions. Approximately 74 percent of stands would have surface fuel loading greater than 20 tons per acre. In addition, ladder fuels would not be removed so there would be continuity between surface, ladder, and crown fuels.

These conditions would result in flame lengths that would be 6 feet and greater under 90th percentile weather conditions. Over 91 percent of the stands would have flame lengths greater than 11 feet where crowning, spotting, and major fire runs are probable, and control efforts at the head of the fire are ineffective. These flame lengths, when combined with current stand structure, would result in a probability of torching of 74 percent, on average, and which would sustain passive crown fire activity. This potential fire behavior would result in high severity fire characterized by high basal area mortality. On average, stands would have 85 percent basal area mortality, and over 90 percent of the stands would have greater than two thirds of tree basal area mortality as a result of a fire under 90th percentile weather conditions. The predicted direct mortality from scorch and cambial damage does not account for post-fire mortality to fire-damaged trees due to insect and disease activity.

Continued high density, high fuel load, and high flame length conditions would (a) reduce the production rates for fire-line construction by hand crews and mechanical equipment, (b) compromise the safety of fire fighters and the public, and (c) decrease the effectiveness of aerially applied retardant. In addition, burning embers from burning trees and standing dead trees could be blown to unburned areas outside the main fire—this could potentially increase the fire size. These direct and indirect effects do not reflect the influence of the fire itself on local weather conditions (Colson 1956; Cramer 1954). At the landscape level, increased spotting tends to increase erratic fire behavior, resulting in increased fire size with higher tree mortality, (Schroeder and Buck 1970). The above factors would decrease the effectiveness of initial attack and extended fire suppression operations, leading to a greater potential for large, high-severity fires. Fires with this expected fire behavior and difficulty of suppression have already occurred within and adjacent to the analysis area. In 2007 the Moonlight Fire and the Antelope Complex Fires burned over 87,000 acres both within, adjacent, and within reasonable proximity to the analysis area, with over 62 percent of these acres burning under high severity (greater than 75 percent basal area mortality).

Under the no action alternative, fire management's ability to safely suppress and contain fires, both in initial attack and extended fire suppression operations, would not be improved and would continue to decline over time from current conditions due to continued stand densification and surface fuel buildup. Under 90th percentile weather conditions, over 91 percent of the stands would have flame lengths greater than 11 feet where crowning, spotting, and major fire runs are probable, and control efforts at the head of the fire are ineffective (Table 19). Under current surface fuel loadings and high stand densities, as represented by a Fuel Model TU-5 (Scott and Burgan 2005), the rates of fire-line construction are relatively slow for both hand crews and tractors when compared with the post-treatment desired conditions.

The above factors result in a major negative effect on the overall ability of fire managers to safely suppress and contain fires, leading to increased suppression intensity and cost. This increased suppression intensity can lead to a greater potential for resource damage during the fire and higher Burned Area Emergency Rehabilitation (BAER) costs after the fire is out. Implementation of alternative B would not establish a network of fuel treatments. Overall, the current predicted fire behavior for this alternative could lead to a greater potential for large, high-severity fires in forested areas, including the wildland urban interface, riparian habitat conservation areas, protected activity centers, and home range core areas in the analysis area during a wildfire under 90th percentile or worse weather conditions.

Direct and Indirect Effects: Air Quality

Under alternative B, treatments proposed under action alternatives would not occur; however, related uncontrollable emissions as described by the U.S. Environmental Protection Agency (2006) could occur from wildfires within the analysis area. This reality is supported by past fire events such as the Moonlight fire of 2007 and the Canyon Complex and Rich Fires of 2008 in which smoke impacted communities in and around the analysis area ranging temporally from a week to over a month of impacted air quality. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects Common to All Alternatives

The cumulative effects of past management practices, fire exclusion, and high-mortality fires (as detailed in appendix F) have largely shaped the forest that exists in the analysis area today. These factors have influenced vast areas of the Sierra Nevada mountain range and are well documented in the scientific literature as noted in Chapter 3. These past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. Changes in vegetation structure as a result of recent fires and past projects since the baseline data were collected have been incorporated into the Keddie Ridge Project’s existing conditions. Such activities have had major impacts at the stand level by converting mid to later seral forest to early seral structure; however, on the landscape scale, this has had a negligible impact due to the dispersed nature of these projects and their size relative to the analysis area.

On National Forest System lands and private lands, past harvest activities focused on selection and sanitation harvests resulting in overstory removal of dominant and codominant trees, and retention of midstory and understory trees. These harvest systems often used lop and scatter techniques for limb wood and tree tops. These practices resulted in promoting closed-canopy, high-density stands of small trees with relatively high fuel loads. Many of these stands continue to be conducive to high-mortality fire today.

Since the mid to late 1990’s, commercial and non-commercial thinning from below, with and without prescribed fire, has been the principal silvicultural treatment implemented on NFS and private lands in the analysis area. This silvicultural treatment has been used to establish several fuel treatments on NFS and private lands both within and adjacent to the analysis area (Green Flat and Lucky S Projects). These treated areas currently meet desired conditions in terms of potential fire behavior and tree mortality.

Herbicides have been used to control competing brush in conifer plantations and noxious weeds on private lands within the analysis area. A reduction of competing brush generally reduces stand-level flammability in plantations and increases rates of tree growth. These factors can shorten the length of time that planted trees remain vulnerable to scorch-related mortality. Past high-mortality fires in the Analysis area were typically replanted, and many of these areas are now dominated by young trees characteristic of CWHR size class 3.

Watershed and wildlife projects are not generally implemented at a scale or location to have an influence on landscape level vegetation or fire behavior and related tree mortality. In general, wildlife and watershed projects listed in “Appendix F: Past, Present, and Reasonably Foreseeable Future Actions,” have a negligible effect on stand development and landscape level fire behavior and related tree mortality. These small projects that improve riparian areas or improve wildlife habitat have a minor beneficial effect by enhancing vegetation diversity and decreasing fire behavior. In general, current road conditions and past road closures to benefit wildlife have had a negligible impact on the vegetation or fire management within the analysis area.

Other present and proposed future projects in the analysis area include wildlife, botanical, watershed, grazing, recreation, lands, minerals, and special use projects. These projects would not be expected to have a measurable effect on forest structure in the analysis area due to the localized and dispersed nature of scale and intensity of such projects. However, the primary minor adverse effect of these projects, particularly recreation activities, with respect to fire, is increased ignition sources from campfires, vehicles, and other intentional or unintentional ignitions from forest users during summer months.

Christmas tree cutting and firewood collection would likely have an adverse effect on regeneration and snag levels, particularly within localized areas around main roads. Christmas trees and firewood cutting have a negligible effect on stand- and landscape-level fire behavior. Levels of regeneration and snags outside of the main road corridors are unlikely to be affected due to recruitment in untreated areas and lack of access. Due to the seasonal and dispersed nature of these activities, there would be a negligible effect across the analysis area.

Present and proposed future fuels and vegetation management projects in the analysis area include the Moonlight Fire Recovery Project, Keddie Ridge Roadside salvage project, the proposed North Arm salvage project, the Maidu Stewardship Project, the Canyon Dam Fuel Reduction and Forest Health Project, the Empire Vegetation Management project, Plumas Fire Safe Council Projects, and Natural Resource Conservation Service Projects. Collectively, these projects represent less than 5 percent of the analysis area, and Forest Service projects represent less than 5 percent of National Forest System Lands.

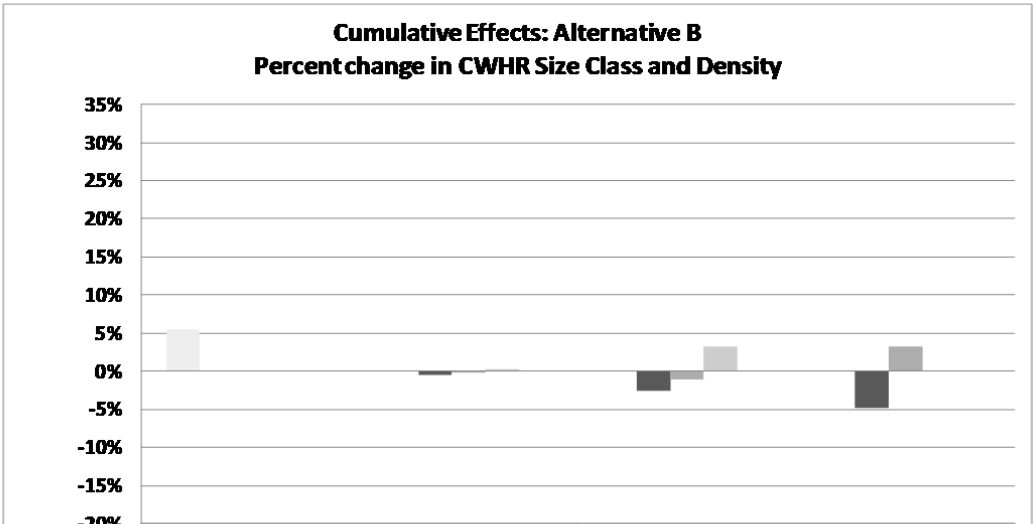
Post-fire and insect salvage projects such as the Moonlight Recovery Project, the Keddie Ridge Roadside Salvage Project, and the North Arm Salvage remove dead trees and would result in the localized reduction of snags; however, snag retention guidelines would be incorporated into these projects. These effects would be highly localized and limited in scale to these project areas. Snags would be retained in the untreated portions of the Moonlight Fire which are large in extent, and snag recruitment would continue through insect related mortality. The North Arm Salvage project would remove dead and live trees to recover the value of dead trees and reduce stand densities to improve resistance to bark beetle related mortality of residual trees. This would result in creating an open canopy stand characterized by CWHR 4P.

Small hazardous fuels projects occurring on private lands such as the Plumas Fire Safe Council Projects, and Natural Resource Conservation Service Projects, include hazardous fuels reduction in the form of commercial and non-commercial mechanical thinning, hand thinning, piling and burning, or underburning. These activities would have a beneficial effect on the stand level by maintaining an open understory in these stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. These projects are generally smaller in scale and highly dispersed through the analysis area. In addition, the treatments employed in these projects would not notably affect the overstory trees. Consequently these projects would result in a negligible impact on overall landscape structure because they are not likely to affect seral stage (as represented by CWHR size class) or overstory canopy (as represented by CWHR density class).

Larger hazardous fuels reduction projects occurring on National Forest System lands such as the Maidu Stewardship project, the Canyon Dam Fuel Reduction and Forest Health Project, and the Empire Vegetation Management Project also employ hazardous fuels reduction in the form of commercial and non-commercial mechanical thinning, hand thinning, piling and burning, or underburning. These activities would also have a beneficial effect on the stand level by maintaining an open understory in these stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. These projects are typically larger in scale and have greater capacity to affect overstory tree density. The Maidu Stewardship project implements prescriptions which prohibit harvest of trees greater than 20 inches DBH and maintain canopy covers greater than 50 percent. These activities would not notably affect the overstory trees and would result in a negligible impact on overall landscape structure because they are not likely to affect seral stage (as represented by CWHR size class) or overstory canopy (as represented by CWHR density class).

The Canyon Dam Fuel Reduction Project and the Empire Vegetation Management project include prescriptions and treatments that would have a greater capacity to affect overstory trees and canopy cover. Within these projects, stands typed as CWHR 4 would allow for greater removal of canopy cover and trees less than 30 inches DBH. These activities would also have a beneficial effect on the stand level by creating open canopy stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. This would result in the modification of mid-seral closed-canopy stands characterized by CWHR 4M and 4D to mid-seral open canopy stands characterized by CWHR 4P across 250 acres within the analysis area. Prescriptions for fuel treatments within CWHR 5 stands, however, would maintain greater than 40 percent canopy cover and would maintain both size class and closed-canopy conditions.

In addition, the Empire Vegetation Management project also includes mastication, area thinning and group selection treatments. Mastication treatments would primarily treat brush and small trees and would not affect CWHR size class or canopy cover. Area thinning treatments would primarily treat smaller trees and would maintain canopy cover greater than 50 percent, and consequently, would not affect CWHR size class or canopy cover. Group Selection treatments, however, would affect CWHR size class and canopy cover through removal of the majority of trees less than 30 inches DBH. This would result in converting approximately 58 acres of CWHR 4 and 15 acres of CWHR 5M into CWHR 1. Such small changes in CWHR size class would be very minor with relation to CWHR size and density distribution across NFS lands within the analysis area. The 5.5 percent increase in early seral conditions represented by CWHR size classes 1 and 2 are the result of group selection implemented under the Empire Vegetation Management project which fall into the analysis area. Figure 4 displays the cumulative effect of percent change in CWHR size class and density of other vegetation management projects within the analysis area under alternative B - the no action alternative.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-0.5%	-2.5%	-4.8%
Moderate		-0.2%	-1.1%	3.2%
Open		0.3%	3.2%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 4. Percent Change in CWHR Size Class and Density of Other Vegetation Management Projects within the Analysis Area under Alternative B

Future DFPZ maintenance is not proposed in the analysis area at this time but is included in the cumulative effects analysis as a possible future event. The 2003 HFQLG Final Supplemental EIS and Record of Decision, in combination with the original HFQLG Act final EIS and Record of Decision, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG pilot project area. The predicted maintenance treatments are described in "Appendix F: Past, Present, and Reasonably Foreseeable Future Actions." These maintenance activities could occur at least 10 years after implementation. The direct and indirect effect of such maintenance activities would maintain an open understory with reduced amounts of brush, tree regeneration, and naturally accumulating slash. These activities may reduce incidental numbers of snags, but may also induce snag recruitment through incidental tree mortality, particularly in prescribed fire treatments. The cumulative effect of DFPZ maintenance would be a reduction in tree regeneration and decreased recruitment of another age class of trees at the stand level; however, these treatments would maintain forest canopy and residual tree size. This, in turn, would retain stand structure and composition and would have a moderate beneficial effect on the long-term effectiveness of fuel treatments in terms of reducing fuel loading and potential fire behavior and effects.

Cumulative Effects of Alternative B

Alternative B would not meet the purpose and needs discussed in Chapter 1. With regards to Forest Vegetation, Fuels, Fire, and Air Quality, alternative B would not reduce hazardous fuel accumulations to improve forest health. Forest structure, species composition, landscape heterogeneity, fuel loadings, and potential fire behavior would remain unchanged. Overall, the existing forest and landscape structure and predicted fire behavior for this alternative could lead to a greater potential for large, high-severity fires in forested areas, including Wildland Urban Interface, riparian habitat conservation areas, protected activity centers, and home range core areas in the analysis area during a wildfire under 90th percentile or worse weather conditions.

The no action alternative would rely on density-dependent mortality, wildfires, and continued fire exclusion, to shape overall landscape structure. The maintenance of early seral stand structure would rely on areas of disturbance. The current landscape is dominated by mid-seral closed forests as represented by CWHR size classes 4M and 4D. No treatments would occur to enhance the development of mid-seral open-canopy forests. Stand densities would be expected to increase with time and would result in overall landscape homogeneity.

The maintenance of high stand densities across the landscape would result in the potential for adverse major impacts such as beetle outbreaks beyond endemic levels, widespread susceptibility to drought, and increased risk for high-mortality fire. These high stand densities and closed-canopy forests would favor a gradual shift in species composition toward shade-tolerant species, which would have an adverse effect on species diversity across the landscape. Such high-density stand structure is susceptible to forest health and fire hazard issues, and a homogeneous occurrence of these mid-seral closed-canopy forests across the landscape would be unstable (McKelvey and Johnston 1992). Alternative B would not provide for spatially variable, diverse stand structures across the landscape as described by Skinner (2005), Skinner and Chang (1996), Weatherspoon (1996), and the HFQLG final EIS (USDA 1999a), and it would not meet the desired conditions identified in the purpose and need sections in chapter 1 of this document.

Over the long-term, mortality occurring in high-density stands would continue to increase surface fuel load through deadfall of standing dead trees. This increase in mortality and related deadfall has been witnessed in the analysis area and other parts of the Sierra Nevada range as a result of region-wide drought in the late 1980s (Guarin and Taylor 2005). These increased surface fuels, combined with continuous ladder and canopy fuels, would continue to hinder suppression effectiveness, and would likely maintain stands susceptible to high-mortality fires such as the Moonlight and Antelope Complex Fires of 2007. The Moonlight and Antelope Complex Fires burned over 87,000 acres, with high severity (basal area mortality exceeding 75 percent) on 54,000 acres - the equivalent of over 84 square miles (USDA 2009c). Increased flame lengths during a wildfire could lead to high mortality in forested areas, including the Wildland Urban Interface, RHCAs, PACs, and HRCAs in the analysis area. In turn, this may result in large-scale adverse impacts to air quality and continued high fire suppression and rehabilitation costs for the indefinite future in the analysis area.

The no action alternative would not improve firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events. The no action alternative would also not reduce potential tree mortality or protect rare species and associated habitat from the major adverse effects of severe wildfire (Stephens and Moghaddas 2005a; Agee 2002). Reasonably foreseeable fuel treatment projects (appendix F) would be implemented at the stand level although they would mostly remain geographically separated. Alternative B would not provide continuity between existing and future fuel treatments, thereby decreasing their overall effectiveness at the landscape level. At the landscape level, the current Fire Regime Condition Class would not be modified over the short-term. Modifications over the long-term would be primarily caused by high-mortality fires and drought and insect-related mortality, none of which would trend the landscape-level Fire Regime Condition Class towards Condition Class I (refer to the "Glossary" for a definition of Fire Regime Condition Class). The no action alternative would allow stands to continue to develop under the influence of the legacy of past management practices and fire suppression (Skinner 2005; Agee 2002). Overall, the no action alternative would trend conditions for fire behavior and predicted mortality away from the desired conditions described in chapter 1.

Effects Common to All Action Alternatives (Alternatives A, C, D, and E)

Design Criteria

Chapters 1 and 2 provide detailed information about the Design Criteria used for each alternative**.** The harvest systems were determined by evaluating topography, slope, and access for each unit. Ground-based mechanical and skyline harvest systems are proposed (chapter 2). All mechanical harvest operations would adhere to the standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15, including Region 5 supplements) and the best management practices as delineated in the "Water Quality Management for Forest System Lands in California: Best Management Practices" (USDA 2000c).

Direct and Indirect Effects of Timber Harvest

In general, the direct and indirect effects described below would be common to all action alternatives that propose mechanical harvesting as a treatment regardless of silvicultural prescription. The effects of the specific silvicultural prescriptions proposed under the action alternatives are described in the subsequent subsections. However, all treatments involving mechanical harvesting using ground-based and skyline logging systems would share similar effects that include the potential for damage to residual trees; incidental removal of snags and trees greater than 30 inches in diameter; the construction of skid trails, landings, and temporary roads to facilitate logging operations; and the creation of activity-generated slash. Implementation of mechanical treatments is expected to maintain near-current total volume of snags and woody debris greater than 10 inches in diameter (Stephens and Moghaddas 2005c).

Throughout all treatments, regardless of silvicultural prescription, trees greater than 30 inches in diameter would be retained in accordance with the 2004 Record of Decision on the SNFPA Final Supplemental EIS (table 2)(USDA 2004b). In general, trees in the 20- to 30-inch diameter classes and the greater than 30-inch diameter classes would be the favored tree sizes to retain. These larger trees have favorable attributes in terms of fire resistance, desired stand structure, and wildlife habitat. In pine-dominated mixed conifer forest types, shade-tolerant species (such as white fir, incense-cedar, and to a lesser degree, Douglas-fir) would be targeted for removal, particularly in the smaller diameter classes. Shade-intolerant species such as Jeffery pine, ponderosa pine, and sugar pine would be retained. In true fir-dominated forest types, species preference would be weighted towards maintaining naturally occurring shade-intolerant species such as Jeffery pine; however, species composition would be maintained at levels appropriate for that ecological forest type.

Damage to residual trees may occur during harvesting operations including damage to stems, bark scraping, wrenched stems, broken branches, broken tops, and crushed foliage (McIver et al. 2003). These effects are typical in logging operations, but care would be taken to minimize the potential for damage to residual trees. The Forest Service would inspect timber sales during harvesting to ensure that damage to residual trees is within reasonable tolerances.

In accordance with the 2004 Record of Decision on the SNFPA Final Supplemental EIS (table 2, page 69)(USDA 2004b), four to six snags per acre that are 15 inches in diameter or greater would be retained within treatment units dependent on forest type and treatment (refer to the “Design Criteria” section in chapter 2). Incidental removal of snags may occur for operability and safety; however, guidelines set forth in the Pacific Southwest Region and Plumas National Forest Product Theft Prevention and Investigation Plan would be used to ensure that operability, safety, and minimum snag densities would be met. The snags to be retained would receive preference in locations where operability and safety are not anticipated to be issues. Snags within falling distances of roads, landings, and heavily used public areas would receive preference for removal where desired levels of large down woody debris have been met. Where minimum snag densities do not currently exist, marking guidelines would provide for the retention of large live trees with wildlife habitat characteristics (such as multiple or broken tops, crooks, and/or bole cavities) to serve as future snag recruitment. For additional information regarding snag retention and recruitment, please see the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

Existing skid trails, landings, and temporary roads would be used, when available, to facilitate the harvesting and removal of forest products (biomass and sawlogs). Skid trails, landings, and temporary roads could be constructed under all action alternatives to facilitate the removal of forest products when existing infrastructure does not exist. Under all action alternatives, no more than 6.8 miles of temporary road would be constructed, and any temporary roads constructed would be decommissioned after use. Construction of skid trails, landings, and temporary roads would require incidental removal of trees beyond those described for silvicultural purposes. This may include incidental removal of trees greater than 30 inches in diameter for operability. However, the location and size of skid trails, landings, and temporary roads, and the trees harvested for the construction of such facilities must be approved and agreed upon by the Forest Service. The removal of trees for operability would be incidental and minimized, and therefore, would have negligible effects on stand structure.

All action alternatives propose to use whole-tree yarding to treat slash generated by harvest activity. The removal of limbs and tops by such methods would greatly reduce activity-generated surface fuels (Agee and Skinner 2005). Some of the skyline units would not include whole-tree yarding due to feasibility constraints, but would treat biomass and residual slash through piling and burning of this material. The majority of trees would be removed using whole-tree yarding, which would effectively reduce the potential for activity-generated fuel accumulation. Slash would be lopped and scattered to minimize fuel bed depth, continuity, and arrangement if whole-tree yarding is not feasible (such as when mechanical yarding of an individual large tree would result in excessive damage to a residual stand). The net effect may result in incidental activity-generated fuel accumulations. Underburning would be used, as determined by post-treatment evaluations, to reduce activity-generated and existing fuels.

Alternative A – Proposed Action

Treatments and silvicultural prescriptions under alternative A were designed using the conceptual framework present in recent scientific literature regarding ecosystem management strategies for the Sierran Mixed-Conifer Forests (North et al. 2009). These concepts include: 1)emphasizing the importance and long-term enhancement of shade-intolerant species such as ponderosa pine, Jeffrey pine, sugar pine, and black oak, 2) reducing surface fuels, ladder fuels, and canopy fuels as appropriate to approximate an active-fire adapted stand structure, 3) reducing stand densities as appropriate to accelerate the development of large leave trees and improve stand resilience to agents of change such as fire, drought, insect and disease occurrences, and changing climate, 4) maintaining defect trees and intermediate-sized and large sized trees, which provide legacy structure that serves as important attributes of wildlife habitat, and 5) promoting heterogeneity at multiple scales (both within-stand and landscape level variability) to enhance structural diversity at the stand level, while creating landscape level diversity of seral stages and open-canopy stands which is more characteristic of an active-fire adapted forest.

Treatments and silvicultural prescriptions would be compliant with and would primarily implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Under alternative A, acres of group selection would be less than the amount allowed under full implementation of the HFQLG Pilot project, and group selection and mechanical thinning treatments would generally implement lower upper diameter limits for retention of intermediate and large-sized desirable shade-intolerant species. Table 26 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative A.

Table 26. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative A.

Type	Treatment	Prescription	Acres
DFPZ	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn.	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 2: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	824
		Rx 3: Thin to 30 – 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	255
		Rx 4: Thin to 30 to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; in RHCAs thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	870
		Rx 5: Thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH and underburn.	180
		Rx 8: Thin to 30 – 50 percent canopy cover, generally retain live trees greater than or equal to 12 inches DBH, and underburn.	206
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn.	231
	Mechanical Thinning	Rx 3: Thin to 30 – 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	262
Group Selection		Harvest trees less than 30 inches DBH . Consider retaining healthy vigorous undamaged trees of desired shade intolerant species greater than 20 inches for seed tree and forest structure purposes, where appropriate.	284

Direct and Indirect Effects: Hand Thinning Treatments

The effects of pile burning treatments would be highly localized and dispersed. These effects would include scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments. These treatments would reduce understory vegetation and would result in incidental mortality in the midstory but would not be expected to change CWHR size class or density class. Hand thinning treatments are analyzed for hand thinning, piling, and burning, as well as follow-up underburning where conditions permit. Table 27 displays the average post-treatment stand attributes for hand thinning treatments that would be implemented under alternative A.

Table 27. Average Post-Treatment Stand Attributes for Hand Thinning Treatments under Alternative A

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx1	179	-46%	100%	160	-9%	42	16.9	7.3%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Hand thinning treatments would reduce stand density through hand thinning, piling, and burning trees less than 8 inches in DBH. These treatments would reduce trees per acre by 19 to 62 percent while retaining all trees greater than 8 inches DBH.

Hand thinning treatments would also reduce basal area per acre by 9 percent to 160 square feet of basal area, on average. The reduction of basal area would be limited to trees less than 8 inches DBH. Approximately 53 percent of stands would be thinned to less than 150 square feet; in the remaining 47 percent of the stands hand thinning alone is not sufficient to reduce basal area below the 150 square foot basal area threshold.

Hand thinning treatments would reduce relative stand densities to desirable level post-treatment. Fifty-three percent of stands proposed for hand thinning would have relative stand densities of 40 percent or lower. Approximately 11 to 16 percent of these stands would have higher relative stand densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

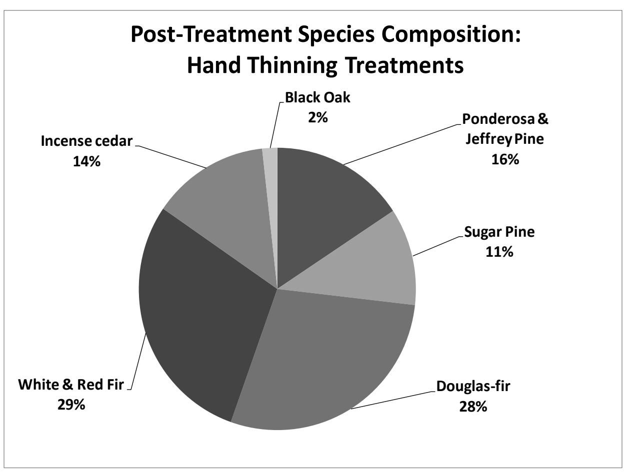


Figure 5. Average Post-Treatment Species Composition of Hand Thinnning Treatments under Alternative A

Species Composition

On average, hand thinning treatments could increase shade-intolerant species composition by 1 percent; however, depending on individual stand conditions, this increase could be as much as 4 percent. Hand thinning treatments would not have a notable effect on overall stand species composition primarily because these treatments limit tree removal to trees less than 8 inches DBH, and consequently, have little effect on basal area distribution by species.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Hand thinning treatments would not enhance development into the next size class or notably affect stand canopy cover. Hand thinning treatments would increase the quadratic mean diameter of treated stands by 7 percent on average and would also decrease stand canopy cover; however, these reductions be negligible as the vast majority of the trees that would be removed would be from the understory.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Hand thinning, piling, and burning treatments would reduce excess surface fuels through piling and burning of existing dead and down material and ladder fuels through hand thinning, piling, and burning trees less than 8 inches DBH. In addition, follow-up underburning would further reduce surface fuel loading. Table 28 displays the average post-treatment fuel and potential fire behavior attributes of hand thinning treatments under alternative A,

Table 28. Average Post-Treatment Fuel and Potential Fire Behavior Attributes of Hand Thinning Treatments under Alternative A

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx1	12	< 1	9	Incidental	25.0	Surface Fire	13

Hand thinning treatments would result in a reduction in predicted flame lengths, probabilities of torching, and basal area mortality by raising the canopy base height and reducing surface fuel loads. The resulting predicted fire type would be surface fire. The longevity of these treatment effects would last between 10-20 years until flame lengths increase above 4 feet where direct attack with handline is not feasible. Based on observations on the 2001 Stream Fire (Beckman 2001), the 2006 Boulder Fire, the 2007 Antelope Complex Fire (Fites et al. 2007), and recent scientific literature (Fule et al. 2006, Safford et al. 2009), lighter intensity, hand thinning treatments may not be as effective as mechanical treatments in modifying ladder and crown fuels and resulting fire behavior or tree mortality, dependent on individual stand conditions. Consequently, hand thinning treatments are prescribed for specific stand conditions where removal of smaller diameter material alone may be effective.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical treatments would be employed in both DFPZ and Area Thinning treatments. These treatments are designed to meet the purpose and need for reducing hazardous fuels, improving forest health, and protecting and enhancing habitat for sensitive species. Only a third of mechanical thinning treatments would occur in later seral forested stands best characterized by CWHR size class 5.

Silvicultural prescriptions under alternative A would implement a diverse range of canopy covers and species/objective specific diameter limits depending on CWHR type and maintenance of values discussed above. For example, prescriptions under alternative A would reduce canopy cover to lower limits within mid-seral CWHR 4M and 4D stands to accelerate growth of residual trees into later-seral open canopy stands characterized by CWHR 5; however, treatments in CWHR 5 stands and riparian habitat conservation areas would maintain more closed-canopy conditions as well as more intermediate and large-sized trees to retain later seral structure. These treatments, when combined with group selection and other treatments would enhance both within-stand and landscape level heterogeneity by creating horizontal diversity including canopy gaps and open canopy stand conditions favorable for the establishment and development of shade-intolerant species as well as clumps of closed-canopy stands with more vertical structural diversity.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 29.9 inches DBH. Table 29 displays the average post-treatment stand attributes for mechanical thinning treatments that would be implemented under alternative A by prescription. On average by prescription, these treatments would reduce trees per acre by 36 to 68 percent, however, dependent on individual stand conditions this could range from 17 to 91 percent. The vast majority of the trees removed would be less than 20 inches DBH. *On average, 97 percent of trees greater than 20 inches DBH would be retained. Depending on the individual stand conditions, a minimum of 73 to 100 percent of the trees greater than 20 inches DBH would be retained.*

Table 29. Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments that would be Implemented under Alternative A by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx2	127	-68%	73%	137	-34%	35	18.8	30%
Rx3	169	-58%	87%	155	-24%	38	18.0	24%
Rx4	226	-49%	94%	144	-22%	40	16.8	19%
Rx5	210	-36%	100%	175	-8%	44	16.5	8%
Rx8	214	-62%	100%	124	-18%	38	14.2	15%
Average	177	-57%	73%	147	-25%	38	17.7	23%

Basal area per acre would be reduced by 25 percent on average for all mechanical treatments. By prescription, basal area reduction would average between 8 and 34 percent; however, dependent on individual stand conditions and CWHR type, basal area reduction could range from 5 to 63 percent. *Basal area per acre would be reduced below the 150 square feet per acre threshold in 70 percent of the treated stands.*

In addition, relative stand densities would be reduced to desirable levels post-treatment. *Two-third of the stands would have relative stand densities within desired conditions immediately post-treatment.*

Within 20 to 30 years after treatment, only 7 percent of stands would have relative stand densities that would exceed the 60 percent threshold and would need to be evaluated for re-treatment.

Species Composition

Mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand. Prescriptions that generally retain trees greater than 24 inches DBH would allow for the removal of undesirable trees such as, a shade-tolerant white fir, up to 29.9 inches DBH if it is competing with a desired tree such as shade-intolerant ponderosa pine or a legacy tree greater than 30 inches DBH or within proximity of a group selection unit where shade-intolerant regeneration would be emphasized. On average, species stand composition of shade-intolerant species would increase by 5 percent; however, depending on individual stand conditions, this increase could be as much as 30 percent or in the case of 14 percent of the stands, result in no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 23 percent under mechanical thinning prescriptions in alternative A. This increase in stand quadratic mean diameter would enhance the development of CWHR 4 stands into CWHR 5 stands. Within 30 years of growth, approximately 39 percent of stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, alternative A provides a range of prescriptions which would create a diverse range in canopy covers. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum, and canopy cover would be maintained at 50 percent with RHCAs.

The prescriptions for mechanical thinning are designed to create both horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. CWHR 4 stands would receive heavier thinning (removal of more trees and canopy cover) to create open canopy stands and enhance diameter growth of residual trees into CWHR 5. CWHR 5 stands would receive lighter thinning (less removal of trees and canopy cover) to maintain closed-canopy stand conditions of later seral stands while reducing ladder fuels and stand density to reduce negative impacts of future fires, drought, and insect and disease occurrences.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would reduce ladder and canopy fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribed fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 30 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative A by prescription.

Table 30. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative A by Prescription

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx2	14	< 1	33	Incidental	41	Surface Fire	10
Rx3	12	< 1	18	Incidental	25	Surface Fire	12
Rx4	11	< 1	20	Incidental	26	Surface Fire	13
Rx5	9	< 1	14	Incidental	22	Surface Fire	12
Rx8	11	< 1	21	Incidental	31	Surface Fire	15
Average	12	< 1	22	Incidental	30	Surface Fire	12

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 25 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribed fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be notably reduced – to less than 1 foot on average, well below the 4 foot threshold which would allow for direct attack utilizing hand crews. The probability of torching would also be greatly reduced – to incidental amounts which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas, small pitches of steep, untreatable ground, and clumps retained with high canopy cover and vertical structure of retained understory trees.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment's reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 12 percent on average, and would range from 4 to 20 percent. All of the treated stands would result in low severity fire.

Direct and Indirect Effects: Mastication Treatments

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mastication treatments would occur in plantations and pole sized stands and would re-arrange shrub fuels and conifer tree ladder fuels less than 10 inches in diameter. Post-treatment residual conifer tree spacing would range from 25 to 30 feet, on average, resulting in approximately 50 to 110 trees per acre. Trees per acre and basal area per acre would be reduced as well as relative stand density.

Species Composition

Mastication treatments would employ species preferences to retain species native to the forest stand ecological type. Desired shade-intolerant species such as black oak, ponderosa and Jeffrey pine, rust-resistant sugar pine, and Douglas-fir would typically receive preference for retention while allowing for a diverse mix of species occupying the site. While mastication treatments are limited in their capacity to treat trees less than 10 inches DBH, the treatment's capacity to affect species composition change is greater than hand thinning or 12 inch mechanical thinning because mastication would occur in stands where the vast majority of trees are less than 10 inches DBH.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Mastication treatments would create open canopy stands within plantations and naturally occurring pole sized (less than 11 inches DBH) stands. These treatments would enhance the development of CWHR 2 and 3 sized stands into CWHR 4 sized stands with Open (P) and Sparse (S) canopy cover (less than 39 percent canopy cover).

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mastication treatments would increase and compact surface fuels by modifying aerial arrangements of shrubs and ladder fuels (small trees less than 10 inches DBH) into a compact surface fuel bed. While these treatments actually increase surface fuel loads, the treatments also reduce vertical continuity of fuels and modify potential fire behavior in terms of flame length and rate of spread.

The reduction of the vertical continuity of fuels would reduce the probability of torching and the initiation of passive crown fire. This would result in surface fire behavior; however, potential fires would likely have higher fireline intensities which would influence direct attack and fire suppression strategy. Basal area mortality would likely remain high where fire occurs as stems of the small trees are exposed to high levels of heat from the increased fuel bed and residence time of burning fire (Fites et al. 2007).

Direct and Indirect Effects: Prescribed Fire Treatments

The effects of prescribed fire treatments in all action alternatives are expected to be the same. Underburning is nonselective, and it may kill some dominant and codominant trees that may have otherwise been retained in mechanical treatments. Implementation of prescribed burning treatments would have a negligible to minor effect on species composition in underburn units. According to the HFQLG Final Supplemental EIS (page 19), overall, the overstory canopy would not be affected by underburning, although torching of individual or small groups of trees would occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels can occur together. Torching may result in gaps in the canopy typically less than 0.5 acre in size. Localized torching from underburning would occur, thereby creating small openings in the overstory where shade-intolerant species may become established and grow, depending on size.

Implementation of prescribed burning is expected to reduce surface fuel loading including existing rotten woody debris, but overall would strive to maintain the current total volume of snags and woody debris greater than 10 inches in diameter (Stephens and Moghaddas 2005c). Prescribed burn-only treatments are expected to result in standing dead snags (Stephens and Moghaddas 2005c) that will likely fall to the ground within 5 to 10 years, thereby maintaining surface woody debris. Prescribed fire-only treatments may need to be treated sooner than mechanical fuel treatments (Fernandes and Botelho 2003).

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Prescribed fire treatments would reduce trees per acre, basal area per acre and relative stand density. Prescribed fire treatments would reduce trees per acre by causing fire-induced mortality primarily in the 1 to 10 inch diameter classes and some mortality in the 10 to 20 inch diameter classes. Mortality in the larger diameter classes may occur as the result of torching and/or delayed conifer mortality as a result of fire-damage and subsequent bark beetle attack.

Species Composition

Prescribed fire treatments would not notably affect species composition. However, prescribed fire treatments are the first step in the process of re-introducing fire into landscapes that have not burned for decades. Multiple entries of prescribed or natural fire may favor fire adapted shade-intolerant species over decades if not a century.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Prescribed fire treatments would not notably affect stand size class and density. Prescribed fire treatments would incur mortality of the smaller diameter trees, primarily those less than 10 inches in diameter with some incidental mortality of larger trees due to torching or post-fire delayed conifer mortality. Prescribed fire treatments would reduce vertical structure by preferentially consuming understory and mid story vegetation. Canopy cover density could be reduced by isolated torching events, however, most tree mortality resulting from prescribed fire treatments would occur in the understory which would not notably affect the overstory canopy cover. Multiple entries of prescribed or natural fire may begin to enhance forest structure and heterogeneity over decades if not a century.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Prescribed fire treatments would reduce surface fuel loading and incur mortality of ladder fuels. Prescribed fire treatments would modify fire behavior by consuming surface fuel and would result in lower predicted flame lengths and probability of torching, similar to a low load compact conifer timber litter fuel model (as described by TL-1 in Scott and Burgan 2005), which has flame lengths well below 4 feet. This, in turn, would modify potential fire type which would be best characterized by surface fire resulting in low basal area mortality.

Over the period of decades, mortality from prescribed fire treatments would fall to the ground as fuel loading recruitment. This would result in increasing fuel loads, probability of torching, and fire type as well as basal area mortality, and result in the need for maintenance re-treatment.

Direct and Indirect Effects: Group Selection Treatments

Alternatives A and E would implement group selection harvest as directed by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act)(USFS 1999a, b) to “test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and improve and maintain ecological health of the forest.”

The group selection method would create openings in the canopy to mimic gaps caused by natural agents, thereby emulating regeneration of a multicohort (multiple age classes) system across the landscape (York et al. 2003; Helms and Tappeiner 1996). Bonnicksen and Stone (1981, 1982) describe the southern mixed conifer forest of the Sierra Nevada as consisting of “mosaic aggregations in a space-time system.” The aggregations (collections) of cohorts (groups of individuals commonly consisting of trees of similar age [Helms 1998]) created using the group selection system may be used to increase diversity in forest structure on the landscape scale (McDonald and Abbot 1994), as well as promote the regeneration, growth, and development of shade-intolerant species (Leak and Filip 1977).

The ability of group selection to promote the regeneration, growth, and development of shade-intolerant conifer species is largely dependent on the size of the opening (York et al. 2004; McDonald and Reynolds 1999). “Seedlings of very shade-intolerant species such as ponderosa pine require a minimum of 30 percent full sunlight to survive in the understory” (Oliver and Larson 1996). The amount of sunlight reaching the group is a function of group size relative to the surrounding codominant and dominant tree height on the edge of the group. Consequently, those trees in the center of the group selection receive the most amounts of light and water, while those trees near the edge receive partial shade and must compete with surrounding codominant trees for water resources (York et al. 2003). A range of group selection sizes would be used to most appropriately “fit” the site requirements to encourage the regeneration, growth, and development of shade-intolerant species. Group selection openings would range in size from 0.5 acre to 2 acres, averaging 1.5 acres in size.

The group selection silvicultural system is designed to create a regulated, uneven-aged stand over time comprised of a balanced distribution of different age classes. The combination of DFPZ, area thinning and group selection harvest methods would strive to emulate gap dynamics of an uneven-age forest system. This system focuses on maintaining forest structure while providing openings that encourage regeneration, growth, and development of shade-intolerant species, and it may be effective in enhancing structural and compositional diversity, which contributes to the ecological health of the forest.

Group selection treatments are designed to promote the establishment, growth, and development of a new age class – or cohort – of shade-intolerant tree species such as ponderosa pine, Jeffrey pine, and rust-resistant sugar pine. Black oak and all trees greater than or equal to 30 inches DBH would be retained. Under alternative A, over 85 percent of group selection treatments would be occur in CWHR 4 stands to convert mid-seral closed-canopy stands dominated by less desirable shade-tolerant species into early seral open canopy openings where establishment, growth, and development of desirable shade-intolerant species is more favorable. Those group selection treatments that would occur in CWHR 5 stands would be strategically placed in areas dominated by uniformly sized, smaller shade-tolerant species.

Site preparation and regeneration needs would be evaluated after harvest. Those Group Selection Units requiring natural and activity slash treatment would undergo “site preparation” via machine piling, brush raking, hand piling, and/or underburning to clear any activity slash and debris that would prevent site regeneration.

Both artificial and natural regeneration would be used to reforest group selection units. A combination of natural and artificial would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. Those units requiring artificial regeneration would be planted with a mix of species native to the ecological forest type. Species to be planted would include Jeffrey pine, ponderosa pine, rust-resistant sugar pine, Douglas-fir, and incense cedar. Natural regeneration would be used for incense cedar, white fir, and red fir species. This regeneration method would have a major beneficial effect on enhancing desired species composition on both the stand and landscape scales.

After establishment of regeneration, release treatments (manual grubbing and/or pre-commercial thinning) would be used to reduce competing vegetation to favor the growth and development of desired species. Without release treatments, shrub and naturally regenerated tree species would likely compete with desired species and slow the growth and development into subsequent seral stages. Over time, these treatments would contribute to the development from seral stages CWHR SMC 1 and 2 to CWHR 3, represented by a quadratic mean diameter greater than 6 inches.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Group Selection treatments would reduce trees per acre by greater than 90 percent, on average, and would reduce basal area per acre by 74 percent on average. Relative stand density would also be greatly reduced to levels far less than 25 percent; however, this would be favorable for promoting the establishment, growth, and development of shade-intolerant tree species.

Species Composition

Species composition of shade-intolerant tree species would be enhanced through two mechanisms: 1) the preferential retention of healthy vigorous pine and black oak species as seed trees, if available on site, and 2) planting a mix of tree species native to the ecological type while emphasizing the shade-intolerant species in that forest type. These two mechanisms would enhance the establishment of shade-intolerant species. Group selection treatments would increase relative proportions of desirable shade-intolerant species such as ponderosa pine, sugar pine, and black oak, (accounting for more 50 percent) and would decrease relative proportions of less desirable shade-tolerant species such as white fir (Figure 6).

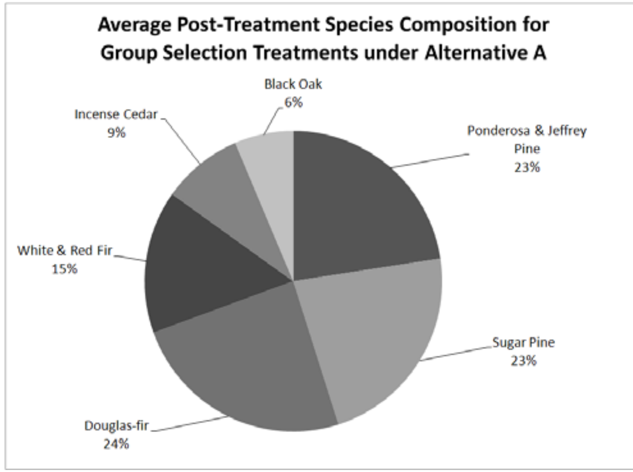


Figure 6. Average Post-Treatment Species Composition for Group Selection Harvest under Alternative A

Landscape Structure and Heterogeneity: Stand Size Class and Density

Group Selection treatments would enhance landscape structure and heterogeneity by converting mid-seral closed-canopy forest dominated by shade-tolerant species to early seral, open canopy gaps which would create favorable conditions for the establishment, growth, and development of shade-intolerant species. Primarily CWHR 4 stands and less desirable areas (in terms of tree size and species composition) within CWHR 5 stands would be converted to areas best characterized by CWHR 1 and 2 stands. Under alternative A, approximately 85 percent of the group selection treatments would occur in CWHR size class 4 stands, and less than 15 percent would occur in CWHR size class 5 stands. Furthermore gaps of openings with tree regeneration are an inherent component of within-stand variability which is thought to be more characteristic of a low to mixed severity, active fire stand structure (North et al. 2009, Collins and Stephens 2010).

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Post-harvest group selection site preparation would be performed, if necessary, to create favorable reforestation conditions. This would also reduce total surface fuel loads in the short-term. However, over the subsequent 20 to 30 years, the establishment and growth of shrub species and sapling/pole-sized trees would create areas of potentially high severity fire behavior.

Predicted flame lengths would exceed the 4 foot threshold for initial attack. Consequently, the probability of torching would increase to 77 percent on average within 30 years resulting in passive crown fire behavior that would result in high levels of basal area mortality. Early seral stands, by nature of their inherent structure, are susceptible to these risks (Thompson et al. 2007); however the scattered, disparate arrangement and small scale of group selection treatments strategically located within DFPZ and Area thinning mechanical thinning treatments mitigates these risks

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Noxious weeds may compete for water, light, and nutrients with native understory vegetation and tree seedlings which would have a negative effect on native forest vegetation. The treatments proposed in alternative A would have a beneficial effect by controlling the invasion and spread of noxious weeds and reducing competition with native forest vegetation in the analysis area. In particular, noxious weed treatments would have a beneficial effect for tree regeneration, as these treatments would reduce the potential for noxious weed establishment in such early seral, open canopy environments. The removal of noxious weeds by mechanical or chemical method would have a negligible effect on stand- and landscape-level fire behavior and related tree mortality. The target weed species are found in small, isolated populations and are not generally considered unusually flammable.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Noxious weed treatments and borax treatments would not reduce trees per acre, basal area per acre or relative stand density and consequently would have negligible effects on stand structure.

Species Composition

Noxious weed treatments would have negligible effects on species composition. Borax treatments would prevent the infection of pine stumps by the *Heterobasidion* root disease. Borax treatments would have both short-term and long-term beneficial effects by reducing the potential for ponderosa pine mortality.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Noxious weed treatments and borax treatments would not affect CWHR Size class and density and consequently, would have negligible effects on landscape structure and heterogeneity.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Noxious weed treatments and borax treatments would have negligible effects on fuel loading, predicted flame length, probability of torching, fire type, and basal area mortality, and consequently, would have negligible effects on fuels and potential fire behavior.

Direct and Indirect Effects: Watershed Improvements

Watershed improvements include road decommissioning, maintenance, and road reconstruction. Since these activities are largely restricted to the road prism, the effects to forest vegetation, fuels, and potential fire behavior and effects would be negligible.

Stand Structure: Trees per Acre, Basal Area perAacre, and Relative Stand Density

Watershed improvements would not notably reduce trees per acre, basal area per acre or relative stand density and consequently would have negligible effects on stand structure.

Species Composition

Watershed improvements would have negligible effects on species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Watershed improvements would not affect CWHR size class and density and consequently, would have negligible effects on landscape structure and heterogeneity.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Watershed improvements would have negligible effects on fuel loading, predicted flame length, probability of torching, fire type, and basal area mortality, and consequently, would have negligible effects on fuels and potential fire behavior. However watershed improvements would improve access along roads which could enhance fire suppression efforts in direct and initial attack of wildfire ignitions.

Direct and Indirect Effects: Air Quality

Under alternative A, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative A

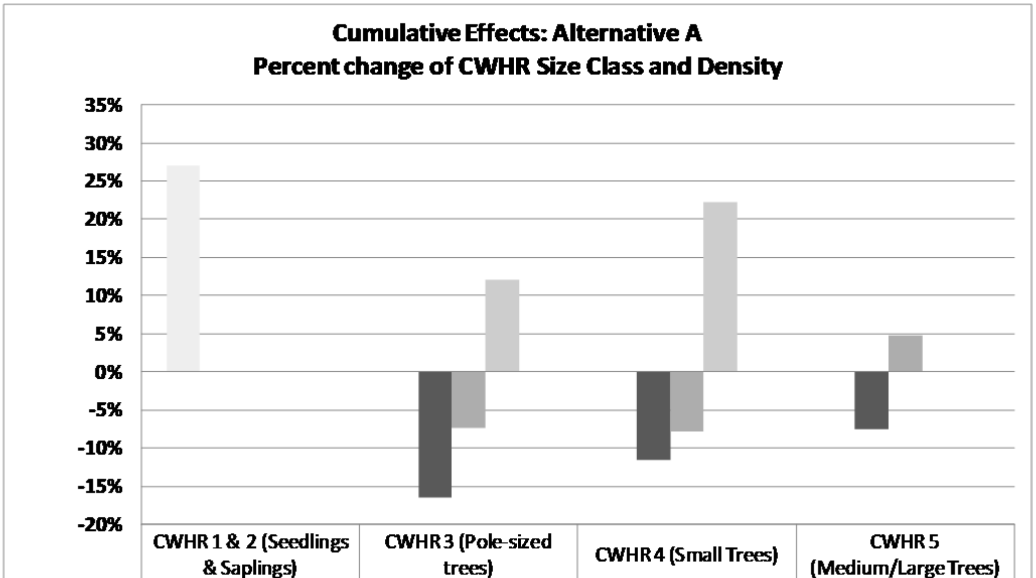
The cumulative effects of past projects may be characterized by the existing conditions that exist on the landscape today. Present and future projects may be characterized by a shift in land management values and practices that emphasize forest structure (including the retention of large dominant and codominant trees), the importance of species diversity, the role of fire as a process, and their relationship to landscape diversity and healthy, resilient ecosystems.

Due to the nature of the proposed treatments and silvicultural prescriptions, cumulative effects would include the maintenance and development of large trees throughout the analysis area. Upper diameter limits focus on retaining both large dominant and codominant as well as intermediate sized-trees which would maintain the component of large trees that exist in the analysis area. In addition, thinning from below treatments would create conditions favorable for growth and development of large trees.

Snag levels could be reduced in current, proposed, and future fuel reduction projects, therefore the cumulative effect would be the reduction of snags in treated areas to minimum retention levels determined by forest type. However, across the analysis area, snag recruitment would continue to occur, particularly in untreated areas where high stand densities would continue to contribute to mortality. Snag retention guidelines implemented in current, proposed, and future forest management projects (as directed by the 2004 SNFPA (USDA 2004b)) in combination with snag recruitment in untreated areas would contribute to maintaining snags throughout the analysis area.

The cumulative effect of current, proposed, and reasonably foreseeable projects would include maintaining and promoting species diversity, particularly enhancing the regeneration and development of shade-intolerant species. Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands and preferential regeneration of shade-intolerant species in group selection units would enhance the regeneration, growth, and development of shade-intolerant species. These treatments would contribute to a higher shade-intolerant species composition in treated areas immediately post-treatment.

Given the current direction in the 2004 SNFPA (USDA 2004b) and the Forest Service's emphasis on ecological restoration through the retention of large trees and thinning primarily small trees, the cumulative effect of, current, proposed, and future forest management projects would be a reduction in



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	27.0%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	-7.8%	4.7%
Open		12.1%	22.3%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 7. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative A

stand densities, particularly in the smaller tree sizes. Stand density would be reduced particularly in the smaller diameter classes through all action alternatives. This effect (and the longevity of this effect) differs by alternative due to the differences in amount of acres treated under differing canopy cover retention guidelines.

Figure 7 displays the cumulative effects of percent change in CWHR size class and density under alternative A. Stand structure within treated stands would have lower stand densities and would be characterized by mid- to later-seral open canopy stands. Under alternative A, treatments would contribute to a decrease in mid-seral closed-canopy conditions, primarily in CWHR 4M and 4D, would correspond with 22 percent increase in mid-seral open canopy stands and a 27 percent increase in early seral areas. The horizontal and vertical structure of these stands would be diverse and would be comprised of clumps of trees, gaps in the canopy, and intermingled openings. The intensity of this effect would be limited by the number of acres treated over time and tempered by the development of mid-seral closed-canopy forests in untreated stands; however, alternative A would provide for the greatest reduction in stand density on the stand level and create more open canopy stands that would enhance development of later seral open canopy stands and would be more resistant to the effects of fire, drought, insects, and disease. These open canopy stands would also promote conditions favorable for shade-intolerant species to establish and develop and contribute to species diversity across the landscape. Relative to all alternatives, alternative A provides for the largest change in landscape structural diversity with the greatest longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative C – Non-Commercial Alternative

Treatments and silvicultural prescriptions under alternative C were designed to meet the purpose and need to reduce hazardous fuel accumulations. Treatments focus on reducing surface fuel accumulations and ladder fuels. These treatments would also be compliant with, but generally would not fully implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b) Table 31 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative C.

Table 31. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative C

Type	Treatment	Prescription	Acres
DFPZ	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 8: Thin to 30-40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; except in CWHR 5M/5D, thin to 40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; and In RHCA's , thin to 50 percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and underburn.	2,591
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	231
	Mechanical Thinning	Rx 8: Thin to 30-40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, thin to 40-50percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and In RHCA's , thin to 50 percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and underburn.	290

Direct and Indirect Effects: Hand Thinning Treatments

Direct and Indirect effects of hand thinning treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Mechanical Treatments

Mechanical treatments under alternative C would implement a 12 inch upper diameter limit; however canopy cover reduction would follow table 2 standards and guidelines as directed under the 2004 SNFPA. This would allow for canopy cover reductions in CWHR size class 4down to 30 percent canopy cover within DFPZ treatments, and down to 40 to 50 percent canopy cover in area thinning treatments. Table 32 displays the average post-treatment stand attributes of mechanical thinning treatments under alternative C.

Table 32. Average Post-Treatment Stand Attributes of Mechanical Thinning Treatments under Alternative C

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx8	255	-43%	100%	173	-15%	46	16.6	14%

Stand Structure: Trees per acre, Basal Area per acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 12 inches DBH. These treatments would reduce trees per acre by 43 percent, on average, and would range from 13 to 88 percent depending on the individual stand. *Across all stands, 100 percent of the trees* *greater than 12 inches DBH would be retained.* On average, alternative C would retain 255 trees per acre which would consistently have higher tree densities than desired conditions for forest health, and would not resemble forest structure adapted to an active fire disturbance regime.

Basal area per acre would be reduced by 15 percent on average, and basal area reduction would range from 2 to 56 percent depending on individual stand conditions and CWHR type. On average, stands would retain approximately 173 square feet of basal area. *Basal area per acre would be reduced below the 150 square feet per acre threshold in only 36 percent of the treated stands.*

Relative stand densities would be reduced to 46 percent post-treatment, on average. Nearly *62 percent of the stands would NOT have relative stand densities within desired conditions immediately post-treatment.* Approximately 25 to 32 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

While mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand, mechanical treatments under alternative C would have lower capacity to affect species composition change because prescriptions that retain trees all trees greater than 12 inches DBH would not affect overstory tree composition. Overstory tree is important because overstory trees have reached reproductive maturity and will produce the majority of seed in the stands for future regeneration. Mechanical thinning treatments under alternative C would not remove undesirable shade-tolerant trees greater than 12 inches DBH, and consequently, would retain shade-tolerant trees that would be a future seed source for more shade-tolerant tree regeneration.

As a result, species stand composition of shade-intolerant species would only increase by 1 percent, on average; however, depending on stand conditions, this increase could be as much as 4 percent or, in the case of 39 percent of the stands, result in a decrease or no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 14 percent under mechanical thinning prescriptions in alternative C. This increase in stand quadratic mean diameter, however, would not notably enhance the development of CWHR 4 stands into CWHR 5 stands. In thirty years after treatment, only 7 percent of treated stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, since alternative C has a 12 inch upper diameter limit, this reduction in canopy would be limited to primarily understory and mid-story trees. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum. On average canopy cover would be 44 percent and would range from 33 to 59 percent dependent on individual stand conditions. *Two-thirds of the stands would have greater than 40 percent canopy cover and moderate and dense closed-canopy conditions would be maintained.*

The 12 inch upper diameter limit for mechanical thinning under alternative C would limit opportunities to enhance horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. While the mechanical treatments would reduce ladder fuels, but the efficacy to reduce stand densities and associated negative impacts of future fires, drought, and insect and disease occurrences would be notably limited.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would primarily reduce ladder fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 33 displays the average post-treatment fuels and potential fire behavior attributes for mechanical treatments under alternative C.

Table 33. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Treatments under Alternative C

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx8	12	< 1	15	Incidental	23	Surface Fire	13

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 25 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be reduced to well below the 4 foot threshold in 96 percent of the stands which would allow for direct attack utilizing hand crews. The probability of torching would be incidental which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas and small pitches of steep, untreatable ground.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment’s reduction of surface, ladder, and crown fuels in 96 percent of the stands. Consequently, potential basal area mortality would also be reduced to 13 percent on average, and would range from 6 to 28 percent depending on individual stand conditions.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would not occur under alternative C.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, borax, and noxious weed treatments would not occur under alternative C.

Direct and Indirect Effects: Watershed Improvements

Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

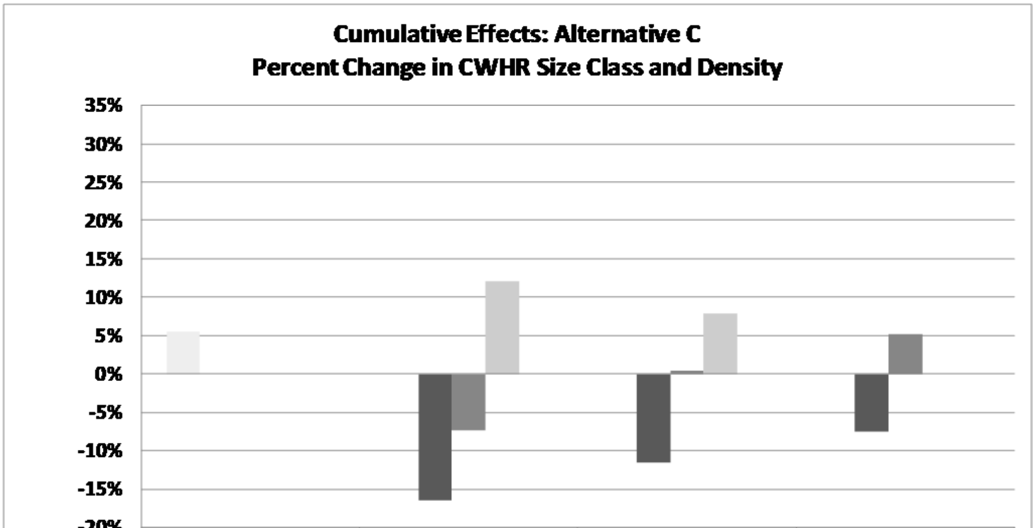
Under alternative C, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative C

Due to the nature of the proposed treatments and silvicultural prescriptions under alternative C, cumulative effects would include the maintenance and development of large trees throughout the analysis area. Upper diameter limits would retain all intermediate and large sized trees including all small trees between 12 and 20 inches DBH, As a result, stand densities would be reduced only in trees less than 12 inches which would only affect densities of understory and some mid-story trees. This effect compromises the ability of these treatments to meet forest health objectives such as improvement of conditions that favor shade-intolerant species, reducing stand densities to desired levels, and creating open canopy stands that contribute to landscape heterogeneity and enhance growth of small and medium sized trees into larger diameter classes.

Snag levels would be maintained due to the 12 inch upper diameter limit and across the project area, snag recruitment would continue to occur where high stand densities would continue to contribute to mortality.

Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands would be implemented, however the efficacy of these preference guidelines would be limited by the upper diameter limit. As a result, retention of small and intermediate sized shade-tolerant trees would be retained and the improvement of species composition would be less relative to alternatives A and E. In addition, alternative C does not implement group selection and generally retains higher stand densities and closed canopies on average which would limit the establishment, growth, and development of desirable shade-intolerant species. Over time, these relatively denser and closed canopy conditions would favor shade-tolerant species.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	0.5%	5.2%
Open		12.1%	7.8%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 8. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative C

Figure 8 displays the cumulative effects of percent chance in CWHR size class and density under alternative C. Under alternative C, mid-seral closed-canopy conditions would generally be maintained with the exception of a relatively minor 7.8 percent increase in mid-seral open canopy stands. The 12 inch upper diameter limit would provide for vertical separation between surface and canopy fuels; however, horizontal continuity of closed-canopy stands would be maintained. The homogeneity of these stands would temper the resistance to the effects of fire, drought, insects, and disease. Maintenance of mid-seral closed-canopy stands would not promote conditions favorable for shade-intolerant species to establish and develop and would not notably contribute to species diversity across the landscape. Relative to all alternatives, alternative C provides for a modest change in landscape structural diversity with a lower longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction in landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative D – 2001 SNFPA ROD Consistent Alternative

Treatments and silvicultural prescriptions under alternative D were designed to meet the standards and guidelines for treatments and land allocation which would be compliant with the 2001 Sierra Nevada Forest Plant Amendment ROD (USDA 2001b). These treatments would also be compliant with, but generally would not fully implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Table 34 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative D.

Table 34. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative D

Type	Treatment	Prescription	Acres
DFPZ	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,464
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 9: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 15 percent of the stand untreated; and underburn.	709
		Rx 10: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 25 percent of the stand untreated; and underburn.	71
		Rx 11: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D, thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	574
		Rx 12: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	346
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	301
	Mechanical Thinning	Rx 10: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 25 percent of the stand untreated; and underburn.	26
		Rx 11: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D, thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	140

Direct and Indirect Effects: Hand Thinning Treatments

Direct and indirect effects of hand thinning treatments would be similar in intensity to those described for alternative A; however the number acres that would receive hand thinning treatments would increase by as much as 40 percent. This is due to canopy cover reduction restrictions associated with the SNFPA 2001 ROD (USDA 2001b) which would prohibit mechanical thinning in stands with less than 50 percent canopy cover in CWHR 5M, 5D, and 6 stands, Old Forest Emphasis Areas, California spotted owl home range core areas, and WUI: Threat Zone and General Forest land allocations. Within these areas, the SNFPA ROD 2001 specifies:

> *"In stands that currently have between 40 and 50 percent canopy cover, do not reduce canopy cover except where canopy cover reductions result from removing primarily shade-tolerant trees less than 6 inches DBH." (USDA 2001b, pages A-26, A-41,A-44, A-48, A-49, A-50)*

This would result in approximately 500 acres that would not receive the beneficial effects of mechanical thinning on further reduction of stand density, species composition improvement, and enhancement of landscape structure and heterogeneity.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical thinning prescriptions under alternative D allow removal of conifers up to 20 inches DBH, and retain a 50 percent minimum canopy cover. In addition, the SNFPA 2001 ROD (USDA 2001b) guidelines specify that 10 to 25 percent of the stand is to be left untreated depending on land allocation or CWHR type. A portion of these stands have pre-treatment existing canopy covers that are less than 50 percent canopy cover and under the SNFPA 2001 ROD guidelines, treatment in these stands should be limited to hand thinning shade-tolerant trees less than 6 inches in diameter. Table 35 displays the average post-treatment stand attributes for mechanical treatments under alternative D by prescription.

Table 35. Average Post-Treatment Stand Attributes for Mechanical Treatments under Alternative D by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx1	251	-48%	100%	194	-9%	52	15.3	6.4%
Rx10	243	-39%	100%	204	-6%	53	15.6	4.6%
Rx11	316	-33%	100%	194	-9%	52	15.8	6.4%
Rx12	235	-39%	100%	179	-7%	48	16.1	3.7%
Rx9	340	-34%	100%	168	-9%	50	13.5	2.7%
Average	292	-37%	100%	187	-8%	51	15.2	5.0%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 12 to 20 inches DBH depending on land allocation; a minimum canopy cover of 50 percent would be retained. These treatments would reduce trees per acre by 37 percent, on average, and would range from 6 to 75 percent depending on the individual stand. *Across all stands, 100 percent of the trees greater than 20 inches DBH would be retained.*

Basal area per acre would be reduced by 8 percent on average, and basal area reduction would range from 1 to 34 percent depending on individual stand conditions and CWHR type. On average, stands would retain approximately 187 square feet of basal area. *Basal area per acre would be reduced below the 150 square feet per acre threshold in only 14 percent of the treated stands.*

Relative stand densities would be reduced to 51 percent post-treatment, on average. Approximately 86 percent of stands *would NOT have relative stand densities within desired conditions immediately post-treatment.* Approximately 32 to 43 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

While mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand, mechanical treatments under alternative D would have lower capacity to affect species composition change because prescriptions that retain trees a minimum canopy cover of 50 percent limits opportunities to affect overstory tree composition through tree removal. Overstory tree is important because overstory trees have reached reproductive maturity and will produce the majority of seed in the stands for future regeneration. Mechanical thinning treatments under alternative D would not remove undesirable shade-tolerant trees greater than 20 inches DBH and opportunities to remove trees less than 20 inches would be limited by canopy cover constraints. Consequently, this would retain shade-tolerant trees that would be a future seed source for more shade-tolerant tree regeneration.

As a result, species stand composition of shade-intolerant species would only increase by 1 percent, on average; however, depending on stand conditions, this increase could be as much as 8 percent or, in the case of 50 percent of the stands, result in a decrease or no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 5 percent under mechanical thinning prescriptions in alternative D. This increase in stand quadratic mean diameter, however, would not notably enhance the development of CWHR 4 stands into CWHR 5 stands. In thirty years after treatment, only 7 percent of treated stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, since alternative D has a 20 inch upper diameter limit AND specifies a minimum canopy cover retention of 50 percent, this reduction in canopy would be limited to primarily understory and mid-story trees. On average canopy cover would be 50 percent and would range up to 66 percent dependent on individual stand conditions. *Moderate and dense closed-canopy conditions would be maintained.*

The 20 inch upper diameter limit, 50 percent canopy cover minimum retention standards, and guidelines specifying that up to 25 percent of stands be left untreated under alternative D would limit opportunities to enhance horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. While the mechanical treatments would reduce ladder fuels, the efficacy to reduce stand densities and associated negative impacts of future fires, drought, and insect and disease occurrences would be notably limited.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would primarily reduce ladder fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 36 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative D by prescription.

Table 36. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative D by Prescription

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx1	12	0.5	7	Incidental	19	Surface Fire	14
Rx10	8	3.4	13	27%	18	Surface Fire	22
Rx11	14	3.4	11	37%	19	Surface Fire	21
Rx12	13	3.9	13	33%	21	Surface Fire	19
Rx9	11	2.8	13	32%	21	Surface Fire	21
Average	12	2.9	11	28%	20	Surface Fire	19

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 27 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths, on average, would be reduced below the 4 foot threshold which would allow for direct attack utilizing hand crews. Approximately 11 percent of the stands would have flame lengths greater than 4 feet primarily due to the amount of fuel loading, and untreated vegetation left in the stand. The probability of torching would be reduced to 28 percent on average which would reduce the likelihood of passive crown fire initiation. Potential for torching would exist in untreated areas such as control areas and small pitches of steep, untreatable ground, and specified untreated areas. In a portion of the stands, the canopy cover retention guidelines simply limit the amount of ladder fuels that can be removed to modify fire behavior.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment’s reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 19 percent on average, and would range from 8 to 32 percent.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would not occur under alternative D.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Direct and Indirect effects of herbicide, borax, and noxious weed treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Watershed Improvements

Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

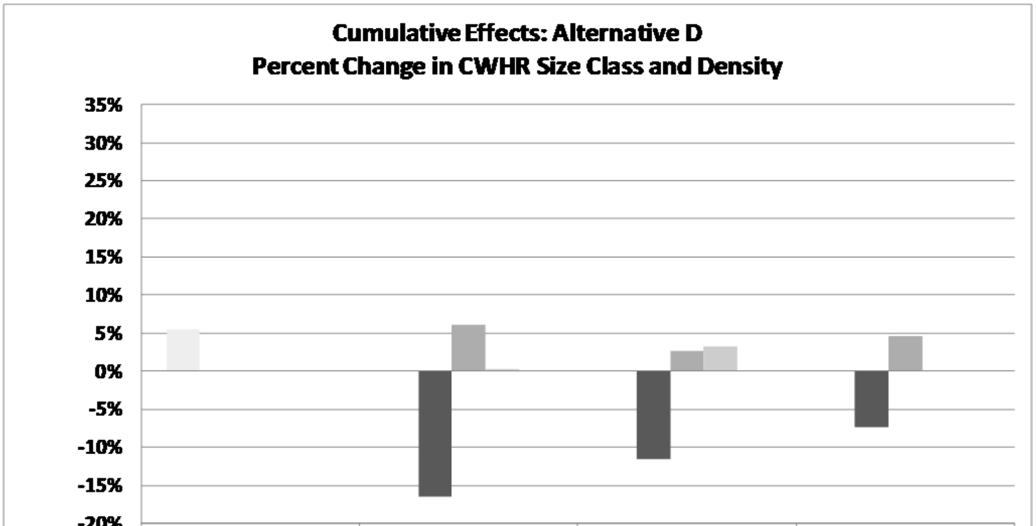
Under alternative D, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative D

Due to the nature of the proposed treatments and silvicultural prescriptions under alternative D, cumulative effects would include the maintenance and development of large trees throughout the analysis area. The variable 12 to 20 inch upper diameter limits would retain all intermediate and large sized trees. In addition, the 50 percent canopy cover minimum would maintain closed-canopy conditions. Lastly, under alternative D, 15 to 25 percent of the unit, depending on land allocation, would remain untreated. As a result, stand densities would be reduced only in trees less than 20 inches which would only affect densities of understory and some mid-story trees. This effect (and the longevity of this effect) compromises the ability of these treatments to meet forest health objectives such as improvement of conditions that favor shade-intolerant species, reducing stand densities to desired levels, and creating open canopy stands that contribute to landscape heterogeneity and enhance growth of small and medium sized trees into larger diameter classes.

Snag levels would be maintained due to the 12 inch upper diameter limit and across the analysis area, snag recruitment would continue to occur where high stand densities would continue to contribute to mortality.

Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands would be implemented; however the efficacy of these preference guidelines would be limited by the upper diameter limits, the 50 percent canopy cover minimum retention guidelines, and the untreated areas. As a result, retention of small and intermediate sized shade-tolerant trees would be retained and the improvement of species composition would be less relative to other action alternatives. In addition, alternative D does not implement group selection and generally retains higher stand densities and closed canopies on average which would limit the establishment, growth, and development of desirable shade-intolerant species. These relatively denser and closed-canopy conditions would favor shade-tolerant species.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-16.5%	-11.6%	-7.4%
Moderate		6.0%	2.6%	4.6%
Open		0.3%	3.2%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 9. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative D

Figure 9 displays the cumulative effect of percent change in CWHR size class and density under alternative D. Under alternative D, mid-seral closed-canopy conditions would be maintained. The 12 inch to 20 inch upper diameter limits would provide for vertical separation between surface and canopy fuels in treated areas, however, horizontal continuity of closed-canopy stands would be maintained. The homogeneity of these stands would temper the resistance to the effects of fire, drought, insects, and disease. Maintenance of mid-seral closed-canopy stands would not promote conditions favorable for shade-intolerant species to establish and develop and would not notably contribute to species diversity across the landscape. Relative to all alternatives, alternative D provides for the most modest change in landscape structural diversity with a lower longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. Vertical continuity of surface, ladder, and canopy fuels would be maintained in the units where 15 to 25 percent of the area is left untreated. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative E – 2004 SNFPA ROD Consistent Alternative

Treatments and silvicultural prescriptions under alternative E were designed to fully implement standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Table 37 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative E.

Table 37. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative E

Type	Treatment	Prescription	Acres
DFPZ	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 13: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	2,242
		Rx 14: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, Thin to 40-50 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	53
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	231
	Mechanical Thinning	Rx 14: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, Thin to 40-50 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	261
Group Selection		Harvest trees less than 30 inches DBH .	326

Direct and Indirect Effects: Hand thinning Treatments

Direct and Indirect effects of hand thinning treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Mechanical Thinning Treatments

Direct and indirect effects of mechanical thinning treatments under alternative E would be similar in scale and intensity to those described in alternative A. However, under alternative E, the upper diameter limit of mechanical thinning in DFPZ and Area thinning units would be 30 inches DBH. Table 38 displays the average post-treatment stand attributes for mechanical thinning treatments under alternative E by prescription.

Table 38. Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments under Alternative E by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx13	178	-59%	73%	144	-27%	37	18.1	24 %
Rx14	204	-44%	91%	164	-14%	41	16.5	15%
Average	183	-56%	73%	148	-25%	38	17.7	22%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 29.9 inches DBH. These treatments would reduce trees per acre by 56 percent, on average, and would range from 20 to 91 percent. The vast majority of the trees removed would be less than 20 inches DBH. *On average, 96 percent of trees greater than 20 inches DBH would be retained. Depending on the individual stand conditions, 73 to 100 percent of the trees greater than 20 inches DBH would be retained.*

On average, basal area per acre would be approximately 148 square feet per acre. Basal area per acre would be reduced by 25 percent on average, and basal area reduction would range from 6 to 57 percent depending on individual stand conditions and CWHR type. *Basal area per acre would be reduced below the 150 square feet per acre threshold in sixty one percent of the treated stands.*

In addition, relative stand densities would be reduced to desirable levels post-treatment, approximately, 38 percent on average. *Sixty one percent of the stands would have relative stand densities within desired conditions immediately post-treatment.* Approximately 7 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

Mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand. On average species stand composition of shade-intolerant species would increase by 7 percent; however, depending on stand conditions, this increase could be as much as 30 percent or, in the case of 21 percent of the stands, result in no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 22 percent under mechanical thinning prescriptions in alternative E. This increase in stand quadratic mean diameter would enhance the development of CWHR 4 stands into CWHR 5 stands. Within 30 years of growth, approximately 39 percent of stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, alternative E provides a range of prescriptions which would create a diverse range in canopy covers. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum.

The prescriptions for mechanical thinning are designed to create both horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. CWHR 4 stands would receive heavier thinning (removal of more trees and canopy cover) to create open canopy stands and enhance diameter growth of residual trees into CWHR 5. CWHR 5 stands would receive lighter thinning (less removal of trees and canopy cover) to maintain closed-canopy stand conditions of later seral stands while reducing ladder fuels and stand density to reduce negative impacts of future fires, drought, and insect and disease occurrences.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would reduce ladder and canopy fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 39 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative E.

Table 39. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative E

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx13	12	< 1	24	Incidental	31	Surface Fire	11
Rx14	13	< 1	17	Incidental	24	Surface Fire	15
Average	12	< 1	22	Incidental	30	Surface Fire	12

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 26 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be reduced to less than 1 foot on average, well below the 4 foot threshold in all stands which would allow for direct attack utilizing hand crews. The probability of torching would be incidental which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas, small pitches of steep, untreatable ground, and clumps retained with high canopy cover and vertical structure of retained understory trees.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment's reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 12 percent on average, and would range from 4 to 20 percent.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Direct and Indirect effects of group selection treatments would be similar to those described for alternative A. However, approximately 42 additional acres of group selection would be implemented under alternative E for a total of 326 acres. Under alternative E, approximately 80 percent of the group selection treatments would occur in CWHR size class 4 stands, and approximately 20 percent would occur in CWHR size class 5 stands. In addition, all trees less than 30 inches DBH would be removed from group selection units regardless of species.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, borax, and noxious weed treatments would not occur under alternative E. Noxious weed populations would have greater potential to spread. The spread of these noxious weeds could complicate future vegetation management activities requiring more mitigation measures to limit the spread of these species.

Borax treatments would also not occur under alternative E. Thinning treatments that do not include borax treatments would increase the probability for the spread and development of new infections of *Heterobasidion* root disease. This could result in increased tree mortality and increased fuel accumulations over time.

Direct and Indirect Effects: Watershed Improvements

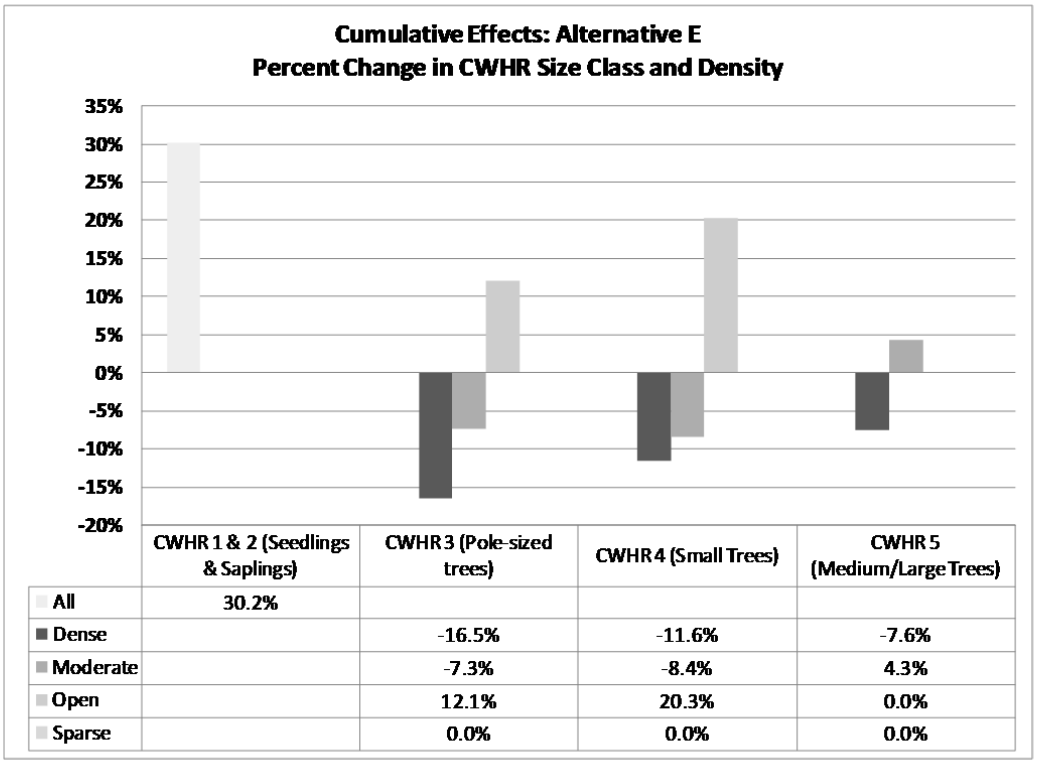
Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

Under alternative E, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative E

Cumulative effects of alternative E would be similar to those described for alternative A, with the exception of group selection treatments. Alternative E would implement 326 acres of group selection



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	30.2%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	-8.4%	4.3%
Open		12.1%	20.3%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 10. Cumulative Effects: Percent change in CWHR size class and density under alternative E

treatments which would provide for a 25 percent increase in CWHR 1 and 2 on NFS lands. Alternative E would contribute to slightly more early seral stage forest habitat than alternative A. This would correspond with a slightly lower increase (17 percent) in mid-seral open canopy stands characterized by CWHR 4P. Figure 10 displays the percent change in CWHR size class and density under alternative E.

Comparison of Effects by Alternatives

Treatments and corresponding direct, indirect, and cumulative effects are compared for all alternatives in the discussion below.

Direct and Indirect Effects: Hand thinning Treatments

Hand thinning treatments would be similar in intensity for all action alternatives, but the scale of these treatments would vary by alternative. Similar acres of hand thinning treatments would occur under alternatives A, C, and E – approximately 1, 257 acres. Alternative D would implement 1,765, approximately 508 acres of additional hand thinning in lieu of mechanical thinning treatments. Under alternative B, hand thinning treatments would not occur.

Table 40. Comparison of Average Post-Treatment Stand Attributes for Hand Thinning Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
B (No Action)	359	0%	100%	175	0	61 %	15.8	0%
All Action Alternatives	179	-46%	100%	160	-9%	42 %	16.9	7.3%

Table 41. Comparison of Average Post-Treatment Fuel and Potential Fire Behavior Attributes for Hand Thinning Treatments by Alternative

Alternative	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
B (No Action)	28	18	5	74%	22	Passive Crown Fire	85
All Action Alternatives	12	< 1	9	Incidental	25	Surface Fire	13

Table 40 and Table 41 display the comparison of average post-treatment stand attributes and fuel and potential fire behavior attributes for hand thinning treatments by alternative.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical thinning treatments would be implemented in all action alternatives, but the scale and intensity of these treatments would vary by alternative. The acres of mechanical thinning treatments by DFPZ and Area thinning types are displayed by alternative in Table 42.

Table 42. Comparison of Acres of Mechanical Thinning Treatments by Alternative

Alternative	Type	Acres	Total Acres
A	DFPZ	2,336	2,598
	Area Thinning	262	
B	n/a	0	0
C	DFPZ	2592	2,882
	Area Thinning	290	
D	DFPZ	1699	1,864
	Area Thinning	165	
E	DFPZ	2295	2,556
	Area Thinning	261	

Alternatives A and E would implement similar amounts of mechanical thinning, but slightly differ due to the amount of group selection treatments which would occur in the “footprint” of the mechanical thinning units. Alternative C would implement the most acres of mechanical thinning because it does not include group selection treatments, which are deducted from alternatives A and E to correct for “double-counting” of acres. Alternative D would implement the least amount of mechanical thinning treatments of all the action alternatives due to factors that include: 1) guidelines for mechanical thinning treatments under the 2001 SNFPA require that 15 to 25 percent of the stand be left untreated, depending on land allocation, and 2) guidelines for mechanical thinning treatments under the 2001 SNFPA prescribe hand thinning treatments in lieu of mechanical treatments for stands with less than 50 percent canopy cover – this would result in 508 acres of mechanical thinning treatments which would be converted to hand thinning treatments. Alternative B would not implement any mechanical treatments.

Mechanical thinning treatments would also vary in intensity between action alternatives. Table 43 displays the comparison of average post-treatment stand attributes for mechanical thinning treatments by alternative.

Table 43. Comparison of Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
A	177	-57%	73%	147	-25%	38	17.7	23.2%
B	513	0%	100%	206	0%	61	14.6	0.0%
C	255	-43%	100%	173	-15%	46	16.6	14.5%
D	292	-37%	100%	187	-8%	51	15.2	5.0%
E	183	-56%	73%	148	-25%	38	17.7	22.1%

Mechanical thinning treatments under alternatives A and E are very similar in effects; while both alternatives would implement similar ranges in canopy cover retention for CWHR types and RHCAs, alternative A would generally retain more intermediate-sized trees, and remove more small diameter sized trees. Alternative E would include slightly more removal of intermediate-sized trees and correspondingly slightly more retention of small diameter-sized trees. These differences, on average, are very slight and would only be discernable on an individual stand basis of a portion of the stands treated.

Under both alternatives A and E, average post-treatment stand conditions would meet desired conditions for stand structure and density, create open-canopy stands, and enhance growth of residual trees into larger diameter classes, thereby promoting the development of later seral stand conditions.

Alternatives C and D would result in relatively less reduction in stand densities and average post-treatment conditions would not meet desired basal area or relative stand density conditions; however this would vary by individual stand conditions. Diameter limits and canopy cover constraints associated with these alternatives limit the capacity and efficacy of these alternatives in meeting the purposes and needs for forest health. As a result, on average, these alternatives maintain more closed-canopy conditions resulting in less opportunity to enhance heterogeneity and relatively less growth and development of later seral conditions. In particular, treatments under alternatives C and D would maintain closed-canopy mid-seral stand conditions resulting in a homogenous landscape condition which is less diverse and resilient to forest disturbances such as drought, insects and disease, and trends such as increasing fire severity (Miller et al. 2009) and climate change (Millar et al. 2007, North and Hurteau 2009, Battles et al. 2008).

Under alternative B, stands would develop untreated which would result in increasing densities and increased risk for tree mortality and high severity effects from potential disturbances such as drought, fire, and insect and disease occurrences.

These changes in density would also have an effect on species composition. Table 44 displays the percent change in shade-intolerant species composition as a result of hand thinning and mechanical thinning treatments.

Table 44. Comparison of Average Post-Treatment Percent Change in Desired Shade-intolerant Species Composition by Alternative and Treatment

Alternative	Average Post-Treatment Percent Change in desired Shade-Intolerant Species Composition			
	Hand thinning Treatments	Mechanical Thinning Treatments	Group Selection Treatments	Total
A	1.2%	6.7%	26.9%	12.2%
B	0.0%	0.0%	0.0%	0.0%
C	1.2%	1.6%	0.0%	1.4%
D	1.2%	1.3%	0.0%	1.3%
E	1.2%	6.7%	13.7%	7.9%

Alternative A would provide for the greatest increase in shade-intolerant species composition as a result of the lower upper diameter limits desired species as well as the preferentially retention of desirable shade-intolerant species under 30 inches diameter within group selection units. Alternative E would also provide a notable increase in shade-tolerant species composition as canopy cover retention and upper diameter limits in mechanical thinning treatments provide the greatest opportunity to preferentially remove relatively larger amounts of shade-tolerant in order to retain desired shade-intolerant species.

Alternatives C and D provide for little increase in shade-intolerant species composition. In alternative C, the 12 inch upper diameter limit reduces the capacity to improve species composition by eliminating the opportunity to remove shade-tolerant trees greater than 12 inches that would compete with shade-intolerant trees. Similarly, under alternative D, the 50 percent canopy cover retention limits, the 20 inch upper diameter limit, and the 15 to 25 percent retention of untreated areas in the stand reduces the capacity to improve species composition by limiting the opportunity to remove shade-tolerant trees that would compete with shade-intolerant trees. Alternative B would not provide opportunities to improve species composition.

For further discussion on stand density, desired and existing conditions for forest structure and health, and climate change with regards to the treatments proposed under the alternatives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Table 45. Comparison of Average Post-Treatment Fuel and Potential Fire Behavior Attributes for Mechanical Thinning Treatments by Alternative

Alternative	Post-Treatment Surface Fuel Load (tons per acre)	Post-Treatment Flame Length (feet)	Post-Treatment Canopy Base Height (feet)	Post-Treatment Probability of Torching	Post-Treatment Crowning Index (mph)	Post-Treatment Fire Type	Post-Treatment Percent Basal Area Mortality
A	12	< 1	22	Incidental	30	Surface Fire	12
B (No Action)	28	24 - 25	6	77%	18	Passive Crown Fire	84
C	12	< 1	15	Incidental	23	Surface Fire	13
D	12	2 - 3	11	28%	20	Surface Fire	19
E	12	< 1	22	Incidental	30	Surface Fire	12

Under all action alternatives, fuel loading and potential fire behavior would be reduced through a combination of treating surface fuels, ladder fuels, and canopy fuels with varying degree. As shown in Table 45, all action alternatives would improve fuel conditions and potential fire behavior relative to the existing condition which would be expected to persist under alternative B.

Alternatives A and E would provide for the greatest reduction in fuels and fire behavior which include the greatest reduction in canopy fuels – as a result these alternatives have the highest crowning index, the wind speed which would be required for fire to move from crown to crown of individual trees. In both alternatives A and E, flame lengths, canopy base height, torching, crowning index, fire type, and basal area mortality meet desired conditions.

Alternatives C would also meet desired conditions by reducing primarily surface fuels and ladder fuels with some reduction of canopy fuels depending on individual stand conditions.

Alternative C would not reduce canopy fuels as much as alternatives A or E and as a result would have a lower predicted average crowning index – meaning that tree crowns would be relatively closer more indicative of closed-canopy stand conditions. The reduction of stand density would be, in part, due to greater tree mortality incurred through follow-up prescribed fire treatments under alternative C relative to alternatives A and E.

Relative to all action alternatives, alternative D would reduce primarily surface fuels and ladder fuels, with limited amounts of canopy fuel reduction. Alternative D provides the smallest reduction in ladder fuels and potential fire behavior reduction because these mechanical treatments retain a minimum of 50 percent canopy cover, and maintain 15 to 25 percent of the stand in an untreated condition. These factors contribute to higher flame lengths, larger probabilities of torching, and lower crowning indices relative to the other action alternatives.

While all action alternatives met the fuel objectives in terms of reducing potential fire behavior, research indicates that models used to predict potential fire behavior may, in some instances, under predict potential for crown fire behavior (Scott and Reinhardt 2001, Cruz and Alexander 2010). These models are best interpreted in a relative rather than an absolute sense. As a result, while all alternatives are predicted to meet desired conditions, alternatives that create lower canopy covers and reduce stand density (alternatives A and E) would have the greatest potential for limiting crown fire potential relative to alternatives that maintain higher canopy covers and implement lower diameter limits, such as alternatives C and D. This thought is consistent with the latest research on simulating fire and forest dynamics for landscape fuel treatment projects in the Sierra Nevada (Collins et al. In press). Collins et al. (In press) noted that this trend is substantiated by Safford et al. (2009) who found that lighter intensity, hand thinning treatments did not reduce fire severity as effectively as more intensive treatments, particularly in areas where slope may influence fire behavior. In addition, Fule et al. (2006) noted that while treatments with lower diameter limits (such as alternatives C and D) could reduce potential fire behavior, such constraints were found to hinder restoration of forest structure that is better adapted to an active fire regime. Consequently, alternatives A and E would better meet fuel reduction objectives and re-align forest health and resiliency with an active fire disturbance regime than alternatives C and D. For further discussion regarding fuels reduction treatments, desired conditions for forest health, and the interaction between fuels reduction and forest health objectives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

In general, the greatest difference in vegetation and fuels treatments between alternatives lies in the mechanical thinning treatments. Amounts of prescribed fire treatments and mastication treatments are identical throughout all action alternatives, and amounts of hand thinning treatments between alternatives A, C, and E are similar. Under alternative D, approximately 508 acres of additional hand thinning treatments would be implemented in lieu of mechanical treatments for stands with less than 50 percent canopy cover. Table 47 displays the comparison of mechanical treatments by alternative using the measurement indicators.

Table 46. Comparison of Mechanical Treatments by Alternative using Measurement Indicators

	Stand Structure & Density				Species Composition	Landscape Structure and Heterogeneity		Fuels and Potential Fire Behavior		
Alternative	Post-Treatment Percent Retention of trees > 20 inches dbh	Post Treatment Basal Area < 150 sq ft. per acre	Post-Treatment Relative Stand Density = 25-40%	Relative Stand Density > 60 % at 20-30 years	Post Treatment % Shade intolerant Species Composition improved	Quadratic Mean Diameter @ 30 yrs > 24 inches dbh (CWHR Size class 5)	Canopy Cover @2010	Post Treatment Flame Lengths less than < 4 ft	Post Treatment Fire type = Surface fire	Post Treatment Basal Area mortality < 25%
A	All stands would retain 73-100% of trees >20"	68% of stands would meet desired conditions	68% of stands would meet desired conditions	7% of stands would exceed the threshold	61% of stands would improve species comp	25% stands would grow into CWHR 5 in 30 years	50% open canopy stands, 50%closed canopy stands	100% of stands meet desired condition	100% of stands would meet desired conditions	100% of stands would meet desired conditions
B	All Stands would retain 100% of trees >20" dbh	17% of stands would meet desired conditions	14% of stands would meet desired conditions	77 - 89% of stands would exceed the threshold	No improvement across any stand	4% of stands would grow into CWHR 5 in 30 years	18% open canopy stands, 82% closed canopy stands	0% of stands meet desired condition	4% of stands would meet desired conditions	0% of stands would meet desired conditions
C	All Stands would retain 100% of trees >20" dbh	38% of stands would meet desired conditions	38% of stands would meet desired conditions	25 - 32% of stands would exceed the threshold	35% of stands would improve species comp	7% of stands would grow into CWHR 5 in 30 years	32% open canopy stands, 68% closed canopy stands	96% of stands meet desired condition	96% of stands would meet desired condition	96% of stands would meet desired condition
D	All Stands would retain 100% of trees >20" dbh	14% of stands would meet desired conditions	14% of stands would meet desired conditions	32 - 43% of stands would exceed the threshold	21% of stands would improve species comp	7% of stands would grow into CWHR 5 in 30 years	18% open canopy stands, 82% closed canopy stands	96% of stands meet desired condition	96% of stands would meet desired condition	86% of stands would meet desired conditions
E	All stands would retain 73-100% of trees >20"	61% of stands would meet desired conditions	61% of stands would meet desired conditions	7% of stands would exceed the threshold	61% of stands would improve species comp	39% stands would grow into CWHR 5 in 30 years	43% open canopy stands, 57% closed canopy stands	100% of stands meet desired conditions	100% of stands would meet desired conditions	100% of stands would meet desired conditions

Direct and Indirect Effects: Mastication Treatments

Mastication treatments would be similar in scale and intensity for all action alternatives. Mastication treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Prescribed Fire Treatments

Prescribed fire treatments would be similar in scale and intensity for all action alternatives. Prescribed fire treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would occur under action alternatives A and E; however, these treatments would vary primarily in scale. Alternative A would implement 284 acres of group selection whereas alternative E would implement 326 acres of group selection. Group selection units would be located primarily in CWHR 4M stands and would be used to convert to enhance shade-intolerant species composition and promote regeneration of a new age class within areas dominated by shade-tolerant species such as white fir. Group selection under alternative A differs from similar treatments in alternative E by preferentially retaining a portion of the shade-intolerant species as leave trees and structural diversity. Table 47 displays the differences in group selection treatments by alternative.

Table 47. Comparison of Average Post-Treatment Stand Attributes for Group Selection Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre > 20 inches	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-Treatment Relative Stand Density	Post-treatment QMD
A	8	-91%	42%	50	-74%	12	28.6
B	Group Selection treatments would not occur						
C	Group Selection treatments would not occur						
D	Group Selection treatments would not occur						
E	5	-92%	24%	37	-82%	9	30.2

Over the long-term of 20 to 30 years, regeneration of young trees and shrub species in the group selection treatments would be susceptible to higher flame lengths, lower canopy base heights, and higher probabilities of torching which would likely lead to passive crown fire behavior resulting in higher basal area mortality – yet, the potential for this type of fire behavior would be restricted to the ½ to 2 acre group selection units. Early seral stands, by nature of their inherent structure, are susceptible to these risks (Thompson et al. 2007); however the scattered, disparate arrangement and small scale of group selection treatments strategically located within DFPZ and Area thinning mechanical thinning treatments mitigate these risks. In addition, the strategic location of group selections within these mechanical fuel treatments would provide greater opportunities for initial attack fire suppression tactics.

Group selection treatments in both action alternatives A and E would enhance landscape structure, heterogeneity and species composition by creating early seral conditions (characterized by CWHR 1 and

2) that are favorable for the establishment, growth, and development of a new age class of shade-intolerant species. Under alternatives B, C, or D, Group selection treatments would not occur and these benefits would not be realized.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, Borax, and Noxious weed treatments would occur in similar scale and intensities under alternatives A and D. These treatments would limit the spread of noxious weeds and the infection and spread of *Heterobasidion* root disease. These treatments would result in beneficial effects to forest vegetation by maintaining and enhancing understory species composition of native plant communities and reducing tree mortality and shift in species composition of forested stands.

Alternatives C and E would not implement herbicide, borax, or noxious weed treatments, but would implement site disturbing activities such as hand thinning, mechanical thinning, prescribed burning, mastication, and group selection treatments which would: 1) create disturbed areas where noxious weeds could be introduced or spread and 2) create tree stumps suitable for infection and spread of *Heterobasidion* root disease. This could result in potential negative effects to the native species composition of forested stands and directly result in tree mortality from *Heterobasidion* root disease. Considering that *Heterobasidion* root disease persists in infected sites for as long as fifty years, this could have long-term negative effects for forested stands.

Alternative B would not implement herbicide, borax, or noxious weed treatments and would not implement site disturbing activities. However, the potential for spread of noxious weeds and the negative effects on native understory vegetation would persist. The potential for *Heterobasidion* root disease would be negligible since stump surfaces suitable for *Heterobasidion* infection would not be created.

For further information regarding Heterobasidion rood disease and treatments, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix D.

Direct and Indirect Effects: Watershed Improvements

Watershed improvement treatments would be similar in scale and intensity for all action alternatives. Watershed improvement treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Air Quality

Burning would occur in hand thinning, mechanical thinning, prescribed fire, group selection, and noxious weed treatments which are displayed on project maps. Within mechanical thinning and group selection treatments, biomass removal would be used to minimize potential ladder fuels that would be underburned. Total emissions by alternative are listed in Table 48.

Table 48. Predicted Emissions for All Alternatives

Alternative	Total PM_{10} Emissions (tons)	Total $PM_{2.5}$ Emissions (tons)	Total PM CH_4 Emissions (tons)	Total CO Emissions (tons)	Total PM CO_2 Emissions (tons)	Total NMHC Emissions (tons)	Total VOC Emissions (tons)	Total Vehicle Emissions[a] (tons)
A	183	161	133	1813	28738	97	237	38
B	0	0	0	0	0	0	0	--
C	181	160	132	1800	28533	96	234	12
D	211	185	156	2096	33251	113	304	11
E	183	161	133	1815	28768	97	238	50
Wildfire	835	751	197	4425	89925	637	1413	--

Note: PM = particulate matter; CH4 = methane; CO2 = carbon dioxide; NMHC = non-methyl hydrocarbon; VOC = volatile organic compound
a. Vehicle Emissions = emissions (dust) from vehicles used during implementation. Assumes an 80 percent reduction in emissions from road surfaces (1.2 pounds per vehicle mile) through implementation of standard road watering procedures. Vehicle miles assumes 20-mile average round trip on dirt roads per load; number of trips determined by data contained in the economic analysis.
b. Wildfire assumes emissions for a 5,593-acre wildfire in the mixed conifer forest type.

All burning would be completed under approved burn and smoke management plans. These smoke management plans would describe Northern Sierra Air Quality Management District regulations for burning activities and associated smoke management, and would detail an implementation schedule, the responsible parties, and monitoring and reporting requirements. Piles would be constructed to minimize mixing of soil and burned under weather conditions that would allow efficient combustion. In terms of actual acres of underburning and pile burning implemented, all treated units would be evaluated after treatment to determine if surface fuels were meeting desired conditions. The units meeting desired conditions may not be burned, thereby decreasing total burned acres and emissions. Implementation of underburning, pile burning, and burning of landing piles would occur over five to seven years as weather conditions and resource availability permit. As a result, annual smoke production from burning activities wou1d result in particulate matter emissions less than the threshold of 100 tons per year for a general conformity analysis.

Implementation of fuel treatments in the Keddie Ridge Project could reduce emissions from future wildfires by reducing their size and intensity. Alternative B, the no action alternative would not implement any emission producing activities; however, for comparison, Table 48 displays emissions assuming a 5,593-acre wildfire burned those acres that would not be treated under the action alternatives. In conjunction with mechanical fuel treatments, underburn activities are expected to reduce accumulated surface and ladder fuels and reduce the “unacceptable risk of wildfire” and related uncontrollable emissions as described in U.S. Environmental Protection Agency (2006).

Due to the dispersed nature of the burn piles, the near complete combustion of piled material, and the control over ignition times to favor good smoke dispersion, it is not anticipated that pile burning would substantially impact the local communities. During underburn and pile burn activities, smoke would likely be visible from Indian Valley and Lake Almanor but would move northeast towards Highway 395, Susanville, and the Honey Lake Valley during the day. At night, inversion could reduce visibility in Indian Valley until late morning when the inversion layer typically lifts (Schoeder and Buck 1974).

Harvesting, biomass removal, and road work would be completed primarily with diesel-powered equipment, including feller bunchers, skidders, tractors, graders, and trucks. This equipment would be inspected to determine equipment (spark arresters, fire extinguishers, and firefighting equipment) compliance with fire safety standards. The condition of emissions control systems of various pieces of equipment would vary by age, maintenance, manufacturer, and past use.

Dust emissions would be spread out during the mechanical treatment implementation period of approximately five years. Dust would be mitigated by road watering and other standard management practices described in contracts (Provisions T-806 and B-5.3).

Serpentine-based soils do occur within the project area in the vicinity of Round Valley Reservoir, and these soils would likely be disturbed by project implementation activities. California Air Resources provide regulations concerning operations on serpentine based soils. Agriculture operations and timber harvesting is exempt under California Air Resource regulations (2002-07-029 Asbestos ACTM for Construction, Grading, Quarrying, and Surface Mining Operations, Section 93105, (c)3; http://www.arb.ca.gov/toxics/atcm/asb2atcm.htm) with the exception of road building. The geology report provides additional treatment design criteria to mitigate exposure to naturally occurring asbestos. Dust would be mitigated by road watering and other standard management practices described in contracts (Provisions T-806 and B-5.3) Activities proposed under action alternatives would follow Region 5 interim draft direction for naturally occurring hazardous minerals as described in the November 12, 2010 Draft Guidance for assessing naturally occurring hazardous minerals in travel management subpart A and other planning documents. These serpentine soils would be mapped and monitored for the presence of naturally occurring asbestos. If naturally occurring asbestos is not present above threshold levels, project implementation activities would occur as planned and would include standard management practices for dust mitigation as discussed above. If naturally occurring asbestos is present in levels above threshold, mitigation measures such as 1) specifying winter season for operations that would minimize dust emissions, 2) specifying respiratory protection equipment and soil moisture conditions to minimize dust exposure, 3) altering treatment type such as converting mechanical thinning to hand thinning in conjunction with other aforementioned mitigations, and/or 4) dropping affected units from implementation.

Cumulative Effects

The cumulative effects of all alternatives on vegetation diversity as examined through changes in CWHR size class and density are displayed in Table 49. While existing conditions serve as the baseline for cumulative effects of past activities within the analysis area, present and future projects would have a minor cumulative effect on change in vegetation throughout the analysis area. These effects are best represented by the no action alternative, alternative B which would not implement any of the treatments proposed under the action alternatives. Alternative B would largely maintain existing conditions of dense, closed-canopy, mid-seral stands which are susceptible to 1) extreme potential fire behavior due to heavy accumulations of surface fuels in combination with a homogeneous continuity of ladder and canopy fuels, and 2) drought, insect and disease driven tree mortality as a result of high stand densities and increased inter-tree competition. It is important to recognize that while alternative B maintains existing conditions, these forested landscapes are dynamic, and maintenance of such homogenous conditions would be relatively unstable and pre-dispose this landscape to rapid change due to high severity disturbance events such as fire, drought, and insect and disease occurrences. Such events like the Moonlight and Antelope Fires of 2007 underscore the scale and severity of disturbances which can occur.

Action alternatives would implement proposed treatments which would further alter the diversity of vegetation on National Forest System Lands within the analysis area and these cumulative effects would vary in intensity and scale dependent on alternative.

Alternatives A and E implement treatments and prescriptions which, in general, allow greater opportunity to create more open canopy, mid-seral stands while maintaining closed-canopy, late seral stands which serve as habitat for late seral dependent species. These effects are displayed by the greater reductions in CWHR 4M and 4D, the greater increase in CWHR 4P, and the maintenance of CWHR 5M. Alternatives A and E also provide for the creation of early seral habitat as displayed by the greater increases in CWHR 1 and 2 size classes. The creation of early seral habitat would provide favorable conditions for the establishment, growth, and development of a new age class of shade-intolerant species which would enhance landscape diversity; however, this effect would come from the conversion of primarily mid-seral stands (CWHR 4) and a minor portion from late-seral stands in CWHR size class 5. Approximately 15 to 20 percent of group selection treatments (38 to 66 acres) would occur in CWHR size class 5 under alternatives A and E, respectively.

Table 49. Comparison of Cumulative Effects: Percent Change of CWHR Size Class and Density Across NFS lands within the Analysis Area by Alternative

CWHR Size Class	CWHR Density	Existing Acres	A	B	C	D	E
CWHR 1 & 2 (Seedlings & Saplings)	All	1321	**27.0%**	**5.5%**	**5.5%**	**5.5%**	**30.2%**
CWHR 3 (Pole-sized trees)	Dense	492	**-16.5%**	**-0.5%**	**-16.5%**	**-16.5%**	**-16.5%**
	Moderate	1270	**-7.3%**	**-0.2%**	**-7.3%**	**6.0%**	**-7.3%**
	Open	1440	**12.1%**	**0.3%**	**12.1%**	**0.3%**	**12.1%**
	Sparse	425	0.0%	0.0%	0.0%	0.0%	0.0%
CWHR 4 (Small Trees)	Dense	6611	**-11.6%**	**-2.5%**	**-11.6%**	**-11.6%**	**-11.6%**
	Moderate	16230	**-7.8%**	**-1.1%**	**0.5%**	**2.6%**	**-8.4%**
	Open	7537	**22.3%**	**3.2%**	**7.8%**	**3.2%**	**20.3%**
	Sparse	1543	0.0%	0.0%	0.0%	0.0%	0.0%
CWHR 5 (Medium/Large Trees)	Dense	5057	**-7.6%**	**-4.8%**	**-7.6%**	**-7.4%**	**-7.6%**
	Moderate	6998	**4.7%**	**3.2%**	**5.2%**	**4.6%**	**4.3%**
	Open	1102	0.0%	0.0%	0.0%	0.0%	0.0%
	Sparse	102	0.0%	0.0%	0.0%	0.0%	0.0%
Non-Forest Vegetation Types	n/a	4719	0.0%	0.0%	0.0%	0.0%	0.0%

The treatments employed under alternatives A and E would best meet desired conditions for the Fuels Reduction and Forest Health purposes and needs as described in chapter 1. Particularly, the diverse prescriptions that would be implemented under alternative A would enhance heterogeneity at multiple scales - both the stand and landscape scale – while reducing fuels and potential fire behavior and improving forest stand structure, species composition, and forest health, in general. Alternative A would best meet desired conditions for both the fuels reduction and forest health objectives as described in chapter 1 and would re-align forest structure, composition, and heterogeneity with an active fire disturbance regime which would enhance forest resiliency to trends presented by climate change.

Alternatives C and D implement treatments and prescriptions which, in general, maintain relatively greater closed-canopy conditions in mid-seral and late seral stands. These effects are displayed by the maintenance of moderate canopy cover in CWHR size classes 4 and 5, and the relatively smaller increases in open canopy stands in CWHR size classes 4 and 5. In addition, there would be no cumulative addition in early seral conditions as displayed by CWHR size classes 1 and 2.

Alternatives C and D would meet fuel reduction purposes and needs to varying degrees. Alternative C would allow for greater canopy cover reduction and treat more acres relative to alternative D, which would maintain canopy covers greater than 50 percent and would not implement treatments within 15 to 25 percent of the stands, which limits the capacity to affect ladder fuels. While treatments under alternatives C and D could enhance structural diversity at the stand level depending on individual stand conditions, the capacity of these treatments to enhance heterogeneity and improve species composition are limited by the upper diameter limits and canopy cover restrictions associated with the treatments and prescriptions respective to each alternative. This tempers the efficacy of alternatives C and D to enhance heterogeneity and species composition at the landscape scale. Consequently, this also reduces the effectiveness of alternatives C and D to meet desired conditions under the forest health purpose and need.

For further discussion regarding fuels reduction, forest health, and landscape heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, B, and C.

Cumulative Effects: Air Quality

Potential cumulative emissions of smoke, dust, and greenhouse gases for all alternatives are displayed in Table 50. Action alternatives would cumulatively contribute to emissions within the analysis area primarily by contributing to short-term direct effect primarily through underburning and pile burning associated with project activities. All burning would be completed under approved burn and smoke management plans, and the cumulative total amount of emissions would be spread over project implementation timelines of 5 to 7 years. As a result, annual emissions wou1d be less than the threshold of 100 tons per year for a general conformity analysis.

Table 50. Predicted Cumulative Emissions from NFS Lands within the Analysis Area that Would Occur Over A 7 Year Period

Alternative	Total PM_{10} Emissions (tons)	Total $PM_{2.5}$ Emissions (tons)	Total PM CH_4 Emissions (tons)	Total CO Emissions (tons)	Total PM CO_2 Emissions (tons)	Total NMHC Emissions (tons)	Total VOC Emissions (tons)
A	340	298	255	3385	53741	184	536
B	157	136	122	1572	25003	87	299
C	339	296	254	3372	53536	183	533
D	368	322	278	3668	58255	200	602
E	340	298	255	3387	53772	184	536
Wildfire	1296	1166	306	6868	139556	988	2192

Note: PM = particulate matter; CH4 = methane; CO2 = carbon dioxide; NMHC = non-methyl hydrocarbon; VOC = volatile organic compound

b. Wildfire assumes emissions for an 8,336-acre wildfire in the mixed conifer forest type that would occur within an annual fire season.

Action alternatives and present and future proposed vegetation management projects would implement treatments that would reduce the potential for future related uncontrollable smoke/greenhouse gas emissions from wildfires by reducing available fuels within the project area. These projects could contribute to reducing or limiting emissions from future wildfires by promoting desirable fuel conditions across the landscape and reducing wildfire size and/or intensity. Alternative B, the no action alternative would not implement any emission producing activities; however would also not improve fire hazard or fuel reduction to desirable levels within the project area. Table 50 displays emissions assuming an 8,336-acre wildfire burned those acres that would not be treated under present, proposed, or future vegetation management projects. In combinations, these projects are expected to reduce accumulated surface and ladder fuels and reduce the "unacceptable risk of wildfire" and related uncontrollable emissions as described in U.S. Environmental Protection Agency (2006).

Climate Change Considerations

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon. Complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives. However, based on climate change science, the relative effects of these treatments on the ecosystem carbon cycle are recognized. The positive long-term effects on the carbon cycle of proposed fuel reduction treatments are a good example of this. Given the anticipated increase in large wildfires in California (Calif. Climate Action Team 2009), the action alternatives propose beneficial fuel reduction treatments which could contribute to reducing or limiting emissions, size, and intensity of potential future wildfires.

In addition, action alternatives that implement treatments which meet desired conditions for forest health would enhance growth of large residual trees, reduce stand densities, and improve stand and landscape resiliency to forest disturbances such as insect outbreaks greater than endemic levels and large scale high severity fire, thereby enhancing the potential for carbon sequestration within the project area. These treatments would have long-term beneficial indirect effects which would contribute to beneficial cumulative effects on air quality. For more information regarding climate change trends and how these interact with the proposed alternatives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Compliance with the Forest Plan and Other Direction

All action alternatives were designed to fully comply with the Plumas National Forest LRMP (USDA 1988) as amended by the Herger-Feinstein Quincy Library Group FSEIS and ROD (USDA 1999a, b; USDA 2003a, b) and the Sierra Nevada Forest Plan Amendment FSEIS and ROD (USDA 2004a, b). All prescriptions comply with table 2 (page 69) of the Sierra Nevada Forest Plan Amendment ROD (USDA 2004b) which provide the standards and guidelines applicable to the HFQLG pilot project area for the life of the pilot project. In addition, prescriptions under all action alternatives are designed to comply with the National Forest Management Act (NFMA) of 1976.

Wildlife – Terrestrial and Aquatic

Introduction

This section presents a summary of the biological assessment / biological evaluation (BA/BE) for the Keddie Ridge Hazardous Fuels Reduction Project and includes complete discussions of possible effects of the proposed project and alternatives on Federal Threatened and Endangered species, Federal Proposed species, Forest Service Sensitive species and Management Indicator Species (MIS). The BA/BE and MIS report (and appendices) are on file at the Mt. Hough Ranger District office and available upon request.

Threatened and Endangered Species

Those species listed under the Federal Endangered Species Act. Threatened species are likely to become endangered throughout all or a significant portion of their range (16 United States Code [USC] 1532).

Endangered species are in danger of extinction throughout all or a significant portion of their range (16 USC 1532).

Candidate Species

A Candidate species is a candidate for listing as a Proposed species. The U.S. Fish and Wildlife Service recently changed its policy on Candidate species—the term "Candidate" now strictly refers to species for which the service has enough information on file to warrant or propose listing the species as Endangered or Threatened.

Forest Service Sensitive Species

Those species, generally Federal Candidates for listing or Species of Concern, that have been designated by the Forest Service as needing special management attention because of viability concerns. The Forest Service manages for these species to ensure they will not require listing as Threatened or Endangered.

Management Indicator Species (MIS)

The MIS are used in project analysis because it is believed their population changes indicate whether management activities are having an effect on the viability and diversity of animal and plant communities. There is one MIS listed as Forest Service Sensitive species—the California spotted owl. This species is addressed in the "Forest Service Sensitive Terrestrial Species" section of this EIS.

Analysis Framework

Guiding Regulations

The Keddie Ridge Project is designed to fulfill wildlife management direction specified in the National Forest Management Act of 1976 and the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP), as amended by the 1999 Record of Decision on the Herger-Feinstein Quincy Library Group (HFQLG) final environmental impact statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental EIS (USDA 1988, 1999b, 2004a,b). Additional management direction for Threatened, Endangered, Candidate, Sensitive, Management Indicator, and migratory bird species on the Plumas National Forest can be found in the following documents:

- Code of Federal Regulations (23, 36, 50 CFR)
- Forest Service Manual and Handbooks (FSM/H 1200, 1500, 1700, 2600)
- Endangered Species Act of 1976
- National Environmental Policy Act (NEPA) of 1969
- National Forest Management Act of 1976
- USDA Forest Service Region 5 Best Management Practices
- Regional Forester (Region 5) Sensitive Animal Species List (June 10, 1998), updated October 2007
- Bald and Golden Eagle Protection Act of 1940
- MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination (2006)
- Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment ROD (2007)
- Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report (2008)
- Migratory Bird Treaty Act of 1918

- Memorandum of Understanding between the US Department of Agriculture Forest Service and the US Fish and Wildlife Service to promote the conservation of migratory birds (2008)

Effects Analysis Methodology

Geographic Area Evaluated for Impacts on Wildlife

Aquatic Wildlife

The “aquatic wildlife species analysis area” geographic boundary was delineated based on the potential direct, indirect, and cumulative effects on aquatic resources. The analysis area for aquatic wildlife species is the same as the “Watershed Analysis Area” used for the cumulative watershed effects analysis as described in the “Hydrology and Soils” section of this chapter. All potential direct, indirect, and cumulative effects on aquatic species would occur within the Watershed analysis area.

Terrestrial Wildlife

The “Wildlife Analysis Area” boundary for terrestrial wildlife was delineated based on the potential direct, indirect, and cumulative effects on California spotted owl protected activity centers (PACs), home range core areas (HRCAs), and breeding home range distribution. The average home range of the owl is representative of the home range of other terrestrial species analyzed in this document using similar habitats (CWHR 4M, 4D, 5M, 5D, and 6), and therefore effects to the owl at this spatial scale would be indicative of the effects to other late seral stage species. The wildlife analysis area extends to a point at which no direct or indirect effects would be discernable and would not act cumulatively with other actions. The wildlife analysis area (115,185 acres) extends beyond the Keddie Ridge Project area (which is approximately 103,309 acres). Of these 115,185 acres, 66,040 acres (57 percent) are National Forest System lands and 49,145 acres (43 percent) are private lands within the wildlife analysis area.

Duration of Impacts

The direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis. Cumulative effects are based on past actions that have occurred in the Keddie Ridge Project area since 1979 (for which there is some information available on the effects of wildlife), and carried forward for 50 to 100 years to reflect the potential long-term effects of the proposed Keddie Ridge Project vegetation treatments.

Forest Vegetation

Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after the Moonlight Fire of 2007, which affected six percent of the wildlife analysis area. The Vestra vegetation map layer, as it is known, did not include thirteen percent (over 14,000 acres) of the analysis area. The HFQLG 2005 Vegetation Mapping Project mapped areas on the forest not covered by Vestra. These two maps were combined in a GIS to provide a complete map of the existing vegetation within the analysis area. All vegetation information is displayed using the CWHR vegetation codes and serves as the baseline acres for analysis. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

Indicator Measures

Indicator Measure: Acres of treatment within riparian habitat conservation areas (RHCAs) and the resulting percent of threshold of concern (TOC) in relation to stream condition. Implementation of ground-disturbing activities in watersheds that are approaching or over the TOC could increase the risk of adverse effects and cumulative watershed effects.

California Spotted Owl—Indicator Measure: Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable California spotted owl habitat.

Northern Goshawk—Indicator Measure: Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable northern goshawk habitat.

Mesocarnivores—Indicator Measure: Acres of suitable habitat and habitat connectivity were the indicator measures used to show the effects of the proposed action and alternatives on Pacific fisher and American marten habitat and connectivity.

Affected Environment

Federally Threatened and Endangered Species

A list of Threatened and Endangered species was provided by the “Federal Endangered and Threatened Species that may be affected by Projects in the Plumas National Forest”, updated April 29, 2010, accessed via United States Fish and Wildlife Service (USFWS) county list web page (http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm). Based on this list, and information regarding range of species, presence of species or presence of species suitable habitat within project area, it is determined that the Keddie Ridge Project would have no affect on the two Federally listed species present on the Plumas National Forest. There are no Federally Proposed species identified by the USFWS as occurring on the PNF. Table 51 displays Federally-listed species affects determinations.

Table 51. Federally-Listed Species Affects Determinations

Scientific Name	Common Name	Suitable Habitat in area	Observed in Project area (Y/N)	Finding
Desmoceras californicus dimorphus	Valley Elderberry Longhorn Beetle	No	No	No effect
Rana aurora draytonii	California Red-legged Frog	No	No	No effect

USDA Forest Service R5 Sensitive Species

The Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment / Biological Evaluation (BA/BE) (USDA 2011b) provides a discussion of the affected environment for all sensitive wildlife species analyzed for the Keddie Ridge Project. The BA/BE is located in the Keddie Ridge Project record, and the analysis of effects on the species identified in Table 52 is incorporated by reference. The bald eagle, California spotted owl, northern goshawk, American marten, Pacific fisher, and Mountain yellow-legged frog are highlighted in this Keddie Ridge Project EIS because of the potential direct, indirect, and cumulative impacts of the proposed action and alternatives on their habitat.

Table 52. Forest Service Region 5 Sensitive Terrestrial Wildlife Species that Potentially Occur on the Plumas National Forest

Species	Category
Birds	
Bald Eagle (Haliaeetus leucocephalus)	Sensitive
American peregrine falcon (Falco peregrinus anatum)	Sensitive
Northern goshawk (Accipiter gentilis)	Sensitive
California spotted owl (Strix occidentalis occidentalis) [a]	Sensitive
Great gray owl (Strix nebulosa)	Sensitive
Willow flycatcher (Empidonax trailii brewsteri)	Sensitive
Greater sandhill crane (Grus canadensis tabida)	Sensitive
Swainson's hawk (Buteo swainsoni)	Sensitive
Mammals	
Sierra Nevada red fox (*Vulpes vulpes necator*)	Sensitive
American marten (*Martes americana*)	Sensitive
Pacific fisher (*Martes pennanti pacifica*) b	Sensitive
California wolverine (*Gulo gulo luteus*)	Sensitive
Pallid bat (*Antrozous pallidus*)	Sensitive
Townsend’s big-eared bat (*Corynorhinus townsendii*)	Sensitive
Western red bat (*Lasiurus blossevillii*)	Sensitive
Amphibians and Reptiles	
Mountain yellow-legged frog (*Rana muscosa*) b	Sensitive
Foothill yellow-legged frog(*Rana boylii*)	Sensitive
Northern leopard frog (*Rana pipiens*)	Sensitive
Northwestern pond turtle (*Clemmys marmorata marmorata*)	Sensitive
Fish	
Hardhead (*Mylopharodon conocephalus*)	Sensitive

Notes:
a. Plumas National Forest Management Indicator Species
b. Pacific fisher, wolverine, and mountain yellow-legged frog designated as Candidate species for listing under the Endangered Species Act.

Bald Eagle

There is one known nesting territory in the Keddie Ridge Project wildlife analysis area, the Round Valley territory, located on the west side of Round Valley Reservoir. This territory was discovered active as early as 1960 but nest monitoring and productions data was not recorded prior to 1971. Since 1971 nesting chronology has been well documented by monitoring activity conducted by California Department of Fish and Game and U.S. Forest Service biologists. Between 1971 and 2010, the one primary nest tree in this territory has produced a total of 39 fledglings. A Bald Eagle Management Area

(BEMA) was identified for habitat allocation in 1988 (USDA 1988) to provide sufficient nesting and foraging habitat to the breeding eagle pair. It is suspected, based on 39 years of monitoring this site, that the adult eagles are non-migratory, staying within the Bald Eagle Management Area (BEMA) (USDA 1988) year round. When the reservoir freezes up, Indian Valley and Indian Creek, both approximately 2 miles east and south respectively, become important forage areas.

California Spotted Owl

Habitat Use and Management Direction—Habitat suitability standards for the California spotted owl (CSO) have been described in a number of sources, including the California spotted owl (CASPO) Interim Guidelines (USDA 1993a), the 1999 HFQLG Final EIS (USDA 1999a), the 2001 SNFPA final EIS (USDA 2001a), the 2004 SNFPA Final Supplemental EIS (USDA 2004a), and the 2004 SNFPA Record of Decision (USDA 2004b).

Stands suitable for nesting and roosting have (1) two or more canopy layers; (2) dominant and co-dominant trees in the canopy averaging at least 24 inches diameter at breast height (DBH); (3) at least 70 percent total canopy cover (including the hardwood component); (4) higher than average levels of very large old trees; and (5) higher than average levels of snags and downed woody material (USDI 2006). The CWHR size classes 5M and 5D (M = moderate; D = dense) have the highest probability of providing stand structures associated with preferred nesting, roosting, and foraging. The threshold canopy cover value that contributes to or detracts from occurrence and productivity is a value near 50 percent (USDA 2001a, Hunsaker et al. 2002). For the Keddie Ridge Project, all of the CWHR 5M size-density classes are considered spotted owl nesting habitat.

Suitable foraging habitat is found in the same forest types listed above for nesting habitat (CWHR classes 5D and 5M), as well as class 4D (trees 11 to 24 inches DBH with dense canopy (60 to 100 percent), and class 4M (trees 11 to 24 inches DBH and moderate canopy cover between 40 and 59 percent). The stands considered to be suitable for foraging have at least two canopy layers, dominant and co-dominant trees in the canopy averaging at least 11 inches DBH, at least 40 percent canopy closure, and higher than average levels of snags and downed woody material (15- to 30-square-foot basal area in snags, 10 to 15 tons per acre downed woody debris) (Verner et al. 1992). Although canopy cover down to 40 percent is suitable for foraging, it appears to be only marginally so (based on owl occurrence and productivity threshold at around 50 percent canopy cover [ibid.]). In its most recent notice concerning the California spotted owl, the USFWS states that owl foraging habitat “is generally described as stands of trees 30 centimeters (12 inches) in diameter or greater, with canopy cover of 40 percent or greater” (USDI 2006), with no other habitat parameters for foraging habitat described. Thus, there appears to be an element of uncertainty associated with what constitutes foraging habitat. For this Keddie Ridge Project analysis, all class 4M are considered owl foraging habitat. In the red fir type, stands with 30 percent or greater canopy cover should be considered suitable for foraging (USDA 2001a).

Table 53 summarizes the potential acres of suitable spotted owl habitat on National Forest System lands in the wildlife analysis area. Suitable CWHR types (USDA 2001a) are Sierra mixed conifer, white fir, red fir, montane hardwood-conifer, montane hardwood, ponderosa pine, montane riparian, lodgepole pine, and eastside pine.

Table 53. Potential Acres of Suitable Spotted Owl Habitat in the Keddie Ridge Project Wildlife Analysis Area

CWHR Type	Habitat Type	National Forest System Acres in Wildlife Analysis Area
4M	Foraging	18,865
4D	Foraging	7,485
5M	Nesting	9,051
5D	Nesting	5,969
Total	Suitable	41,370

The SNFPA Record of Decision (USDA 2004b) management strategy and direction for the California spotted owl recognizes two land allocations with discretely mapped areas, the nest area, or PAC, and the HRCA. Land allocation direction for HRCAs on the Mt. Hough Ranger District include the 300-acre PAC, plus an additional 700 acres of the best habitat available within a 1.5-mile radius of the activity center for a total of 1,000 acres. The direction in the 2004 SNFPA Record of Decision allows for full implementation of HFQLG Pilot Project activities within HRCAs that are established in the HFQLG Pilot Project area until the conclusion of the HFQLG Act in 2012. When the Pilot Project concludes, management direction associated with the HRCA designations will apply to the Plumas National Forest. Therefore, this analysis assesses the impacts of the proposed action and alternatives on HRCAs and suitable spotted owl habitat.

The comprehensive adaptive management strategy to investigate the effects of fuels treatments and group selection silviculture on California spotted owl viability is referred to as the Plumas-Lassen Administrative Study (PLAS). The Administrative Study is being conducted as a collaborative effort by the Forest Service Pacific Southwest Research Station (at Sierra Nevada Research Center); the Universities of California at Berkeley and Davis; and Point Reyes Bird Observatory to determine the long-term effects from forest management practices on spotted owl, song birds, and small mammals. The study will identify the response of these old-forest-dependent species to changes in vegetation composition, structure, and distribution over space and time. When the PLAS began in 2003, the study areas chosen to collect CSO data were all located on the Plumas National Forest. In 2005, the Lassen Demographic Study Area and Plumas NF Survey Areas were fully integrated to define the overall PLAS project area and provide consistent CSO survey effort across the HFQLG project area.

Portions of four PLAS study areas (SAs) are located in the Keddie Ridge Project analysis area. Study areas SA-2 and SA-3, located in the west and southwest portion of the analysis area, have been surveyed since 2003. SA-7 was added in 2009 to encompass the Empire Project area, a portion of which is located in the southern portion of the wildlife analysis area. The Moonlight and Antelope Complex fire study area was added to the PLAS in 2008 to collect information on the association between CSOs and wildfire. This study area makes up a large portion of the northeastern wildlife analysis area and was surveyed again in 2009. Together, these four PLAS areas take in 33,515 acres (29 percent) of the Keddie Ridge Project analysis area.

Spotted owl surveys have occurred in the wildlife analysis area and project area. In 2006 and 2007 the Keddie Ridge Project area was surveyed (Silva_Environmental 2007) following the Protocol for Surveying for spotted owls in Proposed Management Activity Areas and Habitat Conservation Areas (USDA 1993b). As mentioned earlier, four PLAS study areas fall within a portion (29 percent) of the analysis area. SA-2 and SA-3 have been surveyed from 2003-2010. The Moonlight and Antelope Complex fire study area was surveyed in 2008 and 2009. The Empire Project study area (SA-7) was surveyed in 2009 and 2010. PLAS CSO surveys planned for 2011 will include SA-2, SA-3, and SA-7.

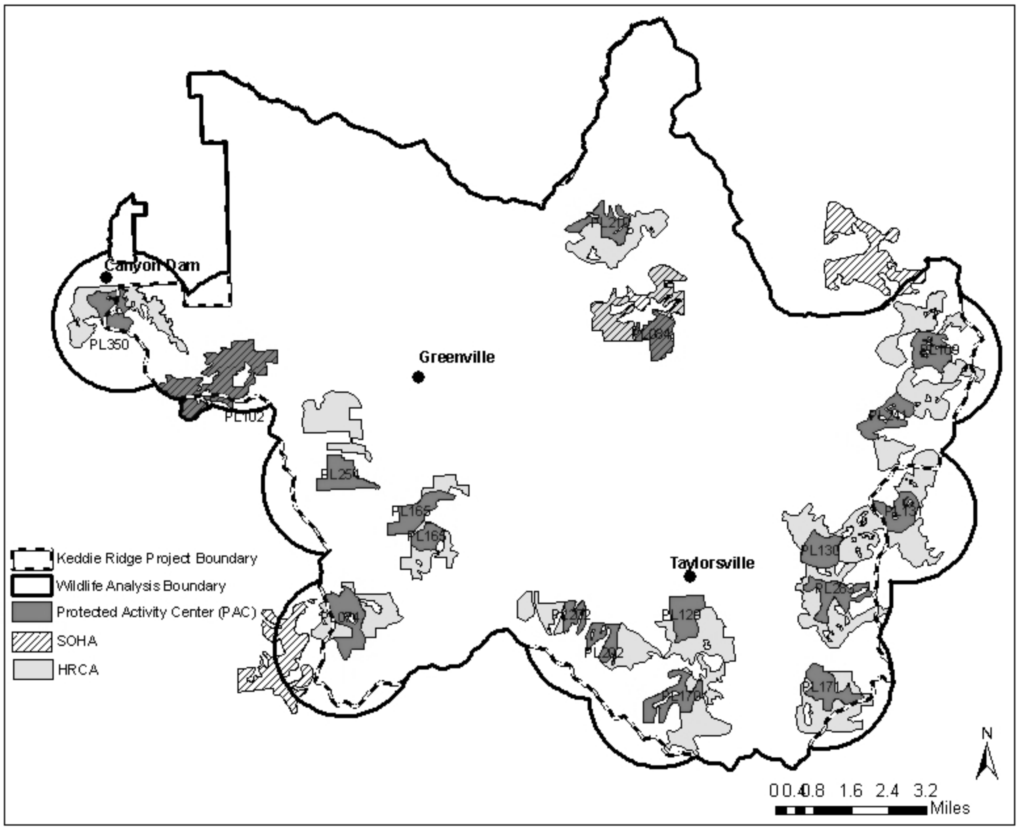


Figure 11. Spotted Owl PACs, SOHAs, and HRCAs in the Keddie Ridge Project Wildlife Analysis Area

Protected Activity Centers and Home Range Core Areas—There are a total of 16 PACs and associated HRCAs in the wildlife analysis area, including all or a portion of four SOHAs (Figure 11). Two spotted owl PACs (PL084, PL131) are located in the project area that could potentially incur direct habitat impacts due to proposed Keddie Ridge Project underburning. Nine associated HRCAs could potentially be directly affected by project activities. The remaining 14 PACs and 6 HRCAs within the wildlife analysis area could be indirectly affected by proposed actions but not directly affected by habitat change as a result of project implementation. Acreages, best detection dates, and current status (based on the most recent surveys to date) for all 16 PACs within the analysis area can be found in Attachment 5 of the Keddie Ridge Project BA/BE.

Areas of Concern—The CASPO Technical Report (Verner et al. 1992) identified Areas of Concern (AOC) within the range and distribution of the California spotted owl. These AOC's are identified simply to indicate potential areas where future problems may limit owl populations and where future problems may be greatest if the owl's status were to deteriorate. Two AOC's identified in the CASPO Report are adjacent to the Plumas National Forest (page 46-49 of the CASPO Report):

- Area of Concern 1: In Lassen County, within the Lassen National Forest and adjacent to the Plumas National Forest. The reason for the concern is that the habitat in this area is discontinuous, naturally fragmented, and poor in quality due to drier conditions and lava-based soils.
- Area of Concern 2: In northern Plumas County, within the Lassen National Forest. The reason for the concern is a gap in known distribution, mainly on private lands, which extends east to west in a band almost fully across the width of the owl's range.

A portion of Area of Concern 2 is located in the wildlife analysis area. The boundaries drawn for this small, narrow section of AOC 2 was based solely on the map provided in the CASPO Report (pg. 47). AOC boundaries in that map, were extremely broad, displayed at the state level scale, and the method used to define boundaries remains unclear (Gould 2008). This roughly 2.25 mile wide band of AOC 2 extends west and northwest of Greenville and lies outside of all proposed activities and would not be directly affected by the Keddie Ridge Project.

Northern Goshawk

The latest published information regarding the goshawk, in terms of population status, distribution, population and habitat trends, and species requirements can be found in the 2001 SNFPA final EIS (USDA 2001a), and in the 2004 SNFPA Final Supplemental EIS (USDA 2004a). A total of 588 northern goshawk breeding territories have been reported from Sierra Nevada National Forests. The Plumas National Forest supports approximately 149 goshawk territories—this is approximately 25 percent of the total number of breeding territories in the Sierra Nevada. These numbers represent goshawks that have been found as a result of both individual project inventories following standardized protocols, as well as nest locations found by other incidental methods. The 1988 Plumas National Forest Land and Resource Management Plan (USDA 1988) calls for a network of 60 nesting territories to provide for the viability of the goshawk. The Plumas National Forest has been developing territories (pre-SNFPA), and now there are 200-acre PACs (USDA 2004a) designated for all newly discovered goshawk breeding sites. Therefore, it is believed that the current density of goshawk territories is contributing to goshawk viability within the Plumas National Forest.

The population trends of northern goshawks in the Sierra Nevada are unknown, although numbers are suspected to be declining due to habitat reductions and loss of territories to timber harvest (Bloom et al. 1986 in USDA 2001a). Based on numerous studies (Bloom et al. 1986; Reynolds et al. 1992; Kennedy 1997; Squires and Reynolds 1997; Smallwood 1998; DeStefano 1998—all citations are in USDA 2001a), there is concern that goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality. Goshawk surveys were conducted in the Keddie Ridge Project wildlife analysis area in 2006 and 2007 by contractors (Klamath Wildlife Resources and MGW Biological) following methodologies for broadcast acoustical surveys as described in the Forest Service Regions 5 Northern Goshawk Survey Protocols

(USDA 2000b). Approximately 453 call points were surveyed twice in each year. Two new goshawk nesting sites were located, and corresponding 200-acre PACS for these territories were established. A total of 8 goshawk PACs are present on National Forest System lands within the wildlife analysis area. All but one (Canyon Dam PAC) fall completely within this boundary.

The northern goshawk requires mature conifers and deciduous forests with large trees, snags, and downed logs; dense canopy closure for nesting and forests with moderately open overstories; open understories interspersed with meadows, brush patches, or other natural or artificial openings; and riparian areas for foraging (USDA 2001a). Recent studies indicate that goshawks typically select canopy closures greater than 60 percent for nesting (Hall 1984, Richter and Calls 1996, Keane 1997). The following affected CWHR types provide high nesting habitat capability: Sierra mixed conifer, white fir, montane hardwood-conifer, lodgepole pine, montane riparian, ponderosa pine, and montane hardwood (CWHR size and density classes 5D, 5M, 4D, 4M). The following CWHR types are rated as providing moderate nesting habitat capability: aspen (4D, 4M, 5D, 5M), red fir (4D, 4M), and eastside pine (5D, 5M, 4D, 4M) (USDA 2001a). There are approximately 40,935 acres of northern goshawk habitat in the wildlife analysis area that provide high nesting habitat capability and an additional 400 acres that provide moderate nesting habitat capability.

Table 54. High and Moderate Capability Northern Goshawk Nesting Habitat in the Wildlife Analysis Area (National Forest System Acres)

CWHR Size/Density Class	Nesting Habitat Capability	National Forest System Acres in Wildlife Analysis Area
4M	High	18,690
4D	High	7,303
5M	High	8,997
5D	High	5,945
Subtotal	**High**	**40,935**
Eastside Pine 4M/4D/5M/5D	Moderate	52
Red Fir 4M/4D	Moderate	348
Subtotal	**Moderate**	**400**
Total	**All Nesting**	**41,336**

Mesocarnivores (Pacific Fisher and American Marten)

The Plumas National Forest has mapped a forest carnivore network across the Forest that consists of scattered known marten sightings, large habitat management areas, and wide dispersal or connecting corridors. The SNFPA standards and guidelines for mesocarnivore habitat do not speak to carnivore networks, allowing each National Forest to decide on the management need for the network. The Plumas National Forest carnivore network is not incorporated into the Forest Plan as a land allocation with standards and guidelines; rather, it is a plan to evaluate impacts of specific projects on habitat connectivity. The management intent of the network is to provide a continuously connected system of habitats focused on the needs of marten and fisher. This corridor is designed to provide a habitat connectivity corridor linking the Tahoe National Forest with the Lassen National Forest. However, there is concern for corridors between these reserves that allow immigration and emigration to maintain healthy populations. Approximately 13,153 acres (3 percent) of the forest carnivore network are within the wildlife analysis area.

Approximately 50 percent of the Plumas National Forest has been systematically surveyed to protocol using track plates and camera stations (Plumas GIS database). To date, there have been no fisher, Sierra Nevada red fox, or California wolverine detections associated with these surveys. On the Plumas National Forest, all but five sightings of marten occurred within the Lakes Basin-Haskell Peak area or around Little Grass Valley Reservoir. The additional five sightings are unverified reports (verified report consists of photograph, tracks, hair sample, and sighting by a reputable biologist).

Portions of the wildlife analysis area have been surveyed several times for mesocarnivores, beginning in the mid-1980's, using both camera stations and track plates. This includes survey efforts by private contractors and Forest Service crews, as well as survey efforts completed under the PLAS small mammal study module. A total of 181 stations have been surveyed with no mesocarnivores detected to date in the wildlife analysis area. The most recent mesocarnivore surveys in the wildlife analysis area were in 2001, for the Moonlight-Jura DFPZ project, and in 2003, for PLAS study areas 9 and 10.

Pacific Fisher—The USFWS completed an initial 90-day review of a petition submitted by 20 groups seeking to list the Pacific fisher as Endangered in Washington, Oregon, and California. After reviewing the best available scientific information, the USFWS found that substantial information indicated that listing the Pacific fisher as Endangered in its West Coast range may be warranted (USDI 2004). After a 12-month status review, the West Coast population of the fisher was designated as a Candidate species by USFWS (ibid), but listing under the Endangered Species Act is precluded by other higher-priority listing actions.

The current distribution of Pacific fisher in California suggests that the once continuous distribution is now apparently fragmented into two areas separated by a distance that greatly exceeds reported fisher dispersal ability. The methods used to detect fisher in numerous survey efforts have failed to detect this species in an area between Mount Shasta and Yosemite National Park (Zielinski et al. 1995). These authors strongly suggest that the absence of fisher detections within this large 240-mile area is because they do not occur in the areas surveyed. This gap in distribution may be effectively isolating the southern Sierra Nevada population from the rest of the fisher range in Northern California. Since 1990 there have generally been no detections or confirmed sightings of fisher within this 240-mile gap of the Sierra Nevada (note: gap equates to 240 miles as identified in the 2001 SNFPA and 260 miles in the April 8, 2004, Federal Register). The Keddie Ridge Project area is located within this "gap."

A joint partnership between the California Department of Fish and Game, Sierra Pacific Industries (SPI), U.S. Fish and Wildlife Service, and North Carolina State University has embarked on a fisher re-introduction effort within the distribution gap discussed above, specifically within SPI's Sterling Management Tract (Butte County). The Forest Service Pacific Southwest Region supports this reintroduction and is actively pursuing partnerships in this effort as a feature of the SNFPA management strategy (USDA 2004a). The SPI lands in which these fisher re-introductions have taken place are approximately 30 miles to the west-southwest of the Keddie Ridge wildlife analysis area. This re-introduction effort began during November 2009 with a total of 13 animals being released onto SPI lands. In 2010 an additional 15 animals were released. Monitoring data also shows the majority of all individual fisher movements since their release have been on private lands (A. Facka, personal communication, March, 2011). Detections of released fishers on public lands (both the Lassen and Plumas National Forests) have primarily been from dispersing males, all of which have been documented returning back to private land (ibid). These male movements onto public lands are not considered relevant from a population establishment standpoint and there is no evidence at this time that any re-introduced individual has permanently moved onto the Plumas National Forest (ibid). In April, 2011 a fisher den established by a released Sterling Tract female, was located on the Lassen National Forest (ibid). Due to reproduction occurring on the Sterling Tract private land, the Forest Service anticipates that additional females may likely den on the Lassen NF in the coming years. Remaining fisher releases for 2011-2012 (8 females, 4 males) will likely occur closer to the Plumas NF than previous releases. Therefore, it is likely that the PNF will also have residing fishers in the next coming years.

The 2004 SNFPA Record of Decision (USDA 2004b) identifies large trees, large snags, large down wood, and higher than average canopy closure as habitat attributes important to fisher. CWHR size classes 4M, 4D, 5M, 5D, and 6 are identified as being important to fisher. A vegetated understory and large woody debris appear important for their prey species. The fisher's preferred forest types include montane hardwood conifer, mixed conifer, montane riparian, ponderosa pine, lodgepole pine, eastside pine, and possibly red fir. The higher-elevation forests are less suitable for fishers because of deep snow packs (USDI 2004). Table 55 displays the acres of denning (CWHR size-density classes 4D and 5D) and foraging (CWHR size-density classes 4M and 5M) habitat present in the wildlife analysis area.

Table 55. Suitable Pacific Fischer Habitat in the Wildlife Analysis Area (NFS Lands)

Habitat Use	CWHR Type	National Forest System Acres
Denning	4D/5D	13,454
Foraging	4M/5M	27,916
Total		41,370

The physical structure of the forest and the prey associated with forest structures are thought to be the critical features that explain fisher habitat use. Powell (in USDI 2004) states that forest type is probably not as important to fishers as the vegetative and structural aspects, and fishers may select forests that have low and closed canopies. Numerous studies (as referenced in the 2004 SNFPA Final Supplemental EIS) indicate that canopy closure over 60 percent is important, and fisher preferentially select home ranges to include high proportions of dense forested habitat. Stands with greater canopy cover, greater variation in tree size, and more hardwood and large snag components provide suitable resting habitat where fishers seek refuge during periodic resting bouts (Zielinski et al. 2010). The fisher's need for overhead cover was well documented in the April 8, 2004, Federal Register. Fishers select stands with continuous canopy cover to provide security cover from predators. The dense canopy increases snow interception, lowers the energetic costs of traveling between foraging sites, and preferred prey species may be more abundant and vulnerable in areas of higher canopy closure (ibid). A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and prefers large areas of contiguous interior forest (ibid.).

American Marten—In the Sierra Nevada, marten are most often found above 7,200 feet, but the species' core elevation range is from 5,500 to 10,000 feet (USDA 2001a). Recent studies (Zielinski 2004, Zielinski et al. 2005), which compared historical and contemporary records of martens, strongly indicates that populations now appear to be discontinuous in the northern Sierra Nevada. This reduction in their distribution is likely the result of several factors, including timber harvest on NFS lands, road building, and trapping.

There are over 40 records of marten observations/detections on the Plumas National Forest dating back to 1975. Only one record, a sighting in 1980 at Taylor Lake, is within close proximity to the wildlife analysis area. Extensive surveys using both soot-covered track plates and baited photo stations have been conducted since the mid-1990s across the majority of the Mt. Hough Ranger District landscape; no marten have been found (documented survey results are on file). Marten have not been detected during surveys conducted within and adjacent to the Keddie Ridge Project area; therefore, it is suspected that marten are likely not present in the wildlife analysis area.

Martens prefer coniferous forest habitat with large-diameter trees and snags, large down logs, moderate-to-high canopy closure, and interspersion of riparian areas and meadows (USDA 2001a). Martens generally avoid habitats that lack overhead cover; rather, they select stands with greater than 40 percent canopy closure for both resting and foraging and usually avoid stands with less than 30 percent canopy closure (ibid.). Foraging areas are generally in close proximity to both dense riparian corridors (used as travel ways) and forest meadow edges and include an interspersion of small (less than 1 acre) openings with good ground cover used for foraging (USDA 2001a).

Important forest types include mature mesic (moderately moist) forests of red fir, Sierra mixed conifer-fir, lodgepole pine, and eastside pine (USDA 2001a). The CWHR size-density classes 4M, 4D, 5M, 5D, and 6 are identified as moderately to highly important for the marten (ibid.). The red fir zone forms the core of marten occurrence in the Sierra Nevada (ibid.). Table 56 displays the acres of denning (4D, 5D) and foraging (4M, 5M) habitat present in the wildlife analysis area.

Table 56. Suitable Marten Habitat in the Wildlife Analysis Area (NFS Lands)

Habitat Use	CWHR Type	National Forest System Acres in Wildlife Analysis Area
Denning	4D/5D	12,389
Foraging	4M/5M	24,872
Total		37,261

Mountain Yellow-legged Frog

The only detections to date of mountain yellow-legged frogs (MYLFs) in the project area occurred in 1979, when four incidental sightings were reported. These sightings were on private land in the north arm of Indian Valley, two within Cooks Creek and two within Lights Creek. Formal amphibian surveys were conducted in the Keddie Ridge Project area in 2006 (Arroyo_Chico_Resources 2006). Contractors followed "A Standard Protocol for Surveying Aquatic Amphibians" (Fellers and Freel 1995). There were no detections of MYLFs during this survey. Many of the streams in the 2006 survey consisted of a cobble substrate and appeared to be highly suitable for MYLFs. However, large numbers of fish, primarily rainbow trout, were also detected in these streams. The presence of such fish populations lowers the suitability of streams for MYLFs (Arroyo_Chico_Resources 2006).

USDA Forest Service R5 Management Indicator Species

MIS for the PNF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA 2007e). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in Table 57. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), Table 57 discloses whether or not habitat for each MIS is potentially affected by the Keddie Ridge Project (4th column).

Table 57. Selection of MIS for Project-Level Habitat Analysis for the Keddie Ridge Project

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	3
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Oak-associated Hardwoods & Hardwood/conifers	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	3
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	3
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree frog *Pseudacris regilla*	2
Early Seral Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures	mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures	mountain quail *Oreortyx pictus*	3
Late Seral Open Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	sooty (blue) grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		northern flying squirrel *Glaucomys sabrinus*	3
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	2

[1] All CWHR size classes and canopy closures are included unless otherwise specified; Canopy Closure classifications: S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate

cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); Tree size classes: 1 (Seedling)(<1" DBH); 2 (Sapling)(1"-5.9" DBH); 3 (Pole)(6"-10.9" DBH); 4 (Small tree)(11"-23.9" DBH); 5 (Medium/Large tree)(≥24" DBH); 6 (Multi-layered Tree) [In PPN and SMC]

[2] Category 1: MIS whose habitat is not in or adjacent to the analysis area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to analysis area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

The two MIS included in this final EIS is the hairy woodpecker, due to the proposal to treat forested stands with medium to large snags, which is the habitat component for this MIS, and aquatic macroinvertebrates, due to the cumulative effects to watersheds. A summary of existing conditions and environmental effects for these two species, derived from the project level MIS Report, is presented in this final EIS. Affected environment and environmental consequences to the California spotted owl, also a MIS, can be found in the Forest Service R5 Sensitive Species sections of this final EIS. It has been determined that the habitat for the remaining MIS in Table 57, with the exception of two (wet meadows and snags in burned forest), will also be affected by this project but these effects are considered indirect, minor, or beneficial. Refer to the Keddie Ridge Project MIS Report for complete discussion of potential effects on all PNF MIS species due to implementation of this project.

Hairy Woodpecker

The hairy woodpecker was selected as the MIS for the ecosystem component of snags in green forests. Medium (diameter breast height between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (CDFG 2006). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Siegel and DeSante 1999). Based on data derived from common stand exam plots within the Keddie Ridge Project, snags over 15 inches DBH, on average, exist at 3 snags per acre.

Aquatic Macroinvertebrates

Aquatic macroinvetebrates are MIS for riverine and lacustrine habitat in the Sierra Nevada. They have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Resh and Price 1984, Karr et al. 1986, Hughes and Larsen 1988, Resh and Rosenberg 1989). They are sensitive to changes in water chemistry, temperature, and physical habitat; factors of particular importance are: flow, sedimentation, and water surface shade.

Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They provide an important ecological link between microscopic food organisms and fish. Aquatic macroinvertebrates include insects, such as the commonly thought of mayflies, stoneflies, caddisflies, helgrammites and midges. Many of these groups are most highly developed for running water environments with adults and larvae living primarily in cold, running streams; many feed and breed under rocks, in the spaces among loose gravel and rocks, piles of waterlogged leaves and debris, and submerged logs.

There are nearly 1,000 miles of streams in the watershed analysis area. Approximately 53 percent of the stream miles are ephemeral, 32 percent are intermittent, and 15 percent are perennial. Ephemeral and intermittent streams are seasonal—they run water during some portion of the year, but are typically dry by late summer. Ephemeral streams only flow in response to storm events or snowmelt, and do not necessarily flow every year. Intermittent streams are seasonally connected to the surrounding water table and may flow during all but the driest months, whereas perennial streams typically flow year round.

Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA 1999a). The sensitivity ratings were based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorm events, and on revegetation potential. The HFQLG Pilot Project watersheds applicable to this project received moderate sensitivity ratings. Based on these ratings, most subwatersheds analyzed in this assessment were considered to have moderate sensitivity and were assigned a “threshold of concern” (TOC) value of 12 percent of the subwatershed area refer to the MYLF cumulative effects section below for further discussion of TOC).

Migratory Landbirds

Under the National Forest Management Act (NFMA), the Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service Landbird Conservation Strategic Plan (USDA 2000a) followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan reference goals and objectives for integrating bird conservation into forest management and planning.

The Plumas National Forest utilizes the U.S. Fish and Wildlife Service 2008 Birds of Conservation Concern for the Sierra Nevada as its framework for analyzing effects to migratory birds. Of this list of eleven birds, Keddie Ridge project level reports (e.g. BA/BE, MIS) address nine of the species either directly or by using a surrogate species that utilize the same or similar habitat attributes. Table 58 highlights how and where these nine migratory birds are addressed directly or by using a surrogate species.

Table 58. Analysis of Migratory Birds for the Keddie Ridge Project

Birds of Conservation Concern (Sierra Nevada - BCR 15)	Forest Service Sensitive Species (S) or Management Indicator Species (MIS)	Project Level Report (BA/BE or MIS)	Critical Habitat component or threat as defined by Sierra Nevada Bird Conservation Plan (PIF)
Bald Eagle	Bald Eagle (S)	BA/BE	Designated as a non-land bird by DeSante
Flammulated Owl	Mule Deer (MIS) Hairy Woodpecker (MIS)	MIS MIS	Depends critically on oaks or oak woodlands, Loss of snags
California Spotted Owl	California Spotted Owl (S)	BA/BE	Depends critically on old growth
Calliope Hummingbird	Sooty (Blue) Grouse (MIS) Yellow Warbler (MIS) Willow Flycatcher (S)	MIS MIS BA/BE	Open Forested habitats, and moist habitats on the East Slope
Lewis' Woodpecker	Hairy Woodpecker (MIS)	MIS	Loss of snags
Williamson's Sapsucker	Hairy Woodpecker (MIS)	MIS	Loss of snags
Olive-sided Flycatcher	California Spotted Owl (S) Hairy Woodpecker (MIS)	BA/BE MIS	Utilize late successional/old growth forest, but does not depend on it critically, Loss of snags
Willow Flycatcher	Willow Flycatcher (S)	BA/BE	Depends critically on montane meadow habitat
Cassin's Finch	California Spotted Owl (S)	BA/BE	Depends critically on old growth

The remaining two species, the Peregrine Falcon and Black Swift, occur in known established sites or have habitats that are very localized and limited in extent on the Plumas NF.

Peregrine Falcon

PNF biologists have reviewed habitat for the Peregrine Falcon on the Plumas NF extensively since the early 1980's. Documented eyries for the Peregrine falcon consists of three rock cliff sites on the Forest, located at Bald Rock (Feather River RD), Pulga (Feather River RD), and North Fork of the Feather River (Mt. Hough RD), just west of Canyon Dam. Disturbance to these habitats is limited, as most activities do not impact these rock cliff sites. Projects that falls within a ½ mile vicinity of these three sites would analyze impacts to Peregrine Falcon, whereas projects outside of a ½ mile vicinity of these sites would not require further analysis. The Canyon Dam site is located over two miles to the west of proposed Keddie Ridge Project activities. No direct or indirect effects are expected to occur to this territory with implementation of the Keddie Ridge Project and consequently does not require further analysis.

Black Swift

Based on surveys and work by the Plumas County Audubon Society the Black Swift is a rare spring and fall migrant across the PNF and has not been confirmed as a resident on the PNF. However suitable wet cliff/waterfall habitat does occur at selected sites on the Forest. Two sites appear to be suitable for Black Swifts, Feather Falls on the Feather River RD and Frazier Falls on the Beckwourth RD. Both sites fall within recreation areas or recreation sites, and do not receive ground disturbing activities that would modify or alter habitat values for the Black Swift. No known sites occur in or are within a ½ mile of the Keddie Ridge Project area.

Environmental Consequences

Summary of Effects

The Keddie Ridge Project Wildlife Biological Assessment / Biological Evaluation (USDA 2011b) provides a discussion of the direct, indirect, and cumulative effects for all sensitive animal species analyzed for the Keddie Ridge Project. The BA/BE is located in the Keddie Ridge Project record and incorporated by reference. The BA/BE concluded that the Keddie Ridge Project would not affect the following species: California red-legged frog, Foothill yellow-legged frog, Valley elderberry longhorn beetle, northern leopard frog, greater sandhill crane, and Swainson's hawk.

Based on the direct, indirect, and cumulative effects discussed in the BA/BE, it was concluded that the Keddie Ridge Project would affect individuals but would likely not result in a trend toward listing or loss of viability for the following species: hardhead minnow, mountain yellow-legged frog, northwestern pond turtle, Sierra Nevada red fox, pallid bat, Townsend's big eared bat, western red bat, willow flycatcher, bald eagle, California spotted owl, northern goshawk, great gray owl, California wolverine, American marten, and Pacific fisher.

The NEPA (*National Environmental Policy Act*) process requires agencies to identify "the significant environmental issues deserving study and de-emphasizing insignificant issues, narrowing the scope of the environmental impact statement" 40 CFR 15001.1(d). Due to the high visibility of old-forest species in California, and the potential impacts of fuels treatment, group selection, and area thinning on forested habitat, the effects on bald eagle, California spotted owl, northern goshawk, American marten, and Pacific fisher are emphasized in this EIS. The mountain yellow-legged frog is also emphasized in this Final EIS due to the proposed use of herbicides in riparian habitat conservation areas (RHCAs) and proposed DFPZ and area thinning within RHCAs.

Terrestrial Wildlife Species

All Action Alternatives (A, C, D, and E)

DFPZ and area thinning treatments applied to CWHR size-density class 4M and 4D stands, which provide important foraging, nesting, and denning habitat to old-forest species, would modify stand structure attributes, species composition, and landscape structure (distribution of CWHR size class and density and percent of open canopy forest conditions created). Based on silviculture prescriptions and design criteria specific to the Keddie Ridge Project, it is expected that the majority of size-density 4M and 4D stands treated under all alternatives would retain habitat suitability values for old-forest species. Alternative D would have the least adverse effects on habitat suitability, reducing 553 acres of 4D stands to a 4M condition. No stands under this alternative would be reduced to an unsuitable state (4P or below). Alternative C, the non-commercial alternative, would reduce the same amount of 4D stands as alternative D as well as create approximately 234 acres of 4P (unsuitable) due to thinning some 4M stands to below 40 percent canopy cover. Alternative C would maintain 92 percent of treated 4M and 4D stands in a suitable state. Alternatives A and E, with implementation of group selection and heavier DFPZ prescriptions, would have the largest adverse effects on habitat suitability but still maintain 66 percent and 57 percent, respectively, of treated 4M and 4D acres in a suitable state. Alternative A would reduce 1,052 acres to an unsuitable condition (818 acres to 4P, 234 acres to GS) and alternative E would reduce 1,325 acres to an unsuitable condition (1,082 acres to 4P, 243 acres to GS).

Approximately 1,303 acres of CWHR size density class 5M and 5D is proposed for treatment under each action alternative. These stands, with their larger tree components and higher canopy closure, provide important nesting habitat for spotted owls and goshawks and denning habitat for mesocarnivores. Approximately 140 acres of 5D under alternatives A, C, and E and 130 acres of 5D under alternative D would be reduced to a 5M condition. Unique prescriptions associated with each alternative more fully identifies the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 or 24 inch DBH trees and would maintain 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inch DBH and maintaining 40-50 percent CC in treated 5M and 5D stands.

The majority of group selection treatments proposed under alternatives A and E would be located outside of CWHR 5M and 5D stands (88 percent under alternative A, 81 percent under alternative E). However, a small percentage of GS acres would fall within size and density class 5M stands considered suitable for nesting owls. No 5D habitat is proposed for GS. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. These acres would exist in a Sierran mixed conifer (SMC 1) state after group selection treatment.

Table 59 shows the cumulative changes in CWHR size density classed 4M, 4D, 5M, and 5D that would occur from implementing the DFPZs, area thinning, and group selections proposed in the action alternatives.

Table 59. Approximate Change in CWHR Size Density Classes 4M, 4D, 5M, 5D Habitat Types in the Wildlife Analysis Area (Based on 66,040 National Forest System Acres)

CWHR Size Density Class	No Action Alternative (Existing Acres)	Alternative A Post-Project	Alternative C Post-Project	Alternative D Post-Project	Alternative E Post-Project
4M	18,865	18,384	19,184	19,418	18,111
	% remaining	97%	103%	103%	96%
4D	7,485	6,914	6,932	6,932	7,039
	% remaining	92%	93%	93%	94%
5M	9,051	9,157	9,191	9,182	9,129
	% remaining	101%	102%	101%	101%
5D	5,969	5,829	5,829	5,838	5,829
	% remaining	98%	98%	98%	98%
Total Change	41,370	40,284	41,138	41,370	40,108
		97%	100%	100%	97%

California Spotted Owl

Two PACs would be entered under all action alternatives to conduct low intensity underburns (PAC 84 – 65 acres, PAC 131 – 8.4 acres). The objectives of this treatment would be to reduce fuel loads and thus decrease potential effects of wildfire. No other activities are proposed in PACs or SOHAs.

Eight of the 15 HRCAs in the analysis area would be affected by proposed treatments under the action alternatives. Under alternatives A, C, and E, four HRCAs would see a reduction in suitable acres. The percent reduction in these four HRCAs would range from 1 percent to 16 percent and would include some group selection acreage. Group selection under alternative E is estimated to reduce a small percentage of nesting habitat in two HRCAs (PL165 – 2 acres of Sierra Mixed Conifer (SMC) 5M, PL254 – 23 acres of SMC 5M).

Northern Goshawk

Fuel treatments, group selections, or area thinning proposed in the action alternatives would not occur in any of the eight northern goshawk PACs present in the wildlife analysis area.

Mesocarnivores (American marten and Pacific Fisher)

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area.

Alternatives A and E, due to the heavier DFPZ treatments and group selections proposed, would reduce some mesocarnivore suitable habitat to an unsuitable state (CWHR 4P or SMC 1). Reductions in denning habitat would occur under all alternatives as a result of thinning treatments opening up the canopy closure. Denning habitat treated under alternatives A and E would be reduced by 4.6 percent and 5.3 percent respectively. Alternatives C and D would reduce denning habitat by 5 percent. Suitable foraging habitat treated under alternatives A and E would result in a decrease of 1.3 percent and 2.4

percent respectively. Alternatives C and D, due to the reduction of 5D and 4D stands to an M state as a result of thinning, would increase existing foraging acres by 450 and 693 acres respectively.

Alternative B (No Action)

Alternative B would pose no risk and uncertainty associated with the proposed actions, but it would maintain a high risk of potential habitat loss from wildfire, while the action alternatives would reduce this risk.

Aquatic Wildlife Species

All Action Alternatives (A, C, D, and E)

Approximately 1,279 acres of riparian habitat conservation areas (RHCAs) would be entered for treatment under each action alternative. All alternatives would apply specific RHCA prescriptions that would maintain suitable habitat values for aquatic species and meet riparian management objectives (RMOs) while creating riparian conditions that would be less susceptible to high-severity fire. This reduction of long-term threat of stand-replacing fire as a result of treatments would offset any short-term minor effects.

The Keddie Ridge Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, no subwatersheds would be at or exceed the threshold of concern (TOC). Thus, suitable riparian conditions for aquatic species would not be susceptible to significant adverse cumulative effects as a result of fuel reduction activities implemented under the Keddie Ridge Project.

Based on the latest risk assessments and application design criteria, the herbicides proposed under alternatives A and E to control noxious weeds would pose no significant adverse effects to wildlife species.

Mountain Yellow-legged Frog

Potential direct effects are expected to be negligible to MYLFs due to the likelihood, based on survey results, that populations are not present in treatment areas.

Suitable MYLF riparian habitat would be affected under all alternatives but, based on RHCA prescriptions and design criteria (including equipment exclusion zones), implementation of best management practices, and implementation of soil and water standards (RMOs), adverse effects would be minimal.

Alternative B (No Action)

Alternative A would pose no risk and uncertainty associated with the proposed actions, but it would maintain a high risk of potential habitat loss from wildfire. The action alternatives would reduce this risk. There would be no direct effects on aquatic wildlife species because no activities would occur to create disturbance or result in any impacts on the existing habitat conditions.

Environmental Consequences: USDA Forest Service R5 Sensitive Species

Bald Eagle

All Action Alternatives (A, C, D, and E)

Direct Effects

Area thinning is proposed on approximately 46 acres in the primary nest zone of the Round Valley bald eagle territory. These treatments would occur in two units of the Keddie Ridge Project, units 75 and 75a. Unit 75 comprises 34 acres and is located on the north side of NFS road 26N19, approximately 0.12 miles (800 feet) from the active nest tree. Area thinning treatments in Unit 75 would take place in 19 acres typed as CHWR Sierra Mixed Confer (SMC) 5D and 15 acres typed as SMC 5M. The prescriptions for each action alternative in unit 75 would be as follows: alternative A—thin to 40 percent canopy closure (CC) and up to 24 inch DBH trees; alternative C—thin to 40-50 percent CC and up to 12 inch DBH trees; alternative D—thin to 50 percent CC and up to 20 inch DBH trees, leave 25 percent of stand untreated; alternative E—thin to 40-50 percent and up to 30 inch DBH trees. Unit 75a comprises 12 acres of SMC 5M and is located south of NFS road 26N19 and is adjacent to unit 75. The active nest tree is located in the very southwest corner of this unit, immediately adjacent to private property. The treatment prescriptions for unit 75a under all action alternatives are the same—hand thin, pile, and burn trees less than 8 inch DBH trees. Light underburning treatments are also proposed within both units.

A short temporary road (approximately 200 feet) would be constructed off of FS road 26N19 to access unit 75. At the end of this temporary road a landing would be constructed to receive and facilitate removal of forest products from the 34 acres to be treated. This landing would potentially be ½ acre in size and all existing trees would require removal. The temporary road would be decommissioned upon project completion.

Area thinning prescriptions are designed to accelerate stand growth and provide for future CWHR size class 4 and 5 trees. Area thinning prescriptions are also designed to encourage long-term regeneration of large pines by maintaining the largest and most fire-resilient dominant and codominant trees. The resulting stand condition of such thinning would be an uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches DBH with total canopy cover of 40-50 percent. Protection and enhancement of nesting habitat by thinning smaller conifers would improve the growth of the residual ponderosa and sugar pines, while surface and ladder fuel reduction would protect the larger tree component for future nest trees. Therefore, the area thinning treatments implemented under the action alternatives would be deemed a beneficial effect, resulting in additional suitable nesting habitat for bald eagles in the future.

The hand thin, pile, and burn treatments proposed in the nest stand unit (unit 75a) would limit the opening of this stand but still remove small diameter (less than 8 inch) trees, which comprise the majority of the ladder fuels. This would result in improved stand conditions by reducing potential wildfire effects while still concealing the nest tree from NFS road 26N19.

Indirect Effects

Changes in the fishery production are not expected in Round Valley Reservoir as a result of implementing proposed DFPZ and area thinning treatments immediately adjacent to the reservoir. Implementing best management practices and meeting all riparian management objectives (the RMO analysis is located in the “Hydrology and Soils” section of this chapter) would ensure that there would be no indirect effects on the fishery or fishery habitat.

To limit disturbance to nesting eagles, the following standard management requirements would be followed: a Limited Operating Period (LOP) would be implemented not allowing area thinning treatments in the Round Valley bald eagle territory (units 75 and 75a) between January 1 and August 15 along NFS road 26N19. No log haul is to occur on this road during the LOP.

Cumulative Effects

The parcels of private ownership land in the Bellas Flat area surround the existing nest tree. The nest tree is on national Forest System land but is 30 feet from the private property. The old growth timber which once existed on the private land within ½ mile of the nest has been heavily cut, with no potential nest trees remaining. Approximately 60 percent of the nest site area and 80 percent of the primary use area are privately owned (as identified in the Round Valley Bald Eagle Management Plan, November 1989). There is continuous pressure to initiate logging activities on private land around the nest that could be adverse to nesting activity.

NFS road 26N19 runs through both the primary nest site area and the secondary nesting area of the Round Valley territory. The existing condition of this road is such that use is limited during the critical stages of nesting because of snow, mud, large dips full of water, and generally poor conditions for vehicle use. No evidence exists that past and present recreational and general use of this road has caused adverse impacts to eagle production/nesting. However, it is a concern that any future road improvements to this road could lead to increased use, which could adversely affect eagle nesting. To remove forest products from unit 75, as proposed under the action alternatives, a small southern section (approximately 120 yards) of NFS road 26N19 could receive minor improvements. The limiting sections of this road to vehicle traffic (due to poor surface conditions) exist north of this short haul route. Therefore, any improvements to NFS road 26N19 associated with implementation of the Keddie Ridge Project is not expected to lead to increased use.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the bald eagle or existing bald eagle habitat. No activities would occur that would cause disturbance to nesting, wintering, or migrating birds.

Indirect Effects

The indirect effects of no action would include the potential for future wildfire and related impacts on habitat development and recovery. The silvicultural recommendations for habitat management presented in the Round Valley Bald Eagle Management Plan to promote present and future bald eagle nesting and foraging activities within the Round Valley Bald Eagle Management Area (BEMA) would not occur. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more severe burn. Increased rates of spread would result in potential loss of bald eagle nesting habitat and other important habitat attributes such as large trees and snags.

Cumulative Effects

No acres of suitable habitat would be treated and would not reduce the average suitability of any habitat types within the analysis area for bald eagles.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

California Spotted Owl

All Action Alternatives (A, C, D, and E)

Direct Effects

The analysis of direct effects on California spotted owl (CSO) is focused on PACs and spotted owl Habitat Areas (SOHAs) existing or created as a result of surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the "Indirect Effects" section below. Direct effects are expected to be minimal for all action alternatives, as described below.

Direct effects on spotted owls are anticipated within two PACs—PL084 and PL131. The remaining 14 PACs within the analysis area would not be entered for treatment under this project. A low intensity underburn on 65 acres in PL084 and 8.4 acres in PL131 is proposed under all action alternatives. The same underburn prescription is proposed in 105.5 acres of SOHA R3, which is associated with PL084. This prescription will result in less than 10 percent mortality n dominant and codominant trees and CWHR suitability on treated acres will remain unchanged. To prevent disturbance to potential nesting birds, underburning activities within PACs and SOHA would take place outside of the nesting season (appendix H).

If spotted owls are detected during future surveys or project-related activities, PACs and home range core areas (HRCAs) would be delineated, and all treatments would be modified to comply with the standards and guidelines in the HFQLG Act final EIS and Record of Decision (USDA 1999a, b) and the SNFPA 2004 ROD (USDA 2004b).

Limited Operating Periods (LOPs) would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections. An LOP would also be applied to haul routes within 0.25 mile of an active nest. LOPs are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location. Impacts from disturbance are not expected to substantially affect habitat use or reproductive capacity of this species.

No new road construction would occur in spotted owl PACs or SOHAs. A LOP could be applied for any road reconstruction in PACs.

Proposed treatment activities could occur as early as fall 2011 and may continue five years beyond the initiation of implementation. There is the potential that spotted owls could establish new, undocumented territories (activity centers) during project implementation and would not be protected as PACs. The decision to conduct additional protocol surveys within the project area will be made by the district biologist based on project implementation timelines.

Indirect Effects

Based on the vegetation map and CWHR model, about 15,020 acres of National Forest System lands in the wildlife analysis area may be considered suitable spotted owl nesting habitat (CWHR size/density classes 5M and 5D), and about 26,350 of National Forest System acres may be considered suitable foraging habitat (CWHR size classes 4M and 4D) (Table 53). The total acres of suitable owl habitat in the wildlife analysis area that would remain after implementation of each action alternative is presented in Table 59 above. The post-project CWHR changes summarized in Table 59 are based on the silviculture prescription assigned to each CWHR stand within treatment units (refer to chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable spotted owl foraging habitat (CWHR size classes 4M and 4D) as a result of implementing project activities would occur under all action alternatives. Approximately 3,065 acres of 4M and 4D habitat is proposed for treatment under each alternative. Prescriptions that would result in 4M and 4D stands reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units and all group selection (GS) units in Alternatives A and E. Alternative A would reduce 818 acres of 4M/4D stands to a 4P state (256 acres from 4D, 562 acres from 4M). Group selection treatments under alternative A would reduce an additional 234 acres of 4M and 4D stands to a SMC 1 condition (approximately 82 acres from 4D and 152 acres from 4M). Alternative E would reduce 1,082 4M/4D acres to a 4P state (361 acres from 4D, 721 acres from 4M). Group selection treatments under alternative E would reduce an additional 243 acres of 4M and 4D stands to an SMC 1 condition (approximately 85 acres from 4D and 158 acres from 4M). GS treatments would specifically target areas dominated by uniformly sized, smaller white fir and that have significant amounts of small down logs or standing small deadwood. Alternatives C would reduce approximately 234 acres of 4M to a 4P state thru thinning 12 inch DBH or smaller trees and creating open (below 40 percent) canopy cover conditions. No stand treated under alternative D would be reduced to an unsuitable state.

The amount of 4D stands reduced to a 4M condition (i.e. canopy closure after treatment would be 40-60 percent) under each alternative would be as follows—alternative A-233 acres, alternatives C and D-553 acres, and alternative E-125 acres. Although canopy cover down to 40 percent is considered suitable for foraging (USFWS 2005), it appears to be only marginally so based on owl occurrence and productivity threshold at around 50 percent canopy cover (Verner et al. 1992). Under all alternatives, the majority of DFPZ and area thinning treatments applied to CWHR 4M and 4D stands would result in no change to CWHR size class or canopy closure class. Of the approximate 3,065 acres of 4M and 4D habitat proposed for treatment, (92 and 100 percent) under alternatives C and D, respectively, would continue to provide suitable foraging conditions for the spotted owl. No group selection would occur under these two alternatives and treatments such as light thinning, mastication, hand-thinning, underburning would maintain these stands in a suitable CWHR state. Alternatives A and E, which would implement group selection and heavier DFPZ treatments, would maintain 2,013 acres (66 percent) and 1,740 acres (57 percent), respectively, of treated 4M and 4D acres in a suitable state.

Based on recent habitat assessments of 103 CSO territorial sites across the Plumas Lassen study area (Keane 2010) the habitat value to nesting/roosting spotted owls of size class 4 stands with a moderate canopy cover increases significantly when larger tree (LT) components (i.e. contribution of greater than 24 inch trees to the total tree crown cover) were recorded. Based on stand exam data collected and modeled for the Keddie Ridge Project, this large tree component exists in a majority of the post-project 4D and 4M stands (i.e. large tree attributed recorded in approximately 55 percent of stands). These areas, based on recent research findings (ibid), would likely provide not just foraging conditions for the spotted owl but also suitable nesting/roosting conditions.

Suitable nesting habitat (CWHR 5M and 5D) proposed for treatment under all alternatives, with the exception of group selection units, is expected to remain suitable for spotted owls (i.e., no change or reduced to 5M). Approximately 1,303 acres of 5M and 5D is proposed for treatment under each action alternative. Mechanical thinning in 140 acres of 5D under alternatives A, C and E and 130 acres under alternative D would reduce these stands to a 5M condition. Unique prescriptions associated with each alternative more fully identify the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 inch or 24 inch DBH trees and would maintain a 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inch DBH and maintaining 40-50 percent CC in 5M and 5D stands.

The majority of group selection treatments proposed under alternatives A and E would be located outside of CWHR 5M and 5D stands (88 percent under alternative A, 81 percent under alternative E). However, a small percentage of GS acres would fall within size and density class 5M stands considered suitable for nesting owls. No 5D habitat is proposed for GS. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. All acreage treated with GS would be reduced to a SMC 1 condition, which is considered unsuitable for spotted owl nesting or foraging. GS treatments in all CWHR types would specifically target areas dominated by uniformly sized, smaller white fir and that have significant amounts of small down logs or standing small deadwood.

Group selection treatments, as proposed under alternatives A and E, would create early seral stages and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The treatment would not result in areas that prevent access to adjoining suitable habitat. By design, group selections make up approximately 11.4 percent of any given stand. The small size of the groups (0.5 acre to 2 acres) would not preclude owls from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in group selection units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is anticipated that the majority of snags would be felled, and very few snags would be left in the 284 acres of group selection under alternatives A and the 326 acres of group selection under alternative E.

Improving forest health is one of the objectives of the Keddie Ridge Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal in mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that owls seek to control exposure and changes in ambient temperature for roosting. Biomass removal can degrade or remove hiding cover in the lower and mid canopy often used by young of the year owlets. On average, the following percentage of stand biomass would be retained in mechanical thin units: under alternatives A and E 27 to 30 percent in CWHR size class 4 and 17 to 22 percent in CWHR size class 5. Alternatives C and D would retain, on average, more biomass in these same units; 41 to 48 percent in CWHR size class 4 and 34 to 44 percent in CWHR size class 5.

Irwin and Rock (Irwin and Rock 2004) found that the probability of stand use by spotted owl increased strongly as basal area rose from 80 to 320 square feet per acre (optimum range is between 160 and 320 square feet per acre) and was positively influenced by the number of trees per acre that were greater than 26 inches DBH. With implementation of mechanical thinning under alternatives A and E the residual basal area in CWHR size class 4 would average 141 to 143 square feet per acre and 163 to 167 in CWHR size class 5. Under alternatives C and D, mechanical thin units in CWHR size class 4 would average 166 to 184 square feet per acre and CWHR size class 5 stands would average 196 to 201 square feet per acre.

Eight of the 15 HRCAs in the analysis area would be affected by proposed treatments under all alternatives (Table 60). Two alternatives, A and E, would decrease existing suitable acres in four HRCAs as a result of implementation of DFPZ and group selection (GS) treatments. Estimated HRCA GS would occur in 4M or 4D stands with the exception being alternative E, which would treat 2 acres of 5M in PL165 and 23 acres of 5M in PL254. Alternative C would decrease existing suitable foraging acres in two HRCAs as a result of thinning 12 inch DBH or below trees to an open cover (4P) condition. HRCA acres treated under alternative. HRCA acres treated under alternative D would retain sufficient size trees and canopy closure to result in no change to existing CWHR size and density classes. No group selection would occur under alternatives C and D.

Table 60. Summary of Existing Conditions and Treatment Effects to Spotted Owl HRCAs

HRCA	Total HRCA acres	Existing suitable acres	Total treated acres	Acres reduced to unsuitable (% reduction)			Estimated group select acres	
				Alt A	Alt C	Alt E	Alt A	Alt E
PL084	717	650 (91%)	27					
PL129	609	580 (95%)	13	5 (1%)		5 (1%)	1	1
PL130	746	662 (89%)	337					
PL165	449	385 (86%)	103	24 (6%)		42 (11%)	6	8
PL202	664	632 (95%)	8					
PL210	684	600 (88%)	178	93 (16%)	61 (5%)	90 (15%)	10	10
PL254	679	475 (70%)	230	6 (1%)	5 (1%)	37 (8%)	1	25
PL283	726	664 (92%)	1					

Several studies provide insight into spatial availability of habitat for California spotted owls (Hunter et al. 1995, Bingham and Noon 1997, Meyer et al. 1998, Franklin et al. 2000, Blakesley 2003, Zabel et al. 2003). Blakesley (2003) states that occupancy, apparent survival, and nesting success all increased with increasing amounts of old-forest characteristics, and reproductive output decreased with increasing amount of nonhabitat within a 500 acre area surrounding nest sites. Blakesley's data indicates that 71 percent suitable habitat within this nest area should be a minimum management target (Blakesley 2005). These studies suggest that effects outside of the PAC (on another 200 acres) may influence a site's "quality" for spotted owls. Based on these studies, it could be assumed that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area.

Using GIS, a 500-acre nest core area for each spotted owl activity center was created. Existing suitable habitat was added to each circle, along with all proposed Keddie Ridge Project treatments. Of the sixteen 500-acre nest cores within the analysis area, only 5 have acreage that will be treated under each alternative. Table 61 (column 2) summarizes the existing condition within these five nest cores. PL241 is the only nest core affected that currently exists at 70 percent suitable habitat, which is just below the minimum management target of 71 percent stated by Blakesley (2005). The 28 acres in this nest core is proposed for hand thin, pile, and burn treatment, which will not reduce suitability in these acres. As Table 61 shows, the remaining four nest cores contain 80-100 percent suitable acres.

Table 59summarizes the effects to suitable CWHR 4M, 4D, 5M, and 5D within the five CSO territories that would be affected by treatments. Total proposed acres of treatment within each nest core is as follows: PL084—99 acres, PL130—16 acres, PL165—21 acres, PL170—38 acres, PL241—28 acres. Under alternative A, based on planned DFPZ treatments in CWHR 4M that would mechanically thin to 30-40 percent canopy closure, 13 acres within PL084 nest core and 2 acres within PL170 nest core would be reduced post-project to an unsuitable condition (CWHR 4P). Under alternative E, based on similar proposed fuel treatments that would remove trees up to 30 inches DBH and create more open canopy conditions unsuitable to the owl, acres in the following nest cores would be reduced to unsuitable : PL084—13 acres of 4M reduced to 4P, PL165—18 acres of 4D reduced to 4P, PL170—2 acres of 4M reduced to 4P. PL084 and PL165 nest cores include portions of two Keddie Ridge DFPZ units where group selection (GS) is proposed under alternatives A and E. The precise acreage and location of group selections in each of these units (42, 81) would be determined in the field b project foresters considering topography, vegetation type, and proximity of resources of concern. An estimated 1.5 acres of group selection in each of these two nest core areas could occur, resulting in additional unsuitable acres from those stated above and displayed in Table 61. Under alternatives A and E PL084 nest core could have 1.5 acres in CHWR 4M reduced by GS and PL165 nest core could have 1.5 acres in CWHR 4D reduced by GS. The percent reduction of suitable acres in these three nest cores is as follows: PL084 – 3 percent, PL165 (alternative E only) – 4.3 percent, PL170 – less than 1 percent.

Table 61. Summary of Existing Condition of 500-Acre Nest Cores Affected by Proposed DFPZ and Area Thinning Treatments and Project's Effects to Suitable CWHR

PAC	Existing suitable nest core acres	Effects to CWHR size/density	Treated acres			Proposed treatment prescription*			
			Alt A	Alt C/E	Alt D	Alt A	Alt C	Alt D	Alt E
PL 084	425 (80%)	4M → 4P	13	13	0	Rx4	Rx8	no acres	Rx13
		4M unchanged	78	78	92	low to moderate underburn			
		4D unchanged	7	7	7	low to moderate underburn			
PL 130	476 (95%)	4M unchanged	2	2	2	masticate brush and trees <10" DBH			
		4D unchanged	14	14	14	masticate brush and trees <10" DBH			
PL 165	421(83%)	4D → 4P	0	18	0	no acres	Rx8	no acres	Rx13
		4D → 4M	18	0	18	Rx3	no acres	Rx9	no acres
		4D unchanged	3	3	3	masticate	handthin	handthin	handthin
PL 170	500(100%)	4M → 4P	2	2	0	Rx2	Rx8	no acres	Rx13
		4M unchanged	29	29	31	masticate brush and trees <10" DBH			
		5M unchanged	7	7	7	masticate brush and trees <10" DBH			
PL 241	348(70%)	4M unchanged	28	28	28	handthin, pile, and burn trees <8" DBH			

*Rx2: Thin to 30-40% CC, 30" UDL , Rx3: Thin to 40% CC, 24"UDL, Rx4: Thin to 30-40% CC, 24" UDL, Rx8: Thin to 12" UDL 30-50% CC, Rx9:Thin to 20" UDL, 50% CC, Leave 15% of the stand untreated, Rx13: Thin to 30-40% CC, 30" UDL

DFPZ, area thinning, and group selection treatments under all alternatives would not reduce CWHR 5M and 5D to an unsuitable state. The only CWHR size class 5 in the affected nest cores is 7 acres of 5M in PL170. Under all action alternatives, these acres are proposed for mastication treatment of trees less than 10 inches DBH, resulting in no change to CWHR.

By quantifying the habitat changes within the home range as a result of project actions, a risk assessment based on habitat needs as outlined by Verner et al. (1992) and Blakesley (2003) among others, can be completed. This method or derivatives of this method have been used for over a decade to predict potential effects and the subsequent risk of implementing vegetation management projects. While there is a large amount of data on habitat suitability with regard to spotted owls, there have been no comprehensive studies on the impacts of vegetation management activities on reproductive success, impacts to prey, and long-term viability at the landscape level within a managed landscape. Specifically, although a risk assessment can be made when projects reduce habitat within a territory below a given threshold, no data exists that permit a reasoned prediction of impacts that vegetation management activities may have when the amount of suitable habitat remains above a given threshold.

The size of the home range selected for this analysis is reflective of breeding home range sizes elsewhere in the Sierra bioregion for mixed conifer forests. While a specific home range size is not discussed per se within the 2004 Record of Decision on the SNFPA Final Supplemental EIS, the Record of Decision does reference an analysis-size circle of 1.5 miles in diameter around the activity center, which equates to approximately 4,500 acres. Home range sizes for the California spotted owl are reported to vary between 3,000 acres (Call et al. 1992, Verner et al. 1992)for breeding pairs to as much as 12,500 acres (Verner et al. 1992) for non-breeding pairs on the east slopes of the Cascade Range. This analysis uses findings from Verner et al. (1992) and SNFPA guidelines (USDA 2004b) in delineating spotted owl home ranges as a circle of approximately 4,500 acres (1.5 mile radius) surrounding the territorial site.

Table 62 shows the amount of suitable habitat and effects of treatment in each territorial home range potentially affected by the Keddie Ridge Project. Thirteen 1.5 mile radius home ranges would have acres treated under this project. Following implementation, all but two (PL102 and PL254) would contain above 30 percent suitable habitat within the 4,500-acre home range, which is the minimum threshold recommended by Bart (1995). The pre-existing suitable home range condition for PL102 is 26 percent and for PL254 it is 20 percent. DFPZ and group selection treatments under alternatives A and E within these two home ranges would change 3 percent of acres in PL102 and 1 percent-10 percent of acres in PL254 to an unsuitable state. Overall, the remaining suitable spotted owl habitat home range percentage for these two territories would only be reduced by 1-2 percent over pre-project levels. The vegetation map used for this analysis indicates these two home ranges include a significant amount of private forested land, which may provide additional suitable acres (as much as 61 percent more for PL102 and 48 percent more for PL254). The home range for PL165 would exist post-project at close to the 30 percent threshold. A large portion of this territory also falls on private forested land, which may provide additional suitable acres (+32 percent).The average percent reduction in suitable habitat for all 4500-acre home ranges is 3 percent for alternative A and 6 percent for alternative E. Treatments under alternatives C and D would not reduce any home range acres to unsuitable.

Table 62. Summary of Existing Conditions and Treatment Effects on CSO Home Ranges in the Wildlife Analysis Area

PAC	Existing suitable Forest System acres	CWHR 4M/4D acres reduced to unsuitable			CWHR density class D reduced to class M				% suitable post project (% acres reduced from existing)	
		Alt A	Alt C	Alt E	Alt A	Alt C	Alt D	Alt E	Alt A	Alt E
PL084	2669 (59%)	263	152	336					53% (10)	52% (13)
PL102	1185 (26%)	36		36					25% (3)	25% (3)
PL129	2427 (54%)	166		178		1	1	1	50% (7)	50% (7)
PL130	3527 (78%)			156					78% (0)	75% (4)
PL131	2776 (61%)			111					61% (0)	59% (4)
PL165	1561 (35%)	90		141		105	95	61	33% (6)	31% (9)
PL170	3768 (83%)	155		200		1	1	1	80% (4)	79% (5)
PL202	2190 (48%)	61		67					47% (3)	47% (3)
PL210	2709 (60%)	321	78	439	10	43	43	12	53% (12)	50% (16)
PL241	2425 (54%)			46					54% (0)	53% (2)
PL254	924 (20%)	8		97	25	33	33	25	20% (1)	18% (10)
PL283	3822 (85%)			50					85% (0)	83% (1)
PL350	2222 (49%)	29		44					49% (1)	48% (2)

Cumulative Effects Common to Old-forest Species, including the California Spotted Owl

The analysis of cumulative effects of the proposed project evaluates its anticipated impact on Threatened, Endangered, and Sensitive species and Management Indicator Species (MIS) and compares those effects to the existing condition (the existing condition reflected by changes that have occurred in the past) within the 115,185 acre wildlife analysis area. Past actions in the area include timber harvest, wildfires, recreation use, wildlife habitat improvement, grazing, and mining. Past timber harvesting on National Forest and private land, together with wildfires, have created a mix of vegetation types and age classes across the wildlife analysis area that has shaped the distribution of old-forest and early seral wildlife species, as reflected by the existing vegetative condition.

The past management history of the Keddie Ridge Project area has strongly influenced stand structure, species composition, fuels, and potential fire behavior at both stand and landscape levels. Fire exclusion and extensive drought-related mortality has created relatively homogeneous areas typified by small even-aged trees existing at high densities. High-density stands are more susceptible to density-dependent mortality driven by drought and insect and disease infestations. Despite many past salvage treatments to remove drought-related mortality, much of this material has fallen over in the last 17 years and become dead and down fuel with high fuel loadings. The high densities of small trees and high fuel loads contribute to continued accumulation of surface, ladder, and canopy fuels, and this accumulation increases the potential for stand-replacing high-severity fire events.

Timber harvest and related activities on NFS lands from 1980 to 2010 affected approximately 27,120 acres in the 115,185 acre wildlife analysis area (approximately 17 percent). Various silvicultural prescriptions were employed, including regeneration (clearcut), selection cut, overstory removal, sanitation cut, commercial thinning, and sanitation salvage (appendix F, table F-1).The majority of these acres were not subject to any harvesting).Site preparation for planting, pre-commercial thinning, and underburning were also part of the timber harvest activities (appendix F). Many of these harvest activities (clearcut, overstory removal, thinning) have resulted in either loss of suitable habitat (stands taken below 40 percent canopy cover) or reduction in habitat value through reductions in canopy cover and removal of stand decadence. These past actions resulted in reduced canopies and simplified overstory and understory structure within treated stands, which could have increased overall habitat diversity at the landscape level at the time of implementation. In summary, the timber/fuels/vegetation projects in the wildlife analysis area focused on even-aged (clearcut, overstory removal) forestry in the 1970s and 1980s, then switched to sanitation and single tree selection, and then to commercial thinning and fuels reduction in the 1990s. This change in focus, brought on by changes in management guidelines (USDA 1988, 1993a, 2001b, 2004b) has created habitat conditions that support the wildlife populations currently present in the wildlife analysis area.

Private land logging activities in the wildlife analysis area that have occurred since 1997 include 550 acres of shelterwood removal; 1,133 acres of commercial thinning; 15,908 acres of selection cut; 1,655 acres of salvage; and 320 acres of clearcutting (Appendix F, table F-2). Approximately 307 of the 320 acres of clearcut harvest activity occurred in 1997, while the selection harvesting (similar to an overstory removal cut) has been occurring consistently almost every year. Clearcuts created early seral habitat and will remain as early seral (grass/forb/brush/ seedling-sapling) for at least the next 10–20 years. After year 20, conifers may start to dominate the vegetative cover, and by year 50, should be classified as size class 3 trees (6–11 inches DBH). With brush control and release activities, which would be commonplace on private lands, trees could attain this size class earlier than 50 years. Selection harvest usually results in opening up the stand while maintaining forested cover, providing for an uneven-sized stand with scattered brush understory throughout. Thus, past management actions on private lands have provided for an uneven-aged continuous forest cover across the private land landscape.

There have been approximately 11,486 acres of wildfires in the wildlife analysis area since 1979. These fires have ranged in size from 17 acres up to 7,048 acres (which was the Moonlight Fire in 2007). These wildland fires burned at high intensity and created large, monotypic openings of early seral brush habitat within the forest that contribute to large-scale fragmentation of continuous forest cover. Specifically, the Moonlight Fire burned within 4,493 acres of suitable habitat, reducing 3,756 acres to an unsuitable state (CWHR 4P or SMC 1). Much of the areas that experienced wildfires in the analysis area are currently occupied by conifer plantation, montane chaparral, and hardwood forest. Brush fields within and between the plantations support very decadent, impenetrable brush. Large brush fields created by wildfire are used extensively by early seral and midseral wildlife species but not used by species requiring old forest and continuous forest conifer cover. Approximately 2,332 acres of under burning for fuel reduction have been conducted within the wildlife analysis area since 1980, resulting in reduced levels of down slash, increased grass/forb growth and regenerated younger age class of brush species.

Since 2001, it is estimated that approximately 20 percent of the commercial woodcutting permits issued for the Mt. Hough Ranger District occurred in the Keddie Ridge Project area, amounting to approximately 9,278 cords of wood. Commercial woodcutting in the past usually consisted of cutting on and removing existing cull decks, which are manmade habitat features on the landscape used by various mammalian species (including mesocarnivores) for cover and den sites. The removal of these features reduces down woody component availability for owl prey species. It is estimated that, since 2001, approximately 25 percent of the Christmas tree permits issued for the Mt. Hough Ranger District occurred in the Keddie Ridge Project area, amounting to approximately 4,949 permits.

The Personal Use Firewood Program on the Plumas National Forest is an ongoing program that has been in existence for years. This program allows the public to purchase a woodcutting permit and remove fuel and firewood from National Forest System lands. A 9-year average (2001–2009) for the Mt. Hough Ranger District indicates that 2,525 permits were issued annually, resulting in the average annual sale of 5,049 cords of wood on the district. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Keddie Ridge Project area is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape, negatively affecting those species dependent on such structures. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss in the analysis area; snag and log removal is required within a short distance from open roads when these structures pose a safety hazard.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Present and ongoing projects occurring in the boundary of the Keddie Ridge wildlife analysis area include the Maidu Stewardship Project, Canyon Dam Fuel Reduction and Forest Health Project, Empire Vegetation Management Project, Moonlight Fire Recovery and Restoration Project, Plumas Fire Safe Council Projects, and Natural Resource Conservation Service (NRCS) Projects.

Maidu Stewardship Project—Project treatments include: approximately 550 acres of commercial and non-commercial thinning to improve Oak habitat; 405 acres of commercial and non-commercial thinning to reduce hazardous fuels, approximately 325 acres of enhancing habitat for culturally important plants. Treatments were initiated in 2006 and are expected to continue through 2016.

Canyon Dam Fuel Reduction and Forest Health Project—Project treatments include: approximately 147 acres of hand thinning, piling, and burning was initiated in fall of 2010 and will be completed over 3 to 5 years. In addition, 488 of mechanical thinning and will be initiated in 2011 and completed over 3 to 5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3 to 5 years.

Empire Vegetation Management Project—Project treatments include: approximately 121 acres of group selection timber harvest; 430 acres of DFPZ mechanical thinning; 133 acres of Individual Tree Selection (ITS) mechanical thinning; and 144 acres of mastication. These treatments will be initiated in fall 2010 and would be completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.

Moonlight Fire Recovery and Restoration Project—Approximately 7,048 acres of the fire burned within the analysis area. Project treatments include: approximately 330 acres of post-fire roadside hazard tree removal and 70 acres of post-fire salvage harvest. These treatments are ongoing and anticipated to be complete by the end of 2010.

Plumas Fire Safe Council Projects—These projects are located on private lands surrounding homes and are currently being implemented by the Plumas Fire Safe Council. Project treatments include approximately 294 acres of a combination of hand thinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Natural Resource Conservations Service (NRCS) Projects—These projects are located on private lands and are currently being implemented by Natural Resource Conservation Service (NRCS). Project treatments include approximately, 1,960 acres of a combination of hand thinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Two of these ongoing projects, Canyon Dam and Empire, would result in some reduction of suitable CWHR 4M, 4D, 5M, and 5D stands. Based on the BA/BE completed for these projects (USDA 2006, 2007a) the net reduction of suitable habitat after treatment within the Keddie Ridge Project analysis area is presented in Table 63.

Table 63. Empire Project and Canyon Dam Project Treatment (Tx) Effects on Old-Forest Suitable CWHR in the Wildlife Analysis Area

Empire Project						Canyon Dam Project	
DFPZ Tx effects		ITS Tx effects		GS Tx effects		Mech. Thin effects	
	acres		acres		acres		acres
4M–4P	155	**4D–4M**	161	**4M–SMC 1**	44	**4D–4M**	90
4D–4P	228	**5D–5M**	3	**4D–SMC 1**	47	**5D–5M**	200
5M–5P	24			**5M–SMC 1**	19	**4M–4P**	75
Total	407		164		110		365

Therefore, the Empire Project would reduce 517 acres of suitable habitat to an unsuitable state (CWHR 4P or MCP) following DFPZ and GS treatments. Canyon Dam would reduce 75 acres to unsuitable state following mechanical thinning treatments. The acres shown in Table 63, when pooled with the acres presented in Table 59 showing CWHR change after implementation of the Keddie Ridge Project alternatives, provides the total expected cumulative CWHR change in size-density class 4M, 4D, 5M, 5D.

The Empire and Canyon Dam projects would affect three spotted owl territories – PL170, PL202, and PL350 but no PAC acres would be treated. Fourteen acres of suitable habitat (4M/4D-10 acres, 5M-4 acres) in the HRCA for PL170 would be reduced to unsuitable following GS treatment under the Empire

Project. The 500-acre core area for PL170 would also see a slight reduction in suitable habitat – 8 acres of 4M reduced to SMC 1. The 1000-acre home range for all three territories would experience a reduction of suitable habitat from these projects. The Empire Project would reduce 254 acres of habitat in the home range of PL170 to unsuitable (227 acres in 4M, 27 acres in 5M) and 24 acres of habitat in the home range of PL202 to unsuitable (21 acres in 4M/4D, 3 acres in 5M). The Canyon Dam Project would reduce 26 acres of 4M habitat in the home range of PL350 to a 4P (unsuitable) state.

The only future foreseeable project that would potentially affect old forest habitat in the wildlife analysis area is the Belden HFQLG Project. Project Treatments include: Approximately 605 acres of Defensible Fuel Profile Zone treatments, 105 acres of Area thinning treatments, and potentially 81 acres of group selection. The exact amount, location, and design criteria for these treatments have yet to be determined but, based on past HFQLG project effects, there is expected to be a cumulative effect to some CWHR 4M, 4D,5M, and 5D stands (i.e. reduction to unsuitable or more open canopy conditions) following implementation of this project.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in northern spotted owls, through both hybridization as well as replacing the spotted owl in some areas. It is thought that this range expansion and subsequent northern spotted owl displacement can be a result of forest fragmentation and the barred owl's ability to adapt better to a mosaic of habitats. It is suspected that barred owl expansion into the range of the California spotted owl is occurring due to these same reasons.

Barred owls have expanded their range in California as far south as Sequoia National Park, and in recent years the known range of barred owls has expanded 200 miles southward in the Sierras (USDI 2006). The U.S. Fish and Wildlife Service has concluded that barred owls constitute a threat to site occupancy, reproduction, and survival of the California spotted owl, but that there is currently not enough information to conclude that hybridization with barred owls poses a threat (ibid.).

According to the most recent annual report of the Plumas-Lassen Administrative Study (Keane 2010) based on historical and current occurrence records, there have been a minimum total of 53 individual barred owl records across the Sierra Nevada. This includes a minimum total of 19 records in the PLS study area, a portion of which is located in the Keddie Ridge wildlife analysis area. The pattern of records suggest that barred owls have been increasing in the northern Sierra Nevada between 1989-2009 and are now present in low, stable numbers in the PLS study area. No barred owl detections have occurred within the wildlife analysis area.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the spotted owl or existing spotted owl habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit the owls, as the increased decadence would have a positive effect on prey base numbers and overall habitat values.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn and would result in higher severity effects to vegetation and habitat. Increased rates of spread would result in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable habitat for productive owl sites as a result of fire could become patchy or unevenly distributed, and the abundance of owls in the wildlife analysis area could decline.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of spotted owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA Final EIS 2001) which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.

Northern Goshawk

All Action Alternatives (A, C, D, and E)

Direct Effects

The analysis of direct effects on northern goshawk is focused on known PACs up to and including the 2005 surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the "Indirect Effects" section below. No direct effects on northern goshawk are expected because of the following factors:

- Goshawk PACs would not be entered for the Keddie Ridge Project. Currently, there are 8 goshawk PACs (2,149 acres) in the Wildlife analysis area. Five goshawk PACs overlap with spotted owl PAC habitat (goshawk nesting habitat requirements are similar to California spotted owl nesting and foraging requirements [(USDA 1999a), page 3-106]).
- Limited Operating Periods (LOPs) would be implemented which would not allow treatment activities and use of haul roads within 0.25 mile of active nest sites from February 15 to September 15. The LOPs are expected to eliminate effects from increased human activity and vehicle and equipment noise. If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, PACs would be delineated and applicable resource protection measures (such as LOPs) would be applied.
- No new road construction would occur in northern goshawk PACs. For any road reconstruction in PACs, a LOP would be applied to all goshawk activity centers.

The analysis of direct effects is based on data gathered during the 2005 survey. Surveys were repeated in 2006 to complete the two-year survey effort. The proposed treatments could occur in late summer 2011 and continue an additional 5 years. There is the potential that goshawks could establish new territories (activity centers) during project implementation that would not be protected as PACs.

Indirect Effects

Based on the vegetation map and CWHR model, about 40,935 acres of National Forest System lands in the wildlife analysis provide high nesting capability for the northern goshawk (CWHR size/density classes 4M,4D,5M,5D), and an additional 400 National Forest System acres provide moderate nesting capability (Eastside pine 4M,4D,5M,5D, red fir 4M,4D)(Table 59). The total acres of suitable goshawk habitat in the wildlife analysis area that would remain after implementation of each action alternative is basically the same as presented in Table 61above, with the exception that this table includes an additional 34 acres of red fir 5M and 5D, which is not considered suitable goshawk habitat. The post-project CWHR changes summarized in Table 59 are based on the silviculture prescription assigned to each CWHR stand within treatment units (refer to chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable goshawk nesting habitat in CWHR size/density classes 4M and 4D as a result of implementing project activities would occur under all action alternatives. Approximately 3,065 acres of 4M and 4D habitat is proposed for treatment under each alternative. Prescriptions that would result in 4M and 4D stands reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units and all group selection units in alternatives A and E. Alternative A would reduce 818 acres of 4M/4D stands to a 4P state (256 acres from 4D, 562 acres from 4M). Group selection treatments under alternative A would reduce an additional 234 acres to a SMC 1 condition (approximately 82 acres from 4D and 152 acres from 4M). Alternative E would reduce 1,082 4M/4D acres to a 4P state (361 acres from 4D, 721 acres from 4M). Group selection treatments under alternative E would reduce an additional 306 acres to an SMC 1 condition (approximately 85 acres from 4D and 158 acres from 4M). Alternative C would reduce approximately 234 acres of 4M to a 4P state thru thinning 12 inches DBH or smaller trees and creating open (below 40 percent) canopy cover conditions. No stands treated under alternative D would be reduced to an unsuitable state.

The amount of 4D stands reduced to a 4M condition (i.e. canopy closure after treatment would be 40-60 percent) under each alternative would be as follows—alternative A-233 acres, alternatives C and D-553 acres, and alternative E-125 acres.

Under all alternatives, the majority of DFPZ and area thinning treatments applied to CWHR 4M and 4D stands would result in no change to CWHR size class or canopy closure (CC). Of the approximate 3,065 acres of 4M and 4D habitat proposed for treatment, 92 percent and 100 percent under alternatives C and D, respectively, would continue to provide suitable foraging conditions for the northern goshawk. No group selection would occur under these two alternatives and treatments such as light thinning, mastication, hand-thinning, underburning would maintain these stands in a suitable CWHR state. Alternative A and alternative E, which would implement group selection and heavier DFPZ treatments, would maintain 66 percent and 57 percent, respectively, of treated 4M and 4D acres in a suitable condition.

Suitable nesting habitat in CWHR size/density classes 5M and 5D proposed for treatment under all alternatives, with the exception of group selection units, is expected to remain suitable for the goshawk (i.e., no change or reduced to 5M). Approximately 1,303 acres of 5M and 5D is proposed for treatment under each action alternative. Mechanical thinning in 140 acres of 5D, under alternatives A, C, and E, would reduce these stands to a 5M condition. Mechanical treatments under alternative D would reduce 130 acres of 5D to 5M. As stated above under spotted owl effects, a small percentage of GS acres would fall within size and density class 5M stands considered highly suitable for nesting goshawks. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. Unique prescriptions associated with each alternative more fully identifies the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 or 24 inch DBH trees and would maintain a 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inches DBH and maintaining 40-50 percent CC in 5M and 5D stands.

Improving forest health is one of the objectives of the Keddie Ridge Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal within mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that goshawks seek to control exposure and changes in ambient temperature for roosting. On average, the following percentage of stand biomass would be retained in mechanical thin units: under alternatives A and E 27 to 30 percent in CWHR size class 4 and 17 to 22 percent in CWHR size class 5. Alternatives C and D would retain, on average, more biomass in these same units; 41 to 48 percent in CWHR size class 4 and 34-44 percent in CWHR size class 5.

Group selection treatments, as proposed under alternatives A and E, would create early seral stages and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The treatment would not result in areas that prevent access to adjoining suitable habitat. By design, group selections make up approximately 11.4 percent of any given stand. The small size of the groups (0.5 acre to 2 acres) would not preclude goshawks from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in Group Selection Units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is likely that the majority of snags would be felled, and very few snags would be left in the 284 acres of group selection under alternatives A and the 326 acres of group selection under alternative E

The 6.8 miles of new temporary non-system roads proposed to be constructed for the Keddie Ridge Project would be decommissioned upon project completion. Thus, no long-term increases in human activities are expected as a result of the action alternatives. No roads would be constructed in PACs.

It is an unknown as to how some of the important prey species (small mammals, birds) preferred by goshawks would respond to opening up forested stands with fuel treatments and group selection units. Based on CWHR modeling, it is known that several bird species respond favorably to either opening up forested stands and/or openings, while some do not (USDA 1999a, appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. The response of prey species, including small mammals and passerine bird use of group openings, is one of the main objectives of the HFQLG post-implementation monitoring that would be conducted by the Pacific Southwest Research Station through the Plumas-Lassen Administrative Study.

Cumulative Effects

Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the means by which land managers control them, have contributed and may continue to contribute to loss of habitat for this species.

Refer to the cumulative effects discussion above for the California spotted owl, as well as cumulative effects discussed in the Keddie Ridge Project BA/BE. Cumulative effects discussion focused on past, present, and future actions as they relate to impacts on suitable owl habitat, more specifically CWHR size/density classes 4M, 4D,5M, and 5D. These same CWHR types are considered to provide suitable goshawk nesting habitat. It is not anticipated that the cumulative habitat reduction would result in loss of occupancy and productivity of known goshawk PACs. This is based on the location of project activities in relation to known PACs, no habitat alteration in PACs, distribution of known PACs, and a minimum of 95 percent retention of available suitable nesting habitat distributed across the wildlife analysis area following project implementation.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the northern goshawk or existing goshawk habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit the goshawks, as the increased decadence would have a positive effect on prey base numbers and overall habitat values.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn which may result in higher severity effects to forested habitats. Increased rates of spread would result in potential loss of suitable goshawk nesting habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable habitat for productive goshawk sites as a result of fire could become patchy or unevenly distributed, and the abundance of goshawks in the wildlife analysis area could decline.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of northern goshawk habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-severity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA final EIS (USDA 2001a), which could lead to lower goshawk abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Mesocarnivores

All Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area. The indirect effects section below discusses potential effects to existing suitable mesocarnivore habitat as a result of implementing Keddie Ridge Project activities.

Indirect Effects

Refer to the indirect effects discussion for the spotted owl for changes to suitable mesocarnivore habitat (CWHR size-density classes 4M, 4D, 5M, and 5D) as a result of implementing fuel treatments, group selection harvests, and area thinning under each action alternative. The number of denning and foraging habitat acres that could be reduced by each alternative is discussed below.

Table 64 summarizes the project effects to denning and foraging habitat for the fisher. As Table 64 shows, alternatives A and E, due to the heavier DFPZ treatments and group selections proposed, would reduce some acres to an unsuitable state (CWHR 4P or SMC 1). Alternative C, as a result of thinning some stands to below 40 percent canopy cover to meet fuel objectives, would reduce approximately 234 acres to an unsuitable (4P) condition. Alternatives C and D would reduce 684 acres and 693 acres, respectively, of denning habitat to a 5M or 4M state. Acres of 4D/5D reduced to 4M/5M under all action alternatives would be considered suitable foraging habitat for the fisher.

Table 64. Keddie Ridge Project Effects to Fisher Denning and Foraging Habitat

	Denning Habitat acres (CWHR 4D/5D)					Foraging Habitat acres (CWHR 4M/5M)		
	5D→5M	4D→4M	4D→4P	GS*→MCP	Total	4M→4P	GS*→MCP	Total
Alt A	140	65	345	82 (4D only)	**615**	562	186 (4M-152, 5M-34)	**808**
Alt C	131	553	0	no GS	**684**	0	no GS	**0**
Alt D	140	553	0	no GS	**693**	0	no GS	**0**
Alt E	140	129	373	85 (4D only)	**717**	721	218 (4M-158, 5M-60)	**954**

*approximation of GS acres only - exact location and acreage yet to be determined. Group selections would primarily be located in size class 4 stands.

In summary, existing fisher denning habitat treated under alternatives A and E would be reduced by 4.6 percent and 5.3 percent respectively. Alternatives C and D would reduce denning habitat by 5 percent. After factoring in the CWHR density class D stands converted to density class M as a result of treatments (Table 64) alternatives A and E would result in a reduction of suitable foraging habitat by 1.3 percent and 2.4 percent respectively. Alternatives C and D would see an increase of approximately 693 foraging acres from existing conditions as a result of thinning treatments within 5D and 4D stands.

Of the CWHR types considered suitable for the American marten in the wildlife analysis area, only Sierra mixed conifer (SMC) habitat is proposed for treatment. Foraging habitat (SMC4M, SMC5M) proposed for treatment is 3,254 acres. Denning habitat (SMC4D, SMC5D) proposed for treatment is 799 acres. Table 65 summarized the project effects to suitable marten habitat. It is estimated that, under alternatives A and E, no group selection would occur within suitable marten denning habitat.

Table 65. Keddie Ridge Project Effects to Marten Denning and Foraging Habitat

	Denning Habitat acres (SMC 4D/5D)				Foraging Habitat acres (SMC 4M/5M)		
	5D→5M	4D→4M	4D→4P	Total	4M→4P	GS*→SMC 1	Total
Alt A	121	241	240	**602**	556	45 (4M-15, 5M-30)	**601**
Alt C	121	481	0	**602**	234	no GS	**234**
Alt D	111	481	0	**592**	0	no GS	**0**
Alt E	121	126	355	**602**	721	66 (4M-12, 5M-54)	**786**

*approximation of GS acres only - exact location and acreage yet to be determined.

In summary, existing marten denning habitat treated under all action alternatives would be reduced by 5 percent (592-602 acres). Existing marten foraging habitat treated under alternatives A, C, and E would see a reduction of 2 percent, 1 percent, and 3 percent respectively. Alternatives C and D would see an increase of approximately 368 and 592 foraging acres, respectively, from existing conditions as a result of thinning treatments within 5D and 4D stands.

Approximately 13,153 acres (3 percent) of the forest carnivore network are within the wildlife analysis area. The Keddie Ridge Project proposes to treat 134 acres of this network. Hand thin/pile/and burn, mastication, or prescribed fire treatments would fall within 115 network acres (85 percent), resulting in little to no change to existing suitable carnivore habitat. Approximately 19 acres of the carnivore network would be mechanically thinned under all alternatives. Alternatives A and E would reduce 3 acres of SMC4M habitat to a 4P state. All action alternatives would treat less than 1 acre of SMC5D that would result in a 5M condition. No group selection acres are proposed in the carnivore network. In summary, the Keddie Ridge Project's effects on the forest carnivore network would be negligible, due to the small amount of acreage proposed for treatment and little to no change to existing suitable habitat post project.

All new roads that would be constructed in support of the Keddie Ridge Project would be closed upon project completion, thus no long-term increases in human activities are expected. The open road density in the Keddie Ridge Project area would remain the same under all action alternatives (approximately 2.4 miles per square mile), which would still provide low habitat capability for forest mesocarnivores. With implementation of the proposed strategic system of DFPZs, the Keddie Ridge Project would help reduce understory fuel buildup and may reduce the potential for high-severity wildfires, which have a great potential to degrade vast tracts of habitat for the marten and fisher.

Cumulative Effects

Refer to the cumulative effects discussion above for the California spotted owl, as well as the cumulative effects discussed in the Keddie Ridge Project BA/BE. The cumulative effects on forest mesocarnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-severity stand-replacing fires, and the means by which land managers control them, have contributed, and may continue to contribute to loss of habitat for these species.

The action alternatives would not increase any large-scale, high-contrast fragmentation above existing levels. The cumulative effect of private land clearcuts and selective thinnings, older National Forest System land plantations, the large brush fields created by past wildfires, together with implementation of DFPZs and group selection (alternatives A and E only) under the Keddie Ridge Project would result in increased "patchwork" of open habitat and young age class vegetation between mature forested stands within the analysis area. This would increase edge effects and possibly increase potential risks to forest interior species movement and use in the wildlife analysis area. Thus the Keddie Ridge Project would act cumulatively with past actions to slightly reduce the connectivity of habitat within the wildlife analysis area, although connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high-severity fire. Connectivity of dense forest habitat (moderate and dense stands in size classes 4 and 5) is shown in Figure 12.

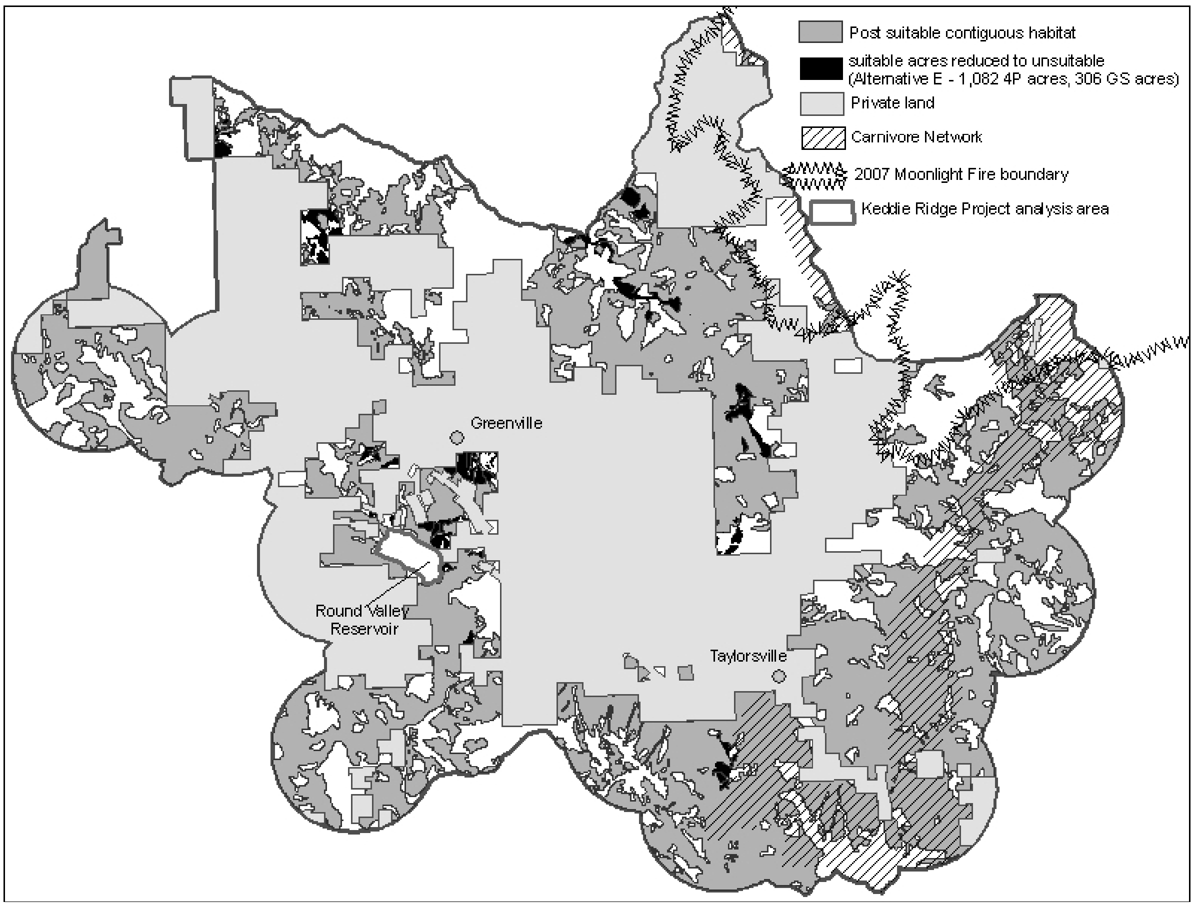


Figure 12. Mesocarnivore Contiguous Suitable Habitat Available (CWHR Size-Density Classes 4M, 4D, 5M, 5D) Following Implementation of the Keddie Ridge Project (Alternative E Effects Shown, Which is Maximum Area Reduced to Unsuitable Compared to All Alternatives)

Figure 12 shows 39 blocks of contiguous habitat ranging in size from 25 acres to 12,470 acres, with the average block size over 1,000 acres. Of all action alternatives, alternative E would have the largest effect on suitable carnivore habitat. Implementation of any of the action alternatives would result in little change to available contiguous suitable habitat.

Based on the direct and indirect effects, implementation of all action alternatives would contribute to cumulative effects on mesocarnivores and mesocarnivore habitat. Post-treatment amounts of suitable mesocarnivore habitat would provide similar numbers and size blocks of contiguous habitat as the existing condition. The reduction of 4.6-5.3 percent of suitable denning habitat and the reduction of 1.3-2.4 percent (alternatives A and E) of suitable foraging habitat for the fisher (table 59) would not cause any large-scale fragmentation of suitable habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternatives A and E would result in the highest risk of all alternatives to mesocarnivore habitat in the short-term and greatest uncertainty about future mesocarnivore activity.

Alternative C would reduce suitable foraging habitat by approximately 1 percent. Implementation of alternative D would not result in additional unsuitable habitat. Alternatives C and D would reduce a small percentage of denning habitat to a foraging condition as a result of treatments. Therefore, these alternatives would also present a level of risk to mesocarnivore habitat in the short-term and uncertainty about future mesocarnivore activity but this level of risk would be less than the alternatives A and E. Based on known detections of marten on the Plumas National Forest, no changes in marten occupancy or populations on the Forest would occur.

Determination

The Forest Service has determined that, for all action alternatives, the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the American marten or Pacific fisher.

Alternative B (No Action)

Direct Effects

There would be no direct effects on mesocarnivores or existing mesocarnivore habitat. No activities would occur that would cause disturbance to denning or foraging carnivores.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit mesocarnivores, as the increased decadence could provide higher quality denning areas, support larger carnivore prey populations, and provide safer movement corridors.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn. Increased rates of spread would result in potential loss of carnivore denning and foraging habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable carnivore habitat as a result of fire could become patchy or unevenly distributed, resulting in less desirable conditions for martens and fishers to become re-established in the wildlife analysis area.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of carnivore habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA final EIS (USDA 2001a), which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. Such displacement is usually temporary and seasonal. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the American marten or Pacific fisher.

Mountain Yellow-legged Frog

All Action Alternatives (A, C, D, and E)

Direct Effects

Potential direct effects from the Keddie Ridge Project include impacts to individual mountain yellow-legged frogs (MYLFs) during activities. Possible direct effects from the proposed actions on Forest Service R5 aquatic sensitive species include crushing of individuals if they are present during project activities. The use of a feller buncher within RHCAs has the potential of directly injuring or killing frogs. Although skyline logging is considered to have minimal ground disturbing effects, falling of trees can result in crushing, injuring, or killing of animals that occur where trees fall. The potential for direct impacts to individuals is greatest during wet periods and in early fall, when frogs are most likely to disperse from aquatic habitats.

A 3-year telemetry study conducted on the PNF found that MYLF have very limited movements into upland habitats or adjacent riparian areas (Wengert et al. 2006). The study concluded that off-stream channel movements were very rare and that in-stream movements within and up and down the wetted stream channel were common and frequent traits of MYLF behavior. Therefore, the Keddie Ridge Project design features and standard management requirements, which include RHCA equipment restriction zones, best management practices (BMPs) to prevent water quality degradation (appendix H) and riparian management objectives standards (appendix E) should provide adequate protection to minimize impacts to MYLFs (if present) within riparian or upland habitats. Potential direct effects are expected to be negligible to MYLFs due to the likelihood, based on survey results, that populations are not present in treatment areas.

Indirect Effects

Riparian habitats would be entered during DFPZ and area thinning treatments for the purpose of restoring, maintaining, or improving riparian habitat conditions. Treatments would include the removal of encroaching conifer vegetation (up to 20 inches in diameter) through mechanical means, hand thinning, mastication, and underburning. Group selection would avoid RHCAs. Approximately 1,279 acres of RHCAs would be entered for treatment under the action alternatives.

Table 66. Approximate RHCA Acres Proposed for Treatment

RHCA Prescription	RHCA acres treated by alternative			
	Alt A	Alt C	Alt D	Alt E
20" UDL*/50% CC	504		281	549
12" UDL/50% CC	45	550	155	
masticate <10" trees	155	133	133	133
underburn	308	308	308	308
HPB* <8" trees	267	288	363	288
Total RHCA acres	1279			

*UDL=upper diameter limit. *HPB=handthin, pile, and burn

"Equivalent Roaded Acres" (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one Equivalent Roaded Acre or ERA. The proposed fuel treatment and area thinning activities would increase ERA values in the subwatersheds where treatments would occur. Increases in ERA may lead to detrimental effects to MYLF stream habitat, including erosion from treated hillsides and increased delivery of sedimentation into streams. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover. Disturbances are often added together to determine a cumulative ERA for individual watersheds. This is discussed in the following cumulative effects section.

Equipment exclusion zones in RHCAs, based on existing RHCA buffer widths and slope class (Table 9), would lessen the extent of skid trail creation within RHCAs. Areas in which mechanical harvest activities would be allowed within RHCAs have the potential to increase the extent of disturbed, displaced, or compacted soils. Such soil conditions would have a potential adverse effect on watershed conditions by increasing sedimentation delivery into streams. Indirect effects due to skidding would likely not occur or would be minimal. Implementation of design criteria specific to skid trails in RHCAs (Table 9), Standard management requirements, and BMPs would help mitigate and prevent increased compaction, erosion, and sedimentation.

Prescribed fires would not affect canopy cover in RHCAs, but they could remove some ground cover. The implementation of standard protection measures (design criteria, SMRs, BMPs) would help minimize indirect effects on amphibians and reptile species. Burns occurring before the first soaking rains of the fall are least likely to directly affect amphibians because the frogs would be in the RHCAs at that time. Burns occurring during the spring would be more likely to cause direct effects on amphibians and reptiles, as individuals would be more likely to be moving outside the RHCAs at that time.

Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short-term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. In-channel large woody debris (LWD)(trees greater than 12 inches diameter) would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers and snag retention standards.

Table 7 states the design criteria for RHCA treatments under all action alternatives. The retention of 20-inch or larger trees (greater than or equal to 12 inches under alternative C), 50 percent or greater canopy cover, all hardwood and riparian species, and sufficient amounts of residual surface fuels (including large woody debris) within RHCAs would indirectly benefit MYLFs by maintaining suitable habitat values while creating riparian conditions that would be less susceptible to high-severity, stand-replacing fire. Large fires have the potential to create large-scale, high-contrast fragmentation across the landscape, which could remove suitable MYLF habitat, isolates habitat patches, and creates large openings that may prevent species occupancy, emigration, and immigration. The action alternatives would reduce the long-term threat of stand-replacing fires, which would offset their short-term minor effects (USDA 2003).

Herbicide Hazard Analysis

An herbicide is a pesticide that kills plants or inhibits their growth. To evaluate the effects of herbicides on wildlife, it is critical to consider several factors such as toxicity, exposure, dose, and the biology and behavior of species that could potentially be exposed to the herbicide. Toxicity is the potential a pesticide has for causing harm to a specific species or group of species.

Alternatives A and D propose to treat three noxious weed species (starthistle, Canada thistle, hoary cress) with herbicides. Two herbicides would be used: aminopyralid (i.e. Milestone® or an equivalent formulation) to treat dry and upland sites greater than 15 feet from the water's edge and the aquatic formulation of glyphosate (i.e. Accord™ or an equivalent formulation) for lowland treatments (between 0-15 feet from the water's edge). Aminopyralid would be applied to approximately 61.5 acres infested with Canada thistle and starthistle. A backpack sprayer would be used to spray upland infestations along roads, skid trails, and landings. Glyphosate would be applied to approximately 1 acre to control Canada thistle and hoary cress. A wick applicator (in riparian areas) or backpack sprayer (on roads and landings) would be used to selectively apply this herbicide. The following additives would likely be added to herbicide formulations to increase efficacy of treatments: non-ionic modified vegetable oil surfactant (i.e. Competitor® or an equivalent) and water soluble colorant [c] (i.e. Hi-Light™ Blue or an equivalent). The Keddie Ridge Project also proposes to apply a registered borax fungicide (i.e. Sporax or Cellu-treat) to pine stumps greater than 14 inches in diameter in units 45, 46, 49, and 50.

Wildlife may be exposed to herbicides if they are in the vicinity of contaminated surface waters or treated vegetation. The routes of exposure include oral, dermal, and inhalation. Oral exposures might occur through ingestion of contaminated food (such as insects) or water (small puddles during application) or incidental ingestion of contaminated plants during foraging or other activities. Dermal exposures are likely to be most important for burrowing mammals (through contact with contaminated soils) and animals that spend considerable amounts of time within ground vegetation.

Fish and invertebrate exposure rates are based on water contamination rates. Syracuse Environmental Research Associates, Inc. (SERA), under contract to the Forest Service, provides very few studies related to the effects of herbicides on amphibian species. There is extremely limited published data on the relationship of herbicides on mountain yellow-legged frogs. The risk to a variety of aquatic, amphibian, and reptilian species varies with the chemical(s), rate(s), timing, and other factors, which can vary by site condition (Syracuse Environmental Research Associates (SERA) 2003, 2007).

The Syracuse Environmental Research Associates, Inc. risk assessment worksheets for aminopyralid and glyphosate (ibid) evaluated toxicity, dose, and biology of a species and developed a “Hazard Quotient” for a number of scenarios. A hazard quotient is basically a mathematical calculation that is expressed numerically in terms of risk, where neutral risk is equal to 1, and the risk of toxicity increases as the value rises above 1 and decreases as the value drops below 1. For the application rates and application methods (backpack) proposed for noxious weeds under the Keddie Ridge Project, all hazard quotients for the two herbicides are below 1 for all terrestrial and aquatic vertebrate species and aquatic invertebrate species evaluated in the SERA worksheets. There is the potential for an herbicide spill into streams or other bodies of water directly affecting fish and aquatic invertebrates with the potential of a chronic exposure. A spill plan would be followed for herbicide application within the project area. The hazard quotient for wicking application is assumed to be even lower than the backpack sprayer application due to the more direct application and control.

Surfactants are used to facilitate or enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Competitor® is a non-ionic modified vegetable oil. The assessments of hazards related to surfactants is limited by the proprietary nature of the formulations. Surfactants, by their very nature, are intended to increase the effect of a pesticide by increasing the amount of pesticide that is in contact with the target. This is not synergistic, but more accurately a reflection of increased dose of the herbicide active ingredient into the plant. The “Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides” (Bakke 2003) sites technical references which indicate a lack of synergistic effects between surfactants and pesticides which suggest that surfactants don’t increase the toxic effects of herbicides. This paper also listed the results of standard acute aquatic species toxicity testing which indicated that any potential effects to aquatic species would be unlikely under normal application rates.

The colorant Hi-Light™ Blue will be added to the herbicide mixtures prior to the application so that the actual treated area can be readily determined. This helps to prevent skips and overlaps. Hi-Light™ Blue is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems. The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (Syracuse Environmental Research Associates (SERA) 1997).

Under alternatives A and D, in units 45,46,49, and 50, Borax (Sporax) would be applied to all cut stumps greater than 14 inches DBH. to minimize the susceptibility to *Heterobasidion* root disease. In the most recent risk assessment for Borax (SERA 2006), Boron, the agent of toxicological concern in Borax, was further evaluated. The focus of the evaluation was wildlife's direct consumption from the stump and ingestion of contaminated water. The assessment concluded that the use of Borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates.

There is little chance that either glyphosate or aminopyralid is expected to reach streams because of their limited transport mobility, relatively short half-lives, and application criteria, which takes into account the time of year, wind velocity, and period to the next rainfall). Application methods would be aimed specifically to individual noxious weed plants and not applied at a broadcast scale. No change in nontargeted plants and vegetative succession would occur as a result of herbicide application on noxious weeds. The noxious weeds proposed for treatment are highly unpalatable and are not consumed by herbivores, but seed-eating birds, such as goldfinches and pine siskins, could possibly feed on the seeds. In conclusion, no significant adverse wildlife effects associated with the herbicide application alternatives are expected.

Cumulative Effects

The following discussion on watershed conditions within the analysis area is drawn from the cumulative watershed assessment under the Hydrology and Soils section found in this DEIS chapter.

The area defined for the cumulative watershed assessment encompasses 12 sub-watersheds, which are contained in 10 HUC 6 watersheds, all of which contain varying degrees of suitable habitat for MYLFs. The Wolf Creek, Lights Creek, and Indian Creek systems converge in the Indian Valley basin and flow south west draining the assessment area. Indian Creek joins Spanish Creek at the boundary of the assessment area to form the East Branch North Fork Feather River.

The threshold of concern (TOC) is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects is high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the

TOC is 12 percent of the watershed area, 100 percent of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface.

Following implementation of any of the action alternatives, no subwatersheds would be at or exceed the TOC and only one subwatershed (Upper Cooks) would approach the TOC. The Moonlight Fire and subsequent private salvage harvest activities raised the ERA value in the Upper Cooks Creek subwatershed to 90.2 percent of TOC, and the Keddie Ridge project would raise it another 8 percent. The Round Valley Reservoir subwatershed, the municipal water supply for Greeenville, is projected to experience the greatest increase in ERA—16.3 percent, bringing the ERA value up to 6.83 which equates to 57 percent of the TOC. The increase in ERA values under all alternatives is predicted to range from .01 to 16.3 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 12.8 to 97.6 percent of the TOC. ERA values under alternatives C and D would be slightly less than alternatives A and E due primarily to the no group selection proposed.

The HFQLG Act Record of Decision, and its associated Scientific Analysis Team guidelines for DFPZ construction, and the SNFPA Record of Decision's aquatic strategy for DFPZ maintenance, would not only prevent or strictly control any additional impacts on frog habitat, but would result in actual habitat restoration and enhancement for some streams (USDA 1999b). It is unlikely that the proposed activities would be a significant addition to cumulative effects on the frog species, and habitat characteristics would not change to a degree that these effects would limit populations; therefore, there would be very few cumulative effects.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog. This determination is based on project design features that would lessen and minimize impacts to the MYLF and suitable habitat which include: 1) incorporation of RHCA equipment restriction zones, 2) implementation of best management practices, and 3) implementation of soil and water standards (riparian management objectives).

Alternative B (No Action)

Direct Effects

There would be no direct effects on MYLF habitat because no activities would occur to cause disturbance to individual frogs or to impact existing habitat conditions.

Indirect Effects

The DFPZ, group selection, and area thinning treatments would not occur under the no action alternative, so there would be no exacted effects on the channel network. The fuel loads left by alternative B could make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead in a potential loss of RHCAs. There would be the potential for RHCAs with high fuel loads to act like chimneys and carry fire up and down the watershed. Typically, burn severity and the effects of wildfire disturbance are often limited in near-stream areas compared to upland areas. The effects of fire adjacent to channels can be devastating to the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation and the resulting effects on stream and riparian habitats and water quality would likely increase following a stand-replacing fire. Roads in the Keddie Ridge Project area would not be improved for drainage and aquatic species habitat connectivity. Sedimentation from road runoff into the drainages and fragmentation of aquatic habitats would continue.

Cumulative Effects

Cumulative effects from private land use (timber and gravel extraction, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog.

USDA Forest Service R5 Management Indicator Species

Hairy Woodpecker

The direct, indirect, and cumulative effect of the Keddie Ridge Project in terms of changes in medium-sized and large-sized snags per acre within green forest habitat would not change from the existing condition, as snags in green forested habitat would only be minimally impacted by DFPZ and Area Thinning Treatments. The primary proposed action that would likely remove snags would be group selection. Alternative A proposes 284 acres of groups selection. Alternative E proposes 326 acres of group selection. Medium (15-30 inches DBH) to large (greater than 30 inches) snags within these group selection acres may or may not remain due to required removal to allow for operability. Additional snag removal that may be required for operability reasons along haul routes and on landings is expected to be minimal. On average, the amount of snags greater than 15 inches DBH existing and that would remain post-treatment within units is 3 per acre. Snag amounts (existing and post-treatment) range from 0 in some units to 12 per acre in others. The design criteria for all action alternatives (chapter 2, tables 5, 6, 7) states that, where available, four of the largest snags (15 inches DBH and 20 feet in height) per acre will be retained. It is determined that the Keddie Ridge Project actions will not alter the existing trend in the ecosystem component for this species, nor will it lead to a change in the distribution of hairy woodpeckers across the Sierra Nevada Bioregion.

Aquatic Macroinvertebrates

Treatments under all action alternatives within RHCAs have the potential to increase the extent of disturbed, displaced, or compacted soils. Such soil conditions would have a potential adverse effect on watershed conditions by increasing sedimentation delivery into streams. Short-term decreases in channel shading and ground cover could occur as well. The implementation of standard protection measures (design criteria, SMRs, BMPs) would help minimize these indirect effects.

Despite the risk of potential adverse effects, the greater long-term benefit of treating RHCAs under the Keddie Ridge Project would be the potential increased protection from catastrophic wildfire. Other effects would include increasing the size of residual trees within RHCAs, preventing potential catastrophic wildfire, reducing future losses of large diameter trees and large woody debris (LWD) to fire, and increasing future LWD recruitment of intermediate to large logs. In riverine systems, debris would help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg 1998). Within the immediate riparian areas, the physical effects derived from in-channel LWD would be retained because no natural debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers. The increase in subwatershed ERA values as a result of project activities proposed under all alternatives (refer to the Hydrologyand Soils section of this DEIS for further discussion of ERA) is not likely to result in noticeably changes to stream flow or sedimentation delivery. As well, based on incorporation of RHCA equipment restriction zones and implementation of best management practices existing water surface shade conditions and riparian LWD is expected to be maintained following treatments.

The Keddie Ridge Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, no subwatersheds would be at or exceed the threshold of concern (TOC). Thus, suitable riparian conditions for aquatic species would not be susceptible to significant adverse cumulative effects as a result of fuel reduction activities implemented under the Keddie Ridge Project. It is determined that the Keddie Ridge Project’s cumulative impacts are too small to have any affect at the larger scale and thus will not alter the existing trend in the habitat or aquatic macroinvertebrates across the Sierra Nevada bioregion.

Hydrology and Soils

Introduction

A cumulative impact, as defined in 40 CFR 1508.7 is

> *the impact on the environment which results from the incremental impact of the action when added to other past, present, and foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ 1971).*

Cumulative impacts may occur off-site and, in the case of the water resource, may affect downstream beneficial uses of water. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple management activities within a watershed (USDA 1988).

Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation, and domestic water supplies. New information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects (Menning 1996, McGurk and Fong 1995), as well as the downstream physical effects.

Soil quality analysis standards presented in the Region 5 Forest Service Soil Management Handbook provide threshold values that indicate when changes in soil properties and soil conditions would potentially result in long-term losses to inherent productivity or hydrologic function of the soil (USDA 1995). When threshold values are exceeded for certain soil properties, the resulting condition is termed "detrimental soil disturbance." This analysis addresses downstream cumulative watershed effects as well as site-specific impacts that relate to changes in long-term soil productivity.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Direction Relevant to the Project as it Affects Soil Resources

National Forest Management Act (NFMA) of 1976 (which amended The Forest and Rangeland Renewable Resources Planning Act of 1974)

As described in Forest Service Manual Chapter 2550 (USDA 2009b), this authority requires the maintenance of productivity and protection of the land and, where appropriate, the improvement of the quality of soil and water resources. NFMA specifies that substantial and permanent impairment of productivity must be avoided.

National Soil Management Handbook

Forest Service Handbook 2509.18 (USDA 1991) defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in forest planning.

Region 5 Soil Management Handbook Supplement

This supplement (R5 FSH Supplement 2509.18-95-1) establishes regional soil quality analysis standards which provide threshold values to indicate when changes in soil properties and soil conditions would potentially result in a significant change in soil productivity, soil hydrologic function, or soil buffering capacity (USDA 1995). The analysis standards are to be used for areas dedicated to growing vegetation. They are not applied to lands with other dedicated uses, such as system roads and trails or developed campgrounds.

The soil quality analysis standards provide for consistent project analyses across the region. These thresholds are used for project analysis but are not a set of mandatory project standards or requirements. When a soil quality indicator exceeds the stated threshold, the result is termed detrimental soil disturbance. The handbook advises that detrimental soil disturbance that affects soil productivity shall not be of a size or pattern that would result in significant change in production potential for the activity area. Analysis threshold indicators for soil productivity include:

- A 10 percent or more reduction in total soil porosity, from that found under natural conditions, corresponds to a threshold soil bulk density that indicates detrimental soil compaction.
- Surface organic matter is to be maintained in amounts sufficient to prevent nutrient cycle deficits and to avoid detrimental physical and biological soil conditions. Fine organic matter (material up to 3 inches in diameter) is to occur over at least 50 percent of the area.

- The threshold for large woody material (logs at least 10 feet long and 12 inches in diameter) is at least 5 well distributed logs per acre.
- Project levels of surface organic matter, including fine organic and large woody material, should not elevate wildfire risk or severity and may be reduced to meet management objectives in fuel breaks.

The R5 Handbook advises that soil hydrologic function is to be analyzed using the R5 Cumulative Watershed Effects Analysis and/or the R5 Soil Hazard Erosion Rating system (USDA 1995). Soil buffering capacity analysis should determine whether materials added to the soil significantly alter soil reaction class, buffering or exchange capacities, or microorganism populations.

Plumas National Forest Land and Resource Management Plan (LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA 1988) establishes standards and guidelines to prevent significant or permanent impairment of soil productivity, including:

- During project activities, minimize excessive loss of organic matter and limit soil disturbance according to Erosion Hazard Rating (EHR): for EHR of 4-8, conduct normal activities; for EHR of 9-10, minimize or modify use of soil disturbing activities; for EHR of 11-13, severely limit soil-disturbing activities.
- Determine adequate ground cover for disturbed sites during project planning on a case-by-case basis. Suggested levels of minimum effective cover are: for EHR of 4-5, 40 percent; for EHR of 6-8, 50 percent; for EHR of 9-10, 60 percent; for EHR of 11-13, 70 percent. These suggested levels are adopted as the LRMP ground cover standard for the Keddie Ridge Hazardous Fuels Reduction Project.
- To avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Permanent landings and skid trails do not exist within the project area and the Keddie Ridge Project does not propose such permanent features.

Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)

The SNFPA ROD (USDA 2004b) amends the Plumas National Forest LRMP and includes a standard and guideline for down wood and snags:

- Determine retention levels of down woody material on an individual project basis. Within westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large wood per acre. Within eastside vegetation types, generally retain an average of three large down logs per acre. For the Keddie Ridge Project, the retention level of down woody material is 10-15 tons of large wood per acre (refer to the Affected Environment or Existing Condition sections below).

Direction Relevant to the Project as it Affects Water Resources

Clean Water Act of 1948 (as amended in 1972 and 1987)

The Clean Water Act of 1948 establishes as federal policy the control of both point and non-point pollution and assigns to the states the primary responsibility for control of water pollution.

State Water Quality Management Plan

Non-point source pollution on Plumas National Forest is managed through the water quality management program contained in *Water Quality Management for Forest System Lands in California* (USDA 2000). This document describes Forest Service practices and procedures for protection of water quality and also contains the 1981 Management Agency Agreement (MAA) between the California State Water Resources Control Board and the USDA, Forest Service. The State Board has designated the Forest Service as the management agency for all activities on National Forest lands and the MAA constitutes the basis of regional waivers for non-point source pollution. The Forest Service water quality protection program relies on implementation of prescribed best management practices (BMPs). Best management practices are procedures and techniques that are incorporated in project actions and have been determined by the State to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. BMPs applicable to the Keddie Ridge Project are presented in appendix H of this DEIS.

Section 303(d) of the Clean Water Act

This section requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The list of affected water bodies, and associated pollutants or stressors, is provided by the State Water Resources Control Board and approved by the United States Environmental Protection Agency. The most current list available is the 2006 303(d) list (SWRCB 2006). No water bodies on this list are located within the Keddie Ridge Project area. However, principal watersheds (at the HUC-5 scale) affected by the project are Lights Creek, Lower Indian Creek and Wolf Creek—these watersheds comprise a sizable portion of the East Branch North Fork Feather River watershed. The North Fork Feather River is included on the 2006 303(d) list for mercury and water temperature impairments. The Keddie Ridge Project would not affect legacy deposits or concentrations of mercury in the North Fork Feather River. The 303(d) list describes hydropower modifications and flow regulation/modification as the potential sources for water temperature impairments.

Beneficial Uses identified by the CA Regional Water Quality Control Board (Central Valley Region)

Beneficial uses are defined under California State law in order to protect against degradation of water resources and to meet state water quality objectives. The Forest Service is required to protect and enhance existing and potential beneficial uses (CRWQCB 1998). Beneficial uses of surface water bodies that may be affected by activities on the Forest are listed in Chapter 2 of the Central Valley Region's Water Quality Control Plan (commonly referred to as the "Basin Plan") for the Sacramento and San Joaquin River basins (CRWQCB 1998) and are described below for the Keddie Ridge Project area.

California Regional Water Quality Control Board Conditional Waiver of Waste Discharge

In January of 2003, the Regional Water Quality Control Board (RWQCB)—Central Valley Region adopted Resolution No. R5-2003-005 that provides for a conditional waiver of the requirement to file a report of waste discharge and obtain waste discharge requirements for timber harvest activities on National Forest System lands within the Central Valley Region. Additional provisions were added in the 2005 Resolution No. R5-2005-0052. This project complies with the Clean Water Act through use of "Best Management Practices" designed to minimize or prevent the discharge of both point and non-point source pollutants from National Forest System roads, developments, and activities. Prior to initiation of any of the Keddie Ridge Project action alternatives, the Plumas National Forest would comply with RWQCB permit requirements per Resolution R5-2005-0052.

The Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)

Appendix E of the SNFPA ROD (USDA 2004b) describes management direction applicable to the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project area. The ROD directs that Scientific Analysis Team (SAT) Guidelines (USDA 1999b) be applied to vegetation management projects in the Pilot Project area per the HFQLG FEIS and ROD (USDA 1999a,b). No standards and guidelines specific to riparian areas, hydrology, or water resources are presented in Appendix E of the SNFPA ROD.

Herger – Feinstein Quincy Library Group (HFQLG) Forest Recovery Final Environmental Impact Statement (FEIS) and Record of Decision (ROD)

The HFQLG ROD changed direction in the Plumas NF LRMP by requiring application of specific SAT guidelines for riparian management. These SAT guidelines include:

- Application of the following minimum buffer widths for riparian protection and delineation of riparian habitat conservation areas (RHCAs): 300 feet for perennial, fish-bearing streams and lakes; 150 feet for perennial, non fish-bearing streams, ponds and wetlands greater than 1 acre, and lakes; and 100 feet for intermittent and ephemeral streams and wetlands less than 1 acre.
- Prohibition of scheduled timber harvest in RHCAs except for salvage harvest or to meet SAT guidelines for resource management objectives.
- Management of fire and fuel treatments to meet resource management objectives and minimize disturbance of riparian ground cover and vegetation.

The SAT guidelines include ten riparian management objectives (RMOs) for RHCAs. To describe how this project's proposed timber harvest and fire and fuel treatments meet these objectives, an RMO analysis is provided in appendix E of this DEIS.

Plumas National Forest Land and Resource Management Plan (PNF LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA 1988) establishes standards and guidelines for protection and maintenance of Forest watersheds, water quality, and water supply, including:

- Implementation of BMPs.
- Establishment of Streamside Management Zones (SMZs) per guidelines in Appendix M of the LRMP. These guidelines were mostly replaced by the SAT guidelines, RHCA width requirements mandated by the HFQLG ROD. However, ephemeral channels without evidence of annual scour and deposition are not addressed by the SAT guideline buffer widths. Therefore, SMZ widths defined in Appendix M of the LRMP are applied to these channels. Recommended SMZ widths for these ephemeral swales range from 0 to 50 feet, depending upon the stability of the swale channel and sideslope.

An SMZ plan is necessary for any activities that will occur within an SMZ, including a description of vegetation management objectives, needed erosion control measures, and an analysis of SMZ areas with over-steepened slopes or very high EHR. The SMZ plan for this project is included in appendix H of this DEIS.

Effects Analysis Methodology

Cumulative Watershed Effects analysis methods and assumptions

There are numerous methods for assessing the effects of land use activities on the landscape (USDA 1988, Berg 1996, Reid 1998). For the purpose of this CWE analysis, the effects of past, present, and reasonably foreseeable future actions were assessed using the Region Five Cumulative Off-site Watershed Effects Analysis (USDA 1988). Under this approach, the effects of land management activities were evaluated on the basis of Equivalent Roaded Acres (ERA). These ERA values serve as a "common currency" to describe effects from a wide range of management activities. The wide use of this model in Region 5 allows for comparisons among projects across both space and time.

Within each subwatershed in the watershed assessment area, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to a theoretical area of road surface, resulting in a measure of ERA. Numeric disturbance coefficients were used to convert these management effects to ERA effects in terms of the pattern and timing of surface runoff. Coefficients vary by management activity, silvicultural prescription, site preparation methods, type of equipment utilized, and fireline intensity (refer to Appendix D – Cumulative Off-site Watershed Effects Analysis Methodology of the Hydrology and Soils Specialist Report).

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. ERA model values are used to track general changes to hydrologic function of watersheds in terms of alteration of surface runoff patterns and timing. In this way, ERA values can serve as an index to assess effects on downstream water quality. An increase in ERA for a watershed could result in detrimental changes to sedimentation rates and stream channel condition and subsequently have effects on downstream water quality and beneficial uses.

As the amount of anthropogenic landscape manipulation increases within a watershed, the susceptibility of that watershed to cumulative watershed effects (CWE) increases. There is a point where additive or synergistic effects of the land use activities will cause the watershed to become highly susceptible to CWE. Natural watershed sensitivity is an estimation of a watershed's natural ability to absorb land use impacts without increasing CWE to unacceptably high levels. Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially affect downstream channel stability and water quality. Upper limits of watershed "tolerance" to land use are estimated for the ERA model, this upper limit is called the threshold of concern (TOC).

For the ERA model analysis, the TOC for each subwatershed is expressed in terms of the percent of the area in a hypothetically roaded condition. The TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a "yellow flag" indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. As ERA disturbances approach the TOC, there is an increased risk that soil hydrologic function, downstream water quality and beneficial uses would be impaired. For example, stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged.

A closer look at the activities planned within an analyzed watershed would be important where ERA values exceed or are approaching the TOC. The TOC for this project was developed by considering the natural sensitivity of the Keddie Ridge Project subwatersheds and the sensitivity of downstream beneficial uses to changes in watershed hydrologic function. Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in Appendix N the HFQLG Forest Recovery Act Final Environmental Impact Statemen t (USDA 1999a). The majority of HFQLG Pilot Project watersheds applicable to this project received moderate sensitivity ratings. Examples given in the R5 Soil and Water Conservation Handbook estimate the TOC for watersheds of moderate sensitivity to be 15 to 16 percent. For this project, the TOC is conservatively estimated to be 12 percent of the watershed area. For additional information, refer to the “Watershed Sensitivity” section below.

Assumptions: In calculating the ERA contribution by the proposed harvest activities, all areas of the treatment units were assumed treatable. For example, no compensations were made for rock outcrops, roaded areas, or small-scale slope limitations that would restrict harvest activities. In most cases, such site-specific information was not available. Coefficients were applied to similar activities regardless of soil type, slope conditions, season of operation, or specific equipment characteristics. In calculating ERA contributions due to roads, all roads were considered equally, regardless of surface material (pavement, gravel, or native soil surface). Acres of roads were calculated by assuming that temporary and unclassified roads are 20 feet wide, and all other roads are 25 feet wide. The linear recovery curve (Figure 13) used in this analysis is not necessarily reflective of recovery patterns on the ground. Linear recovery models tend to under-predict effects in the very early stages of recovery, and over-predict effects in later stages of disturbance recovery.

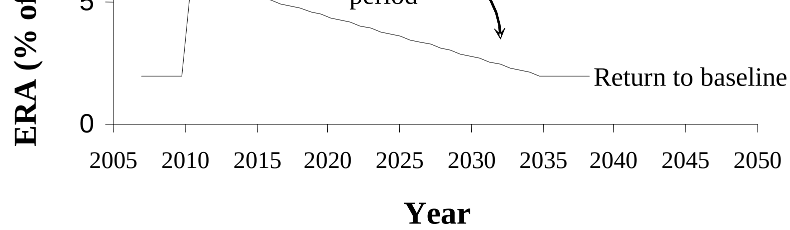


Figure 13. Conceptual Disturbance and Recovery Model for a Harvest Activity.

Soil Assessment Analysis Methods and Assumptions

In the summer of 2007, the soil and hydrology field crew, under the direction of the District soil scientist, assessed soil productivity measures for all soil types in the proposed treatment units. Though not all units were quantitatively surveyed, site visits were made to all units to verify existing conditions and confirm that the survey units chosen as surrogates had similar soil texture, cover, and condition. The fuel treatment units and area thinning units were sampled using similar methods. Due to the potential ground disturbance, units proposed for mechanical harvest treatment were given the highest priority for soil assessment. Soil-related information was collected in 29 of the proposed Defensible Fuel Profile Zone (DFPZ) units and three of the area thinning units described in the proposed action. The fuel treatment units were sampled more intensively because the proposed treatments are expected to affect a larger proportion of each treatment unit and there are substantially more of them. The proposed treatments in the area thinning units are expected to be more dispersed. When implementing group selection, the typical management unit or stand in which growth is regulated consists of an aggregation of groups, not individual groups. To assess soil conditions at an appropriate scale for group selection management, soil surveys were conducted at the scale of the area thinning unit.

The R5 Soil Quality Analysis Handbook states that a 10 percent reduction in total soil porosity corresponds to a threshold soil bulk density that indicates detrimental soil compaction (USDA 1995). To assess for detrimental soil compaction, the “spade method” was used which consists of measuring compaction from the resistance felt from sticking a spade shovel at the transect point into the ground. Per Exhibit 01 of the R5 Soil Quality Analysis Handbook, soil bulk density samples were collected and analyzed on soils similar to soils found in the project area to calibrate the spade method and assure that the person performing the test properly correlated the resistance felt with threshold soil bulk densities. Subsequently, a 12-16 inch deep and 6-12 inch wide hole was excavated with the spade to assess whether detrimental compaction exists based upon field indicators of soil compaction.

Watershed and Soil Indicators

Direct and Indirect Effects of DFPZ and WUI Fuels Reduction Treatments

Soil productivity indicators consist of the soil properties required for analysis by the PNF LRMP and the R5 Soil Management Handbook: soil cover, soil porosity, and soil organic matter. Organic matter levels are used as indicators of soil productivity. Effective soil cover is used to evaluate the potential for accelerated erosion. Effective soil cover consists of material that impedes rain drop impact and overland flow of water, including organic residues 0.5-inch thick, exposed roots, stumps, surface gravels more than 0.75 inch, and living vegetation. Minimum effective ground cover for the Keddie Ridge Project is prescribed at 40, 50, 60, or 70 percent on areas with maximum Erosion Hazard Ratings of low, moderate, high, and very high, respectively.

A 10 percent reduction in total soil porosity corresponds to a threshold soil bulk density that indicates detrimental soil compaction. Reductions in soil porosity correspond with increases in soil bulk density. The extent of detrimental soil disturbance shall not be of a size or pattern that would result in a significant change in production potential for the activity area. Organic matter losses are assessed by measuring the surface fine organic matter and large woody material. The threshold value for surface fine organic matter is at least 50 percent cover over the activity area, and includes plant litter, duff, and woody material less than 3 inches in diameter. Desirable large woody material is composed of logs at least 20 inches in diameter and 10 feet long. The recommended threshold for logs is 5 logs per acre (which could range from 3 to 10 tons per acre depending on decay class and size), representing the range of decomposition classes. Levels of fine organic matter and large woody material may be reduced to meet fuel management objectives, except when needed for essential erosion control.

Water quality indicators include potential for increased sedimentation rates. The effectiveness rate from Best Management Practice (BMP) monitoring informs this indicator.

Cumulative Effects Analysis

As described above, for the cumulative watershed effects model, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to Equivalent Roaded Acre values and the total ERA, expressed as a percentage of subwatershed area, was compared to the threshold of concern. Subwatersheds that exceed or are approaching the TOC are indicated to be at a higher risk of cumulative detrimental effects to downstream beneficial uses. A closer look at the activities proposed within those subwatersheds is necessary.

Table 67. Summary of Environmental Indicators and Measures Examined in this Assessment

Key ecosystem element	Environmental indicators	Variable Assessed
Water Quality	Chronic sedimentation, accelerated hillslope erosion	BMP effectiveness rate, Equivalent roaded acres (ERA), threshold of concern (TOC)
Soil Productivity	Soil loss Detrimental compaction Organic matter losses	Effective soil cover Soil porosity as indicated by soil bulk density, large down wood, surface fine organic matter

In order to understand the contribution of past actions to the cumulative soil productivity effects of the Proposed action and alternatives, this analysis relies on current soil conditions as a proxy for the impacts of past actions. This is because existing soil conditions reflect the aggregate impact of prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Water quality and soil productivity variables are summarized in Table 67.

This cumulative soil effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to. Current soil conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual soil impacts would be nearly impossible. Second, focusing on individual actions would be less accurate than looking at existing soil conditions, because there is limited information on the soil impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focus on the soil impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we capture the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

Soils

Soil Assessment Area

The soil assessment area (Figure 14) consists of the defensible fuel profile zone (DFPZ) fuel treatment units, area thinning units, and noxious weed treatment units described in the Proposed action. Note that Figure 14 shows the soil assessment area boundary for reference.

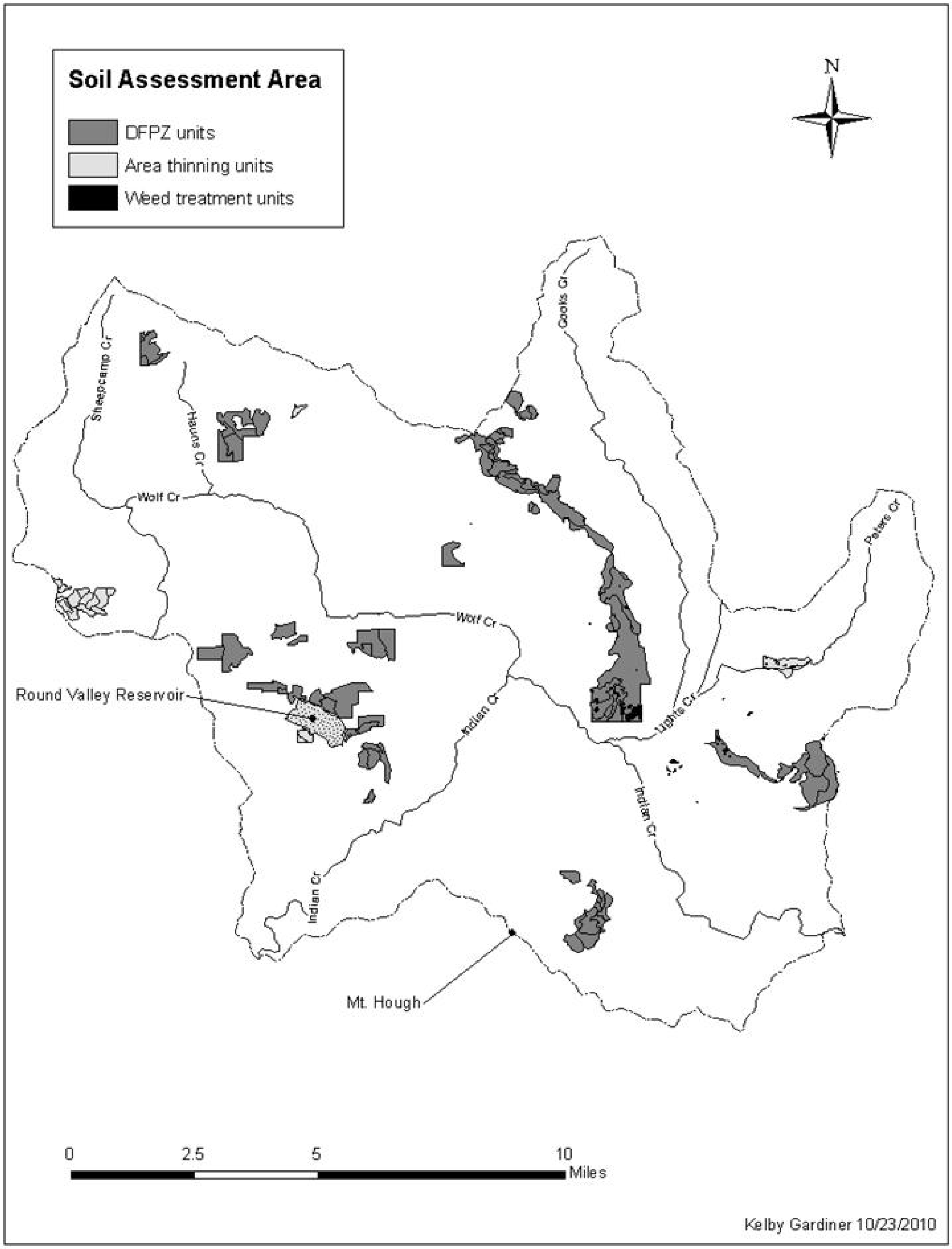


Figure 14. Soil Assessment Area

Soil Condition

Forest productivity in the assessment area ranges from low productivity to non-productive sites (USDA 1988). Forest survey site class (FSSC) is a measure of site productivity in cubic feet of wood per acre per year. Site class 1 is the most productive, while FSSC 7 is the least. Site class 7 lands are considered non-productive, and occur in 148 acres of treatment units along ridgetops and steep rocky slopes. Both site class 5 and 6 lands are interpreted as having low productivity (USDA 1999a), while site class 4 is slightly more productive. Round Valley reservoir and the Hauns Creek area possess most of the site class 4 lands, which make up 21 percent of treatment units. Site class 5 lands are found throughout the project area and make up roughly 24 percent of treatment units. The majority (53 percent) of soils found within the assessment area are site class 6 lands. Site class 7 lands account for 2 percent of treatment units, most of which occur in the Peters Creek area.

The maximum erosion hazard ranges from moderate to very high in the soil assessment area (Table 68). This erosion hazard rating (EHR) predicts the potential for sheet, rill, and gully erosion under existing conditions if vegetation and litter are removed. Moderate EHR exists on 2,376 acres of DFPZ and area thinning units, high EHR makes up 3,418 acres, while 148 acres are rated as having a very high EHR.

Soils in the project area are derived from both igneous and metamorphic parent material. Igneous rock can be formed in two ways; below ground as an intrusive or plutonic occurrence, or at the earth's surface as an extrusive or volcanic formation. Metamorphic parent material was igneous, metamorphic, or sedimentary rock that has been subjected to extreme heat and pressure causing physical and or chemical changes.

Parent material in the western portion of the project area, near the community of Canyon Dam, is comprised of andesite, schist, greenstone, peridotite, and andesitic tuff breccias. These geologic occurrences weather to form soils generally classified as loam with several site dependent modifiers including; cobbly, gravelly, sandy, silty or clay loam.

Table 68. Soil Productivity Results from Field Surveys

Geographic area	Average percent soil cover	Average areal extent of detrimental compaction	Average number of down logs per acre	Average percent cover of fine organic matter	Unit Number(s)	Erosion Hazard Rating
Taylorsville/ Peters Creek	84	20	16	81	89 & 93	M, H, & VH
Keddie Ridge	95	15	20	74	2, 4, 9,12, 14, 15, 18, 20-28, 60, 68, 69, & 83	M, H, & VH
Canyon Dam/ Hauns Creek	96	13	40	52	10, 11, 56-58	M & H
Round Valley Reservoir	95	15	28	91	74, 78, 79, 82, & 85	M & H
China Grade	92	0	24	87	98 & 106	M & H

Effective Soil Cover—LRMP Standard

Effective soil cover is necessary to prevent accelerated soil erosion. Soil cover ranges from 77 to 100 percent for the surveyed units. PNFLRMP standards and guidelines for effective ground cover vary by the soil erosion hazard rating. Effective ground cover should be maintained at 60 percent for soils with a high erosion hazard rating (EHR), and 50 percent for soils with a moderate EHR.

Soil Compaction—LRMP Standard and Region 5 Guidance

The R5 Soil Management Handbook provides a soil porosity threshold to determine the intensity of compaction that is deemed detrimental. The extent of detrimental soil compaction shall not be of a size or pattern that would result in a significant change in production potential for the activity area. The spatial extent of detrimental compaction that would cause a significant reduction in productive capacity would likely vary by local factors such as soil type and climate. Table 68 summarizes the average existing spatial extent of detrimental compaction measured during field evaluations. The area of detrimentally compacted ground is primarily occupied by skid trails and landings, although not all skids and landings were deemed compacted.

Down Woody Material—LRMP Standard and Region 5 Guidance

The applicable standard for large down wood is in the PNF LRMP as amended, which states that down woody material retention levels should be determined on an individual project basis. For the Keddie Ridge Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained. The Region 5 guidance provides a threshold for large woody material, recommending retention of 5 logs per acre (3 to 10 tons per acre) representing the range of decomposition classes. The existing average number of large down logs per acre in the surveyed units ranged from 23 to 32.

Fine Organic Matter—Region 5 Guidance

The Region 5 guidance provides a threshold for surface fine organic matter, recommending retention of 50 percent cover in all stands. Organic cover helps maintain site fertility and prevent soil loss from erosion. Fine organic matter consists of plant litter, duff, and woody material less than three inches in diameter. Average cover of fine organic matter ranged from 61 to 82 percent in surveyed units Table 68.

Watershed

Watershed Assessment Area

The area defined for the watershed assessment encompasses 12 sub-watersheds, which are contained in 10 HUC 6 watersheds. The Wolf Creek, Lights Creek, and Indian Creek systems converge in the Indian Valley basin and flow southwest, draining the assessment area (Figure 15). Indian Creek joins Spanish Creek at the boundary of the assessment area to form the East Branch North Fork Feather River.

Watershed Condition

The existing conditions reflect the aggregate impact of prior human actions and natural events such as wildfire that have affected the environment and might contribute to cumulative effects. The ERA model attempts to accurately account for the cumulative effects of past, present, and reasonably foreseeable actions and combine such effects into a single aggregate ERA value that represents the current condition of each subwatershed. The following discussion does not attempt to recount all possible factors that contributed to the cumulative watershed effects (CWE) ERA analysis or list all human or natural impacts that occurred within the soil assessment area during the analysis timeframe (35 years). Instead, it simply focuses on some of the major contributing factors used to calculate the current condition ERA values and assess future effects. The current conditions in the analysis subwatersheds have been impacted by many actions over the last century— specifically mining, grazing, and timber harvesting.

Tractor logging during the 20th century has left noticeable effects on the composition of the timber stands remaining today, including effects on tree species composition, age, and diameter classes. From 1980 to 2010, scheduled timber harvests and associated activities on NFS lands treated approximately 35,000 acres in the analysis subwatersheds. In some cases, individual stands were treated multiple times, so the actual number of affected acres is slightly less. Silvicultural prescriptions included clear cutting, overstory removal, group selection, sanitation, shelterwood, and area thinning, as well as associated activity fuel burning. Between 1997 and 2010, proposed harvest activities on private lands called for harvests on approximately 9,670 acres of timberland in the analysis subwatersheds.

There are 9,399 acres in the analysis subwatersheds that were burned in wildland fires between 1964 and 2010. Large wildfires (the Moonlight Fire burned 4,994 acres within the Keddie Ridge watershed assessment area) have resulted in severe impacts on soil productivity and subwatershed condition in these areas, but conditions will continue to improve as soil cover and organic matter accumulate.

Historically, livestock grazing occurred throughout a large portion of the watershed assessment area, especially on the private land that makes up the majority (8,400 acres) of Indian Valley. Today, there are still portions of two allotments on National Forest System lands within the watershed assessment area—Taylor Lake and the Lights Creek allotments—though the majority of grazing impacts to date are most visible along the banks of Lights and Indian Creeks in the valley bottom private lands.

Historic logging, mining, and grazing have also influenced the hydrologic and vegetative characteristics of the analysis watersheds. Such historic legacy effects are common to many of California's forested watersheds (Cafferata et al. 2007). More recent forest activities, including fire suppression and development of the transportation system, continue to affect the watershed conditions in this area. Unpaved roads are often considered the primary source of sediment to stream channels (MacDonald and Coe 2007).

Generally, recreational activities occur throughout the entire Keddie Ridge Project area, with concentrated use around the communities of Taylorsville and Greenville. Round Valley Reservoir, the municipal water supply for Greenville, is a popular boating and fishing destination. Dispersed recreational impacts of undeveloped camping areas, firewood cutting, user-created roads and trails are evident. Off-highway vehicle (OHV) use may contribute to compacted soil conditions where these activities occur. The locations of many user-created features have recently come to light under the national OHV route designation process. The selection of alternative 5 of the Travel Management EIS allows many of these routes to be incorporated into the ERA assessment for future projects, with actions planned to improve and maintain selected trails (USDA 2010b). Other recreational activities, such as Christmas tree cutting, hiking and hunting, have negligible effects on the soils or ERA assessment.

Data obtained from the California Department of Pesticide Regulation identified approximately 1,200 pounds of glyphosate (isopropylamine salt) applied to 345 acres in the watershed assessment area (at varying application rates) between 2004 and 2008 (CDPR 2009). There was no reported use of aminopyralid within the Keddie Ridge watershed assessment area.

Beneficial Uses

Existing beneficial uses of surface waters in the Keddie Ridge Project area are found in the Central Valley Region Water Quality Control Plan (CRWQCB 2004). The Keddie Ridge Project drains to the North Fork Feather River, for which existing beneficial uses include municipal and domestic water supply, hydropower generation, recreation, freshwater habitat, habitat suitable for fish reproduction and early development, and wildlife habitat.

Forest Vegetation

A mixed conifer forest type dominates the watershed assessment area, though several pine plantations and oak woodlands are established in burned areas and clear cut units. Much of the existing forest contains dense ladder fuels and fuel loading up to 100 tons per acre. High fuel loads occur in stands that experienced deadfall of mortality due to a region-wide drought in the late 1980s. High densities of small trees and high fuel loads contribute to high accumulations of ladder fuels and canopy fuels. These fuel conditions are conducive to crown fire initiation and propagation, and increased potential for stand-replacing high-severity fire events. Conditions within riparian habitat conservation areas (RHCAs) are similar to those described above. This includes conifer encroachment within the RHCAs, which has lead to a decline in riparian species that cannot tolerate a completely shaded environment. The high density of small trees makes many RHCAs within the Keddie Ridge Project area vulnerable to the effects of severe wildfire because drainages can rapidly funnel hot air upslope, contributing to fire spread. For example, thousands of acres of RHCAs within the Stream Fire of 2001 and the Moonlight Fire of 2007 were severely burned.

Stream condition

According to the PNF corporate GIS stream layer, there are nearly a 1,000 miles of stream in the Keddie Ridge watershed assessment area (Table 69); approximately 53 percent of the stream miles are ephemeral, 32 percent are intermittent, and 15 percent are perennial. Ephemeral and intermittent streams are seasonal—they run water during some portion of the year but are typically dry by late summer. Ephemeral streams only flow in response to storm events or snowmelt, and do not necessarily flow every year. Intermittent streams are seasonally connected to the surrounding water table and may flow during all but the driest months, whereas perennial streams typically flow year round. Streams are further classified by their slope—response reaches have low-gradient (less than three percent slope) alluvial conditions. The morphology of response channels reflects depositional processes associated with flowing water. Transport reaches have higher gradient (3 to 12 percent slope), non-alluvial conditions and the morphology of transport channels is generally resilient to change.

As mentioned in the "watershed condition" section above, historic land management activities have noticeably impacted the landscape. This is evident in many of the stream channels that drain the Keddie Ridge Project area. The headwaters of Wolf Creek are home to Calgom mine, where over 80 acres of hydraulic mining has occurred. Active placer mining claims are also present along much of Wolf Creek between the community of Canyon Dam and Greenville. This stretch of creek is closely paralleled by Highway 89 on the north and a railway on the south, confining stream flows to the active channel and contributing above normal amounts of sediment to the system during and after precipitation events. Riparian vegetation is well established and has excellent diversity: willow, black cottonwood, big-leaf maple, red-osier dogwood, and alder are all abundant with the occasional aspen stands present as well. Hauns and Sheepcamp Creeks flow through a considerable amount of private land in a southerly direction and are tributary to Wolf Creek. A significant amount of historic private timber harvest and road construction has occurred in this area, greatly contributing to the cumulative watershed effects of Wolf Creek. It is noteworthy to mention that the Mt. Hough Ranger District completed a multi-year stream restoration project on Wolf Creek in 2010. Over a quarter mile of vertical stream banks were laid back to form a new flood plain which was stabilized with erosion cloth and native vegetation. Log and rock veins were placed in the active channel to encourage deposition of bedload material mobilized by the aforementioned actions.

The portion of the Lights Creek watershed that is considered in this analysis encompasses Cooks Creek, Peters Creek, and the lower portion of Lights Creek that flows through Indian Valley—approximately one quarter of the entire Keddie Ridge watershed assessment area. The 2007 Moonlight Fire burned just over 900 acres of RHCA in the Cooks and Peters Creek subwatersheds—most of which occurred at the headwaters of these basins. Field surveys by district watershed staff show that channels are well armored by rock and large woody debris, with vigorous growth of riparian and upland vegetation present in the years following the fire. Improved effectiveness of stream buffers to filter sediment is apparent. Willow, big-leaf maple, and alder are the dominant riparian species present in the eastern portion of the Keddie Ridge Project. Aspen are established in the headwaters of Peters Creek and have benefited from the Moonlight Fire, where the fire has consumed encroaching conifers, consequently opening the canopy and improving the potential for aspen to further colonize. The Lucky S mine, a historic mining area that was thoroughly exploited for gold, is located in the headwaters of Peters Creek. Lower Peters Creek is the site of a hydropower special use permit maintained by a local resident, but operations generally cease in late summer when stream flow begins to subsurface.

Tributaries in the Lower Indian Creek watershed are comparable to those of the Lights Creek drainage system. Riparian vegetation is composed of willow, big-leaf maple and alder, but many of the steep ephemeral and intermittent streams lack vegetation due to the extremely rocky, well-drained soil, and the dense overstory canopy of confers. Indian Creek merges with the two previously mentioned drainages, Lights and Wolf Creeks, and continues to flow in a westerly direction through the project area as a low gradient response reach. As Indian Creek exits Indian Valley, downstream of the community of Crescent Mills near the Arlington Bridge, its gradient begins to increase and it is considered a transport reach. Geologic historian Cordell Durrell speculates that Indian Valley was once inundated in nearly a thousand feet of water. Arlington Bridge is thought to be the site of the outlet of the, now completely sediment filled, lake (Durrell 1988).

There are over 650 miles of existing roads within the watershed assessment area. Although the road network is generally in good condition, a number of poorly located roads contribute to substantial resource damage. These roads generally run parallel to and extremely close to stream channels. Rainfall can run off of road surfaces, carrying sediment into the stream network thus reducing water quality. Culverts can prevent fish from accessing upstream habitat by creating depth, leap, and velocity barriers.

Thousands of Canada thistles (*Cirsium arvense*) are present within the Keddie Ridge Project area. Many of these are located in riparian habitat conservation areas (RHCAs). Canada thistle is a noxious, invasive weed that can spread rapidly and potentially displace native plant species. The presence of Canada thistle is a high management concern due to its distribution and abundance within the Keddie Ridge Project area. As a noxious weed, it poses a threat to biological plant diversity in RHCAs. Affected streams include: South Fork Foreman Ravine, Cooks Creek, Peters Creek, and several unnamed seasonally flowing tributary channels.

Table 69. Miles of Stream Type and Stream Density in the Watershed Assessment Area

Drainage system	Drainage area (ac)	Miles of stream by type			Total stream miles	Stream density[1] (mi per mi^2)
		Ephemeral	Intermittent	Perennial		
Lights	26,198	119	65	41	224	5.5
Lower Indian	32,883	175	115	40	330	6.4
Wolf	46,818	232	142	56	430	5.9
Total	105,899	526	322	137	984	5.9

[1]Stream density is determined as the miles of stream per square mile of drainage area. Drainage area is shown in acres to be consistent with other area representations in this document.

Watershed Sensitivity

Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in Appendix N the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA 1999a). The sensitivity ratings were based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorm events, and on revegetation potential. Of the 12 HFQLG Pilot Project watersheds applicable to this project, 10 received moderate sensitivity ratings. Based on these ratings, most subwatersheds analyzed in this assessment were considered to have moderate sensitivity and were assigned a “threshold of concern” (TOC) value of 12 percent of the subwatershed area. Lower Cooks Creek watershed is more susceptible to cumulative effects, with a TOC value of 10 percent based on road and channel conditions and a higher sensitivity rating. Peters Creek watershed has been only somewhat disturbed by land uses, has fewer steep slopes and a lower road density—all of which lead to a slightly higher TOC value of 14 percent.

Precipitation

The Keddie Ridge Project is situated at the northern edge of the Sierra Nevada, with the Lake Almanor basin marking the transition into the Cascade mountain range and the northwestern edge of the watershed assessment area for the proposed hazardous fuels reduction project. Average annual precipitation data from the Rattlesnake Hill weather station, located 5 miles west of Round Valley Reservoir at an elevation of 6,100 feet, averaged 37 inches of rain between 2004 and 2010 and is representative of the western side of the Keddie Ridge watershed assessment area. The Kettle Rock rain gauge, 18 miles east of Rattlesnake Hill, sits 7,800 feet above sea level at the eastern boundary of the watershed assessment area and reflects the rain shadow effect that the Sierra Nevada experiences. Over the same seven-year period (2004-2010), average annual precipitation was approximately 30 inches (DWR 2010).

Precipitation falls primarily as snow above 6,500 feet and as a combination of snow and rain below that elevation. The majority of annual rainfall is characteristic of the Mediterranean climate, with most precipitation occurring between October and May with isolated thunderstorms common during the summer months. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

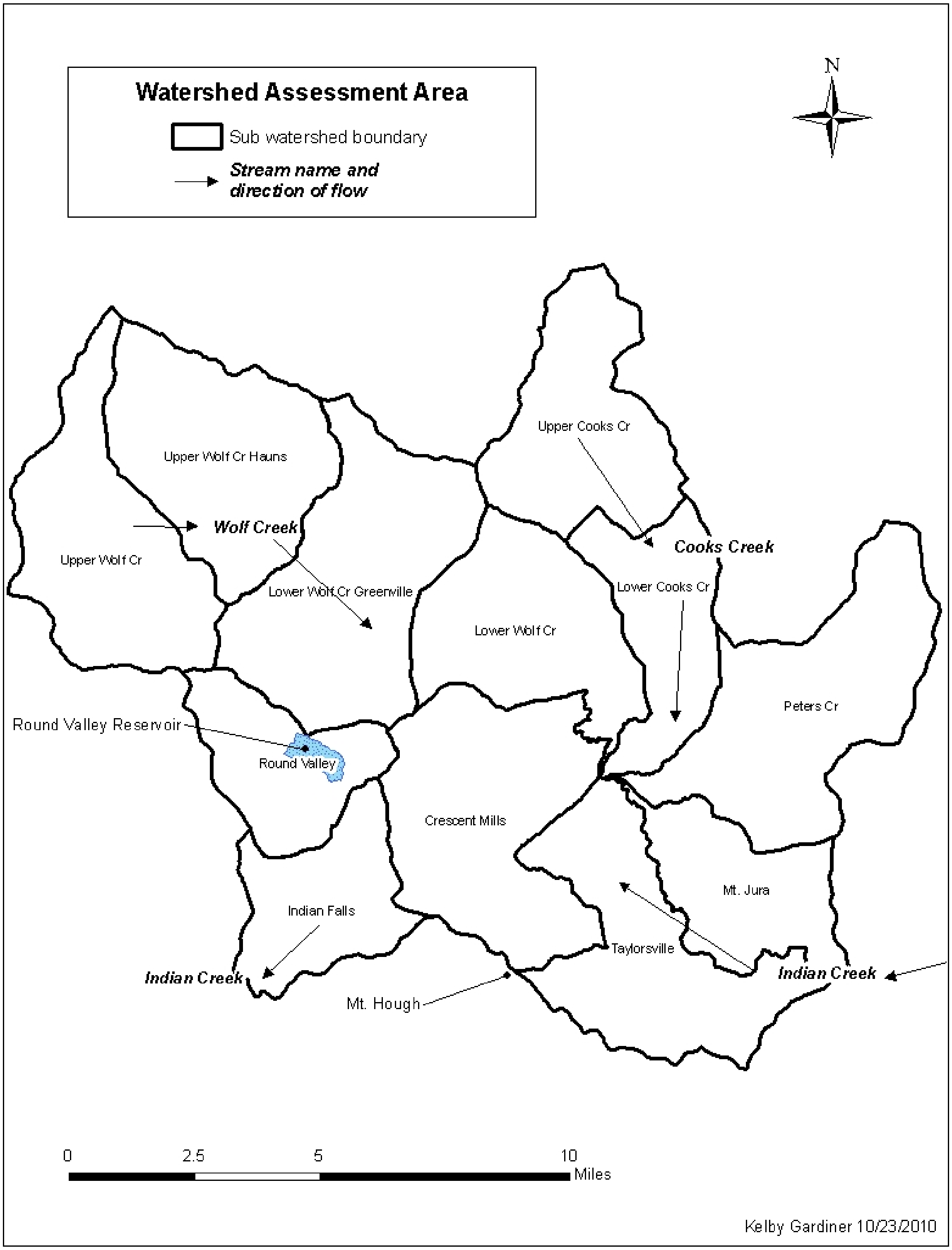


Figure 15. Watershed Assessment Area

Environmental Consequences

Design Criteria

Chapters 1 and 2 of the DEIS provide detailed information about the design criteria for each alternative. All mechanical harvest operations would adhere to standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15) and the best management practices as delineated in the "Water Quality Management for Forest System Lands in California: Best Management Practices" (USDA 2000). Timber sale contracts contain many standard provisions that help ensure protection of soil and water resources. These include provisions for an erosion control plan, road maintenance, and skid trail spacing.

Proposed management activities in RHCAs are expected to contribute to improving or maintaining watershed and aquatic habitat conditions described in the riparian management objectives (refer to Appendix C – RHCA Treatment; riparian management objectives (RMOs) of the Hydrology and Soils Specialist Report). RHCA widths are consistent with the Scientific Analysis Team (SAT) guidelines set forth in Appendix L of the HFQLG Final EIS. Where RHCAs would be treated, prescriptions and protection measures have been designed to address the RMOs. Where RHCAs would be mechanically treated, ground-based equipment would only be used on slopes less than 25 percent and on stable soils. To provide a buffer between streams and mechanically treated areas, an equipment exclusion zone would be established. The buffer width would vary by stream type and the steepness of the side slope, as shown in Table 70. For example, all mechanical equipment would be excluded from within 100 feet (horizontal) of perennial fish-bearing streams with sideslopes of 0 to 15 percent, and 150 feet from perennial fish-bearing streams with sideslopes between 15 and 25 percent. These streamside zones would serve as effective filter and absorptive zones for sediment originating from upslope treatment areas. Fuel reduction in these equipment-exclusion zones would be allowed and would be determined on a site-by-site case to protect the sensitive attributes associated with the riparian area.

Table 70. Equipment Restriction Zones and Burn Pile Restriction Zones in RHCAs

Stream Type	Equipment Restrictions by Slope Class			Burn pile restrictions by Slope Class[a]	
	0–15%	15–25%	>25%	0–15%	>15%
Perennial, fish bearing	100 ft	150 ft	No mechanical treatment	25 ft	40 ft
Perennial, no fish	50 ft	100 ft	No mechanical treatment	25 ft	40 ft
Intermittent	25 ft	50 ft	No mechanical treatment	15 ft	25 ft
Ephemeral	25 ft	25 ft	No mechanical treatment	15 ft	15 ft
Reservoirs/wetlands greater than 1 acre	50 ft	75 ft	No mechanical treatment	15 ft	25 ft

[a] Where feasible, burn piles would not be placed any closer to streams than the distances shown

Soil Analysis

This section is organized by the four soil indicator measures: effective soil cover, soil compaction, down woody material, and fine organic matter. Effects to each measure are first discussed for alternative B, the no action alternative, followed by a section titled, "Effects common to the action alternatives". In terms of the soil indicator measures, effects to each individual action alternative are very similar, the effective difference between action alternatives being the number of units and total acres to be treated. However, these differences would exist at small, localized scales and differences in effects to soil productivity, hydrologic function, and buffering capacity at the scale of the project area would be difficult to discern. Effects from the herbicide treatment are discussed separately above.

Effective soil cover—Alternative B

Direct Effects

Under the no action alternative, soil cover can be expected to increase as organic materials accumulate on the forest floor. Existing levels of soil cover are shown in Table 68. Soil cover ranges from 77 to 100 percent for the surveyed units and will likely develop increased cover under the this alternative.

Indirect Effects

As a result of increased soil cover, the risk of soil erosion may decline on forested hill slopes. Soil cover dissipates the energy of falling raindrops by intercepting them before they strike the soil surface. Reduced soil erosion would help retain soil nutrients and a favorable growth medium on site. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Cumulative Effects

Due to fuel reduction treatments proposed for the action alternatives, the risk of a high-intensity wild fire occurring in the near future would be higher under alternative B. If soil cover were reduced to bare soil following a wildfire, the soil would be more susceptible to erosion. In addition, fire can create a non-wettable layer below the surface known as hydrophobicity (Everett et al. 1995). During a precipitation event, soil above the non-wettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a moderate-intensity wildfire, the affected stand would likely not meet the PNF LRMP standards for effective soil cover. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk and Robichaud 2003).This needlefall effect has been observed by district watershed staff following numerous recent fires including: Cold, Rich, and Moonlight.

Effective Soil Cover—Effects Common to the Action Alternatives

Direct Effects

Harvest operations may increase soil cover by adding activity fuels to the forest floor, but can also decrease cover due to organic displacement during yarding operations. Mastication would generally increase soil cover because materials are shredded and then broadcast into the unit away from the machine. Prescribed fire activities, including pile burning and underburning, would consume organic materials and reduce the amount of effective soil cover. Recent BMP evaluations demonstrate that prescribed fires on the Plumas National Forest are effective in terms of leaving sufficient soil cover after implementation (USDA 2009a). Pile burning would remove soil cover locally, and underburning is expected to occur under prescribed conditions that would not result in complete consumption of the duff and litter layers.

Beginning in 2001, effective soil cover has been monitored on HFQLG project units for both the pre- and post-project condition per the Monitoring Plan prescribed in the 1999 HFQLG FEIS. Post-project monitoring began in 2004. For the 75 sets of data for pre- and post-harvest units, large differences between silviculture methods are apparent as the 51 thinning units averaged approximately 80 percent soil cover post-project and the 24 group selection units averaged approximately 60 percent effective cover post-project (USDA 2010b).

Statistical analysis of the thinning and group selection data sets available in 2007 determined statistically significant ($P < 0.05$) differences between pre- and post-project soil cover condition. For the 39 thinned units, the 95 percent confidence level described a post-project reduction in the areal extent of soil cover ranging from 9 percent to 15 percent. Average existing effective cover for thinning units proposed by the Keddie Ridge Project ranges from 84 percent to 96 percent. Since existing effective cover exceeds 75 percent for all of the units proposed for thinning, even the higher end of the 95 percent confidence range for decrease in soil cover (a 15 percent decrease) would leave the units with sufficient cover to meet the project standard of 50-60 percent.

For the group selection units, the 2007 HFQLG soil monitoring data indicated a statistically significant and more dramatic reduction in post-project ground cover. The average decrease in the areal extent of effective ground cover was 48 percent, with a 95 percent confidence interval ranging from -36 percent to -62 percent (USDA 2008e). Group selection (GS) units would occur within thinning units so existing soil cover reported above is applicable for GS units. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to assure project compliance with soil standards (USDA 2008f). These techniques include utilization of post-logging slash and designation of skid trails in group selection units. These techniques would result in a decrease for soil cover in group selection units that is much less substantial than the 48 percent decrease (on average) observed in the 2007 HFQLG monitoring report.

Indirect Effects

Increases in effective soil cover due to mastication or other operations would further reduce the risk of erosion by providing a physical buffer against wind and rain displacement of soil. A reduction in effective soil cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of forest floor or other cover material across a large area would be more effective at intercepting surface water than large areas devoid of cover. The effect of short-term reductions in soil cover for action alternatives would generally be well distributed across treated units. Concentrated removal of soil cover is most likely to occur in areas such as landings, skid trails, temporary roads, and equipment tracks. Soil erosion will be minimized by the installation of erosion control structures (cross ditches and waterbars) which are standard timber sale contract practices.

After the initial reduction in effective soil cover due to mechanical treatments, effective soil cover would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Local reductions in soil cover may have local effects on soil temperature. Larger reductions may result in greater temperature extremes in the soil. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson et al. 1985).

Cumulative Effects

The treatments proposed in the action alternatives are generally expected to reduce effective soil cover, with the exception of the mastication treatment. The cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in soil cover conditions that remain in compliance with the PNFLRMP standards. A reduction in ground cover would likely be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. Due to proposed fuel reduction treatments proposed, the risk of a high-intensity wild fire occurring in the near future would be less under the action alternatives than under alternative B. A wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone. Following the proposed treatments, forest floor material would decrease in some areas due to mechanical displacement or consumption by fire, and would increase in other areas due to additions of masticated material. Patches of bare areas would be susceptible to local erosion.

Soil Compaction—Alternative B

Direct Effects

Table 68 shows the extent of detrimental compaction assessed in the field. Under this alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals, would contribute to an increase in soil porosity and decrease compaction. In addition, incorporation of organic matter into the soil by biological processes, such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

Indirect Effects

As the degree and extent of soil compaction is reduced slowly over time, soil physical conditions would return to their pre-compacted state. Soil infiltration would be enhanced as porosity is increased. Increased infiltration may reduce surface runoff and subsequent erosion and sedimentation.

Cumulative Effects

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity.

Soil Compaction—Effects Common to the Action Alternatives

Direct Effects

Timber harvest and biomass removal would require the use of skid trails and landings. A number of skid trails and landings exist within the treatment units, and it is predicted that some of these will be re-used to implement the proposed activities. The use of heavy forestry equipment and frequent stand entries would increase the potential for soil compaction (Powers et al. 1998). Mastication operations are not expected to result in increases in the extent of detrimental compaction. For any mechanical harvest, the extent and degree of compaction would depend on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations, and harvest equipment features. Project design criteria include implementation of BMPs and other soil protection measures, such as wet weather standards, to minimize soil compaction. Erosion control and compaction remediation measures for landings and skid trails are addressed by BMP 1-16 (“log landing erosion prevention and control”) and BMP 1-17 (“erosion control on skid trails”).

Soil porosity and compaction monitoring results reported in the 2007 HFQLG Soil Monitoring report stated that a review of monitoring data indicates that legacy compaction is commonplace. Most of the detrimental compaction observed post-project also existed pre-project (USDA 2010c). Statistical analysis for 40 thinned units and 11 group selection units determined that the mean post-project areal extent of detrimental compaction as not statistically different from the pre-project mean. Confidence intervals indicated broad ranges that suggested both a trend toward increasing the extent of detrimental compaction and a trend toward decreasing extent.

Indirect Effects

A growing body of recent research suggests that compaction is not always detrimental to forest productivity. For example, after 10 years of growth, the North American Long-Term Soil Productivity (LTSP) experiment has found that soil productivity was both positively and negatively affected by compaction treatments (Powers et al. 2005). In this comparison of 26 study sites, the effects of compaction depended on soil texture. In general, sandy soils showed improved productivity in compacted soil, clayey soils had reduced growth, and loams showed no apparent trend. Soils in the Keddie Ridge treatment units are largely dominated by loamy soil textures, often with a high component of coarse fragments. The risk of compaction in these texture classes is generally moderate. However, compaction of soils in these texture classes may not necessarily reduce site productivity. The wet weather operation soil protection measure would reduce compaction effects. It is important to note that the LTSP study utilizes extreme levels of soil compaction; a mechanical roller, typically used for compaction of highway subgrades, was used to compact the test plots at optimum moisture for compaction. Tree growth is influenced by many factors, including the climate regime, soil aeration, moisture and nutrient availability, soil strength, root-soil interactions, soil mass flow and diffusion properties, and numerous other factors.

Compaction may influence some of these characteristics and thereby influence plant growth and soil productivity.

Cumulative Effects

The extent of detrimental compaction, as defined by the R5 guidance, is difficult to predict due to the environmental and operational variables discussed above. With the incorporation of the design criteria for this project, and the fact that a large number of the units have a moderate compaction potential, it is reasonable to expect that only a portion of the new skid trails would contribute to the cumulative amount of detrimental compaction. Monitoring of detrimental soil compaction has occurred within the HFQLG Pilot Project area. These data suggest that each harvest entry into an area will add a little bit of compaction (USDA 2006e). The cumulative effect of the mechanical operations proposed in the Keddie Ridge Project is likely an increase in the extent of detrimental compaction. This increase, however, may not result in any measurable change to soil productivity for the reasons discussed above. In the LTSP study, an extraordinary effort was used to compact the soil for research purposes. The expected extent of detrimental soil compaction for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential for the activity area.

Down Woody Material—Alternative B

Direct Effects

The applicable standards for large down wood are in the LRMP as amended, which states that down woody material retention levels should be determined on an individual project basis. For the Keddie Ridge Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained. The Region 5 Soil Handbook provides a threshold for large woody material, recommending retention of 5 logs per acre representing the range of decomposition classes. Table 68 shows the level of down woody material measured during field sampling. Many units have well over the recommended threshold level. Under the no action alternative, snags are expected to fall, and down wood loads (in terms of tons per acre) and the number of logs per acre are expected to increase. However, in the event of a future wildfire, some down logs are likely to be consumed, particularly those in later decay stages. While rotten logs can retain moisture late in the summer season, some years are quite dry and rotten logs could easily be consumed by fire.

Indirect Effects

In the absence of fire, the increase in down woody material could alter the microclimate and microhabitat at the forest floor. If down wood does retain moisture late in summer (compared with litter and duff materials), this could result in very small-scale changes in nutrient cycling and microbial activities. For example, rates of net nitrogen mineralization may be increased near the logs due to the increased moisture. However, these changes are unlikely to have significant influences over stand productivity because down wood generally covers only a very small proportion of the forest floor.

Cumulative Effects

Under the no action alternative, down wood would continue to accumulate. Overall, levels of down wood are currently very high in the sampled units. This is due largely to heavy deadfall following a drought period. At a localized scale, the wood load may alter nutrient cycling, but this is likely inconsequential in terms of soil productivity. Large amounts of down wood contribute to a heavy fuel load in many units. If a wildfire were to enter the units, much of the wood may be consumed. Heavy fuels such as logs contribute large amounts of heat to the soil during the glowing combustion phase of a fire. In the event of a fire, this intense heat load could produce localized areas of non-wettable soils and strong alterations of mineral soil properties (Moghaddas and Stephens 2007). This could result in long-term reductions in soil carbon and other stored nutrients that contribute to long-term soil productivity.

Down Woody Material—Effects Common to the Action Alternatives

Direct Effects

Mechanical operations would likely rearrange down woody material on the forest floor. Some new woody debris may be created if hazardous snags are felled and left on site. Mastication would add woody material to the forest floor, but these would occur as shredded materials and not logs, as recommended by the R5 guidance. Prescribed burning would consume some of the heavy wood loadings known to exist in the project area. If prescribed burning occurs in the fall, rotten logs may be more susceptible to consumption by fire compared to spring burning, however this would largely depend on the precipitation patterns preceding the burn period.

Large woody material monitoring results from the 2007 HFQLG Soil Monitoring report stated that large woody material decreased from levels observed during pre-treatment monitoring. Only 62 percent of the thinning units and 18 percent of group selection units met the recommended guideline of 5 large down logs per acre under the post-project condition, whereas 85 percent of the thinning units and 73 percent of the group selection units met the guideline under the pre-project condition. The 2009 HFQLG Soil Monitoring Report states that some of this wood was likely removed to meet fuel reduction objectives. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to bring Forests into compliance with soil standards, including the standard for large down wood (USDA 2008f). These techniques include coordination between sale administration personnel and fuel treatment personnel to reduce the loss of large down wood during harvest and burning operations and would be applied on the Keddie Ridge Project to assure that the project standard for large down wood would be achieved under action alternatives.

Indirect Effects

Reductions in large woody material would cause minor, localized changes to soil microhabitat. As described for alternative B, rotten logs can retain moisture longer during the summer season compared with litter and duff materials. A loss of logs and subsequent change in moisture conditions could result in changes in nutrient cycling and microbial activity at the location of the log. This change is expected to be insignificant at the stand scale. Areas of high wood loads in the Keddie Ridge Project are often “jack-strawed,” with woody materials accumulated atop each other. When wood is not in direct contact with the ground, its decomposition rate is greatly reduced. As a result, areas with heaviest wood loads are unlikely to have a large increase in moisture-retention abilities because much of the wood is relatively sound and elevated off the soil surface. Underburning areas of heavy wood loadings could result in localized effects to the underlying soils. The underlying soils are heated during combustion of woody materials. Prescribed burning is designed to occur when soils are moist, which reduces heat transfer and the resulting changes to soil chemical and biological properties.

Cumulative Effects

Reductions in large woody material are expected as a result of the treatments. Currently, many units have wood loadings that are well above the R5 recommended levels 5 logs per acre. The Keddie Ridge landscape likely supports a much higher level of large wood now than during the pre-fire suppression era. In the Keddie Ridge landscape, these woody fuels currently contribute to a heavy fuel loading and increased potential severity during a wildfire. Wildfires tend to occur during late summer when fuels and soils are at their driest. These conditions result in high levels of heating and chemical, physical, and biological alterations of the soil environment, and high losses of large wood. The proposed treatments are designed to reduce fire behavior in the event of a wildfire. By reducing the heavy wood fuel load during prescribed conditions, the resulting changes to the soil will be greatly reduced. Where it exists, 10-15 tons per acre of the largest woody materials would be retained by the project activities.

Fine Organic Matter—Alternative B

Direct Effects

Under the no action alternative, fine organic matter can be expected to increase as organic materials accumulate on the forest floor. Existing levels of fine organic matter are shown in Table 68 and are expect to steadily accumulate over time.

Indirect Effects

As a result of increased cover of fine organic matter, the risk of soil erosion may decline on forested hill slopes. Fine organic matter functions as effective soil cover, which was discussed above. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Cumulative Effects

If fine organic matter were consumed during a wildfire, the soil would be more susceptible to erosion. During a precipitation event, soil can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a fire, the affected stand may not meet the R5 guidance that recommends 50 percent cover of fine organic matter. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk and Robichaud 2003).

Fires short circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. Terrestrial cycling pathways return some nutrients relatively quickly. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils would experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et al. 1999). Such changes in the soil temperature regime would affect the rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

Fine Organic Matter—Effects Common to the Action Alternatives

Direct Effects

Pre-existing organic matter would be rearranged due to harvesting and yarding equipment. Accurate prediction of treatment effects on surface fine organic matter is difficult but trends would likely be consistent with those observed for effective soil cover in the 2007 HFQLG Soil Monitoring Report (described above). For example, the 2007 HFQLG Soil Monitoring Report presented a statistically significant difference between the pre- and post-project means for effective soil cover on 39 mechanical thinning units, with the 95 percent confidence level describing a post-project reduction in the areal extent of soil cover ranging from 9 percent to 15 percent. A similar reduction of fine organic matter can be expected for the thinning units under this project, indicating that some of the units may, in the short-term, be below the Handbook’s recommended threshold of 50 percent. After the initial reduction in fine organic matter due to mechanical thinning treatments, fine organic matter would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Mastication would contribute to fine organic matter increases because shredded materials are broadcast into the unit away from the masticator. Pile burning and underburning would reduce cover of fine organic matter. Pile burning would remove forest floor materials locally, and underburning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers.

Indirect Effects

Changes in the cover of fine organic matter will affect the risk of erosion, as discussed for effective soil cover, discussed above. Increases in fine organic materials, where units are not subsequently underburned, would add to the total nutrient pool stored in the forest floor. These nutrients are largely unavailable to plants in their organic forms, and are slowly decayed and recycled by soil organisms. As a result of the decomposition process, nutrients are released in available form for uptake by plants and other organisms. When prescribed burning activities consume fine organic matter, essential nutrients can be transferred downward into the soil (Moghaddas and Stephens 2007) or to the atmosphere through volatilization and ash convection (Khanna and Raison 1986). Terrestrial cycling pathways return some nutrients relatively quickly. Burn prescriptions are designed to prevent total consumption of fine organic materials. For example, district watershed staff observed that during underburn operations on the Green Flat Project, the duff layer was left largely intact despite the prescribed fires. As discussed above, scorched needles contribute new inputs of fine organic matter shortly after prescribed fire operations.

The Long-Term Soil Productivity study described above is investigating how substantial removal of forest organic matter affects site productivity. The national ten year results indicate that bole only and whole tree organic matter removals, similar to the thinning treatments proposed for this project, have had no detectable effects on soil nutrition or biomass productivity. Significant reductions in soil carbon and nutrient availability were observed only for the extreme case of whole tree removal plus complete removal of all surface organic matter on the forest floor. However, the data trend indicated no general decline in biomass productivity across any of the organic matter removal levels. Given the modest and short-term reductions of fine organic matter that are expected due to the proposed treatments, those reductions would not significantly change the soil production potential within the proposed units.

Cumulative Effects

The mechanical harvest treatments proposed in the action alternatives and the prescribed burning activities would cause reductions in fine organic matter. Overall, the cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in fine organic matter conditions that meet the R5 recommended levels. Increases in fine woody materials on the forest floor due to mastication may cause short-term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift et al. 1979). Microclimate changes at the forest floor due to reduced canopy cover could alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Erickson et al. 1985). Any reductions below the 50 percent recommended levels are only expected in the underburn units, however these would also be expected to quickly increase due to litter inputs from scorched vegetation. The extent of fine organic matter reductions due to proposed activities for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential for the activity area.

Hydrology Analysis

Effects Common to Alternatives A, C, D, and E

Direct and Indirect Effects

Harvest activities with heavy equipment can result in the creation of new skid trails and an increase in the extent of compacted soil. Prescribed burning would reduce the amount of ground cover. The additional effects of entering RHCAs with vegetative treatments would include increasing the size of residual trees within RHCAs. In order to help maintain favorable microclimates in RHCAs, hardwoods would be retained in all units. This is especially important in the known trout fishery streams, including Wolf Creek, Lights Creek, and Indian Creek. In-stream flows would be assessed during equipment operations, with respect to drafting requirements. Harvest activities may locally alter soil moisture regimes and subsequent water yield due to altered interception and evapo-transpiration due to the decrease in canopy cover.

Prescriptions for the Keddie Ridge Project include product removal, underburning, and mastication. The harvest operations (product removal) would cause associated disturbance from skid trails, site preparation, and transportation needs, such as temporary roads. Underburning would result in reduced ground cover and increased exposure of bare soil. Following implementation, the remaining canopy and vegetative recovery would contribute to rebuilding forest floor materials. Erosion and sedimentation that may result from the activities could decrease the quality of coldwater fish habitat by infilling pools and embedding spawning gravels. Due to ground disturbance, harvested areas would be more susceptible to erosion and sediment transport to the channel network. However, implementation of best management practices would help mitigate and prevent increased compaction and recent results of BMP monitoring on the Plumas Nation Forest demonstrate that BMPs are effective at preventing erosion and sedimentation (USDA 2009a). Over the past three monitoring seasons (2007-2009), 186 evaluations of BMPs were conducted for practices associated with timber and fuel management activities. BMPs were rated as effective for over 88 percent of those evaluations (USDA 2009a). The BMP deficiencies observed were predominantly due to legacy effects associated with the original design or location of system haul roads.

Legacy road designs often incorporated in-sloped road surfaces that drained to an inside ditch rather than current design practices that utilize, as often as practicable, out-sloped road surfaces that disperse runoff. In-sloped designs concentrate road runoff in the inside ditch and the legacy design roads—most constructed prior to existence of the Federal Clean Water Act—did not include sufficient frequency of drainage structures to disperse road runoff and prevent the ditches from delivering sediment to streams at road crossings. Legacy designs that located roads at mid-slope locations typically have higher road-intercepted runoff volumes than roads near ridgetops and mid-slope locations also result in frequent stream crossings. When the 2007-2009 timber BMP evaluations are considered without the road evaluations, the resulting set of 67 evaluations had a 95 percent effectiveness rate. Road reconstruction activities are proposed for all action alternatives to reduce sedimentation impacts associated with legacy road designs.

The road treatments consist of measures to improve road drainage, reduce erosion caused by road drainage, and reduce sedimentation from roads into the stream network. Most roads in the affected subwatersheds have an in-sloped roadbed that is drained by an inside ditch. Culverts occur at varying intervals to drain the ditch, resulting in concentrated flows from the culvert outlets. The road treatments largely include obliterating the ditch, where possible, and reshaping the roadbed so that it is out-sloped. This would allow for dispersed road drainage that is not concentrated by culverts. Where ditch obliteration is not possible, armored rolling dips will be constructed to somewhat disconnect the inside ditch from stream crossings. Culvert outlets will be armored as needed to reduce erosion downstream of the culvert. This armoring will provide roughness to reduce the energy of the water flowing from the culvert and will encourage sediment deposition near the culvert, rather than traveling on toward a stream channel.

Proposed mechanical noxious weed treatments include hand pulling, weed-whacking, and pulling individual plants with a weed wrench. Ground disturbance due to these activities would be negligible—weed pulling may loosen the soil at a local scale. Treatment of noxious weeds with herbicide would occur in all action alternatives and is discussed in a separate section below.

Short-term sediment delivery to streams could potentially occur after prescribed burning due to loss of ground cover. Based on 28 prescribed fire BMP evaluations completed on the Plumas National Forest over the last three years, no short-term sediment delivery to streams after prescribed burning was documented (USDA 2009a). Scorched conifers often drop needles following low or moderate-severity fires and this needle cast would provide ground cover that may help reduce rill and inter-rill erosion and sediment delivery (Pannkuk and Robichaud 2003). Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short-term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. The main objective is to reduce the potential for catastrophic wildfire, and thus, retain the RHCA's desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges.

Road construction would create new sources of sediment and disrupt the hydrologic continuity on affected hillslopes. However, state-of-the-art road design BMPs would be followed for new road construction, including out-sloping of the road template and installation of frequent road drainage structures to minimize delivery of sediment to adjacent streams. Road reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing or upgrading culverts where needed. Road drainage improvements would be designed to disperse runoff and eliminate the occurrence of road drainage being hydrologically connected to adjacent stream channels. Short-term increases in sediment during road reconstructions would be minimized by BMPs and would be offset by long-term improvements to water quality as a result of amelioration of hydrologically connected road segments. Road decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope, and/or seeding the affected area. Road decommissioning would promote vegetative recovery, which can decrease compaction, increase infiltration into the roadbed, and increase soil stability and limit concentrated flow as well as surface erosion. Over time, decommissioned roads would produce less sediment and surface runoff to adjacent watercourses. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff, and sediment production compared to subsoiling or cover cropping.

Cumulative Effects

ERA model values and a discussion of the ERA results relative to TOC for each of the action alternatives is presented below in the section titled "Differences in Effects Analysis Across Action Alternatives." Higher ERA values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment loads off-site. Stream channels in poor condition tend to be more sensitive to increases in peak flows because the channels frequently lack an effective root mass to bind streambanks and large organic debris to retain bedload materials. These channels are frequently downcut (have eroded down into the bottom of their channels), and all flow is confined to the channel rather than to a broader floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream. Increases in ERA may lead to detrimental effects, including erosion from treated hillsides and chronic sedimentation. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover. Road construction would temporarily increase ERA values due to the addition of roaded acres on the landscape, but all new roads constructed for the Keddie Ridge Project would be decommissioned after implementation. Road decommissioning would reduce ERA contributions by roads, and result in long-term beneficial effects on water quality.

The effects of entering RHCAs with vegetative treatments would be similar to those described directly above. Despite the risk of erosion, the greater long-term benefit of treating the RHCAs would be the potential protection from catastrophic wildfire. Other effects would include increasing the size of residual trees within RHCAs, preventing potential catastrophic wildfire, reducing future losses of large diameter trees and large woody debris (LWD) to fire, and increasing future LWD recruitment of intermediate to large logs. In forested stream systems, debris would help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg et al. 1998). Within the immediate riparian areas, the physical effects derived from in-channel LWD would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers. Canada thistle has the potential to replace many grasses and forbs in the riparian zone, thereby reducing species diversity, but treatment of Canada thistle would help control this invasive noxious weed and protect riparian species diversity. Herbicide effects are discussed below.

Alternative B – No Action Alternative

Direct and Indirect Effects (Alternative B)

Under the no action alternative, all subwatersheds would continue to recover, and ERA values would slowly decline to a baseline level over time. In alternative B, surface, ladder, and crown fuels would not be treated on upslope areas or in RHCAs. Noxious weeds would not be treated. Road drainage improvements and decommissioning activities would not occur, so watershed benefits and reductions in ERA values due to road decommissioning would not be realized. Fuel treatment activities would not occur. A future severe wildfire could greatly increase ERA values within and across subwatersheds.

In the short-term, water quality and downstream beneficial uses would remain unchanged. As watersheds recover from past management activities, there may be small improvements in water quality. However, in the absence of road improvements, decommissioning, or obliteration, the transportation system would continue to be a large contributor of sediment to the stream network. The high density of roads and road/stream crossings would continue to affect the hydrologic regime in these subwatersheds.

Cumulative Effects (Alternative B)

None of the subwatersheds that are contained by the greater watershed assessment area exceed the threshold of concern (TOC). Private harvests are expected to continue within the overall watershed assessment area, though it is difficult to predict the location, type of harvest treatments, or number of acres that would be affected. In alternative B, surface, ladder, and crown fuels would not be treated on upslope areas or in RHCAs. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003, Everett et al. 1995, Skinner 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). During wildfires, drainages can behave like chimneys, rapidly directing fire upslope through the drainage area. Under alternative B, watersheds would remain vulnerable to the effects of a future severe wildfire. In the event of a future severe wildfire, affected areas may be highly susceptible to erosion, and generate large pulses of sediment to stream channels (Elliot and Robichaud 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

Noxious weeds would not be treated in alternative B. As a result, these weeds may spread over time. As above, many occurrences of the noxious weed Canada thistle are located within RHCAs, and pose a potential threat to biological plant diversity in riparian communities. The spread of Canada thistle could decrease the diversity and productivity of native and desired nonnative riparian plant communities.

Direct, Indirect, and Cumulative Effects of Herbicide Application (Alternatives A and D)

Aminopyralid (i.e. Milestone® or equivalent formulation) herbicide treatments would be performed by manual ground application using backpack sprayers at an application rate of 0.05 to 0.11 pounds acid equivalent per acre (lbs a.e./ac). The formulation would also include a surfactant (Competitor® (Wilbur-Ellis Company) which is a non-ionic modified vegetable oil), and a marker dye (Hi-Light™ Blue (Becker-Underwood, Inc.) which is a water-soluble colorant). Aminopyralid would be used to treat dry and upland sites greater than 15 feet from the water's edge. The aquatic formulation of glyphosate (i.e. Accord® or equivalent formulation) is proposed for lowland treatments (between 0-15 feet from the water's edge) and would be applied selectively by hand using a wick applicator at an application rate of 1-3 lbs a.e./acre. The Keddie Ridge Project also proposes to apply a registered borax fungicide (i.e. Sporax or Cellu-treat) to pine stumps greater than 14 inches in diameter in units 45, 46, 49, and 50. The average application rate for borax in thinning areas would be less than 1 pound per acre (approximately 0.5 pounds per acre) with a range of 0.1 lbs/acre to 1.1 lbs/acre. Group selection units within units 45, 46, 49, and 50 could have as much as 2.7 pounds/acre applied.

There is a considerable body of information describing the potential effects on soil and water resources associated with using each of the proposed herbicides. Much of this information is contained in the risk assessments completed by Syracuse Environmental Research Associates, Inc. (SERA 2007, 2003, 2006), under contract to the Forest Service, and in the HFQLG Act Final Supplemental EIS (USDA 2003a). These documents are incorporated by reference into this effects analysis for the Keddie Ridge Project.

The HGQLG Final Supplemental EIS analyzed the likelihood of detection of glyphosate in surface waters following backpack spray application methods and with full implementation of all water quality best management practices. The HFQLG Final Supplemental EIS concluded that it was unlikely that glyphosate would be detected in forest streams in the pilot project area when streamside buffers and ground applications are used. This conclusion was partially based on the white paper, "A Review and Assessment of the Results of Water Monitoring for Herbicide Residues For The Years 1991 to 1999" (Bakke 2001), which compiled and summarized the results from 15 separate water monitoring reports written by hydrologists and geologists on the Angeles, Eldorado, Lassen, Sierra, and Stanislaus National Forests. These reports documented the results of over 800 surface- and ground-water samples taken for reforestation and noxious weed eradication projects that used three herbicides (glyphosate, hexazinone, and triclopyr).

According to "A Review and Assessment of the Results of Water Monitoring for Herbicide Residues for the Years 1991 to 1999" (Bakke 2001), detections of glyphosate have been associated with its use in riparian areas or applications that did not follow established best management practices. The only sited occurrence of a detection occurred in only 1 of 12 samples. The detection was low (15 parts per billion), and the application was by spray in the actual stream channel at greater than 1.5 lbs/acre. In the Proposed action, glyphosate would only be applied by wick application which would effectively eliminate the chance of drift because herbicide is not emitted by spray, and the buffer would be 15 feet from the water's edge. The incorporation of these design elements would greatly reduce the risk of indirect effects due to drift.

The proposed use of herbicides includes the additional use of a surfactant (Competitor®) and a marker dye (Hi-Light™ Blue). Surfactants are used to facilitate or enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Competitor® is a non-ionic modified vegetable oil. The assessment of hazards related to surfactants is limited by the proprietary nature of the formulations. Surfactants, by their very nature, are intended to increase the effect of a pesticide by increasing the amount of pesticide that is in contact with the target. This is not synergistic, but more accurately a reflection of increased dose of the herbicide active ingredient into the plant. The "Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides" (Bakke 2003) sites technical references which indicate a lack of synergistic effects between surfactants and pesticides which suggest that surfactants don't increase the toxic effects of herbicides. This paper also listed the results of standard acute aquatic species toxicity testing which indicated that any potential effects to aquatic species would be unlikely under normal application rates. Studies have shown that mobility of materials throughout the soil profile is a function of the concentration of the surfactants in the soil solution. For this to occur, concentrations of surfactant must be high, in the range of 1,000 ppm or more(Bakke 2003). This level is unlikely to be reached under normal application rates as proposed by this project, which would likely have concentrations considerably, less than 12 ppm. "Although the potential exists for surfactants to affect the environmental fate of herbicides in the soil, any potential effects would be unlikely under normal conditions because of the relatively low concentration of surfactants in the soil/water matrix. Localized effects could be seen if a spill occurred on the soil, so that concentration of surfactant approached or exceeded about 1,000 ppm" (Bakke 2003).

The colorant Hi-Light™ Blue will be added to the herbicide mixtures prior to the application so that the actual treated area can be readily determined. This helps to prevent skips and overlaps. Hi-Light™ Blue is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems. The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lake and ponds (SERA 1997).

Unlike the other two pesticides proposed, the agent of toxicologic concern in borax (i.e. boron), occurs naturally and exposures to this element are unavoidable. The use of borax is not expected to substantially contribute to concentration of boron in water or soil beyond those that are associated with the normal occurrence of boron in the environment (SERA 2006).

Direct Effects

No direct effects on soil productivity are predicted from the proposed herbicide treatment in alternatives A and D. The potential for adverse effects of herbicide residues in soil and water would be minimized or eliminated by incorporating the proposed design criteria and applying BMPs for herbicide application. Design criteria include carefully planned herbicide use according to the label and other relevant requirements, spill contingency plans, proper disposal of containers and cleaning equipment, adequate buffer strips, spray drift control, and restricted use of herbicides near water bodies with sensitive amphibian species.

Drift calculations from the SERA risk assessments (SERA 2003, 2007) analyzed the potential for herbicide drift during applications of glyphosate and aminopyralid. Backpack sprayers were analyzed under two wind speed conditions: (1) 0 to 5 miles per hour (mph) winds in which droplets could drift as far as 23 feet and (2) 15 mph winds with the potential to drift up to 68 feet. Based on these calculations and a 10 mph maximum wind speed for application using a backpack sprayer, the proposed stream buffers would reduce the potential for the herbicide to reach water due to drift. Refer to appendix B of the final EIS for a list of the proposed design criteria for noxious weed treatments.

Mobility and Persistence of Glyphosate

Glyphosate has limited mobility because it tends to adsorb strongly to soil particles, especially to clay and to iron and aluminum ions. While it has high water solubility, it does not tend to leach through the soil profile in most soils. Although glyphosate has a relatively short half-life in soil (25–130 days) (USDA 2003a), adsorption to soil can create an herbicide sink, which may take longer to dissipate. In soils with high sand content (about 80 percent), leaching and longer persistence have been observed (Smith 1996, Eberbach and Douglas 1983). Generally, glyphosate is degraded in soils within three months (USDA 1988). A study in the Journal of Agricultural and Food Chemistry indicated that glyphosate desorbed (the compound detaches from the soil particle) at a higher rate than had been indicated by previous research(Piccolo 1994). The results, however, were obtained by laboratory experiments and were not taken under natural conditions. The compound only detached after several hours of severe mechanical shaking. These conditions do not occur in the natural system.

Mobility and Persistence of Aminopyralid

According to the aminopyralid report completed by SERA in 2007, aminopyralid is quite soluble, and its persistence in soil can vary depending on soil type and other environmental conditions—its half-life can range from 14 to 343 days. Although aminopyralid does not bind readily in soil, it dissipates rapidly in some common soil conditions. No known metabolites of aminopyralid have been identified.

The SERA risk assessment (2007) states that aminopyralid or any other herbicide may be transported to off-site soil by runoff or percolation. Runoff and percolation are both considered in estimating contamination of ambient water. For assessing off-site soil contamination, however, only runoff is considered. This approach is reasonable because off-site runoff will contaminate the off-site soil surface. Percolation, on the other hand, represents the amount of the herbicide that is transported below the root zone and may thus impact water quality.

The probability is very low that a detectable level of either of the two proposed herbicides would reach surface water (flowing streams, springs, seeps, and riparian areas). The probability of the Keddie Ridge Project violating a water quality standard would be very small—this is based on the glyphosate and aminopyralid risk assessments (SERA 2003, 2007) and on the results of over 12 years of monitoring glyphosate in Region 5. At the levels proposed for application, neither aminopyralid nor glyphosate is expected to have direct detrimental effects on water quality.

Mobility and Persistence of Borax

The borax risk assessment states “in water, boron compounds transform rapidly into borates, no further transformation is possible, with borate speciation dependent upon pH. Those compounds may be transported by percolation, sediment, or runoff from soil to ambient water. Borate compounds are adsorbed to soils to varying degrees, depending on several factors, including soil type and water pH” (SERA 2006). A study by the Southeastern Forest Experiment Station in 1971 showed that borax “persisted uniformly at a toxic concentration 5.1 cm below the stump surface for at least 8 weeks. Twenty six months after treatment, borax had leached to subtoxic levels throughout the upper 0.3 cm of stumps, but toxic amounts were measured at a depth of 1.2 cm” (Koenigs 1971).

Soil Microorganisms

According to the SERA (2003) risk assessment, glyphosate is readily metabolized by soil bacteria with aminomethyl phosphonic acid as a major metabolite. In addition, many species of soil microorganisms can use glyphosate as sole carbon. There is very little information suggesting that glyphosate is harmful to soil microorganisms under field conditions, and a substantial body of information indicates that glyphosate would likely enhance or have no effect on soil microorganisms.

In application rates of 1.2 lbs a.e./acre (0.54 kilograms per hectare), a transient decrease in populations of soil fungi and bacteria was noted after 2 months but no effect was apparent after 6 months. Similarly, at an application rate of 7.12 lbs a.e./acre (3.23 kilograms per hectare), no effect was seen on soil fungi and bacteria after 10 to 14 months. A transient decrease in soil microbial activity was also noted after the application, but no lasting effects on soil have been reported (SERA 2003).

Several field studies involving microbial activity in soil after glyphosate exposures note an increase rather than decrease in soil microorganisms or microbial activity. Application of glyphosate may cause transient increases in soil fungi that may be detrimental to some plants, and some studies have shown that inoculation of soil with various pathogenic soil fungi may result in an apparent enhancement of glyphosate toxicity (SERA 2003).

Aminopyralid toxicity data on soil organisms are limited, but the projected maximum concentrations under normal application rates would be far below potentially toxic levels. A study by (McMurray 2002) showed modest increases in nitrate and total mineral nitrogen concentrations in soil directly following application but no statistically significant effects were noted thereafter. The information on soil organisms is limited and consists only of a no-observed-effect concentration (NOEC) value for earthworms reported as 5,000 ppm (mg a.e./kg soil). The proposed maximum application rate of .11 lbs a.e./acre corresponds to a concentration of about 0.05 ppm and “indicates inconsequential risks to earthworms” (SERA 2007). Consequently, this information does not provide any basis for asserting that adverse effects on soil organisms are plausible.

Borates are effective fungicides and some nontarget soil microorganisms could be affected by exposure to boron in soil. “However, information to adequately assess risk in this class of organisms is not available” (SERA 2006). Due to the application method and rates, widespread exposure to soil microorganisms are not likely.

Indirect Effects

Based on a review of the literature and monitoring reports from other Region 5 herbicide projects, the proposed spray treatments are not expected to significantly increase the potential for erosion. Reducing the amount of ground cover protecting the soil, and thus increasing erosion rates, is a potential indirect effect. However, it is expected that none of the action alternatives would significantly reduce existing ground cover in treated areas. Litter and duff inputs may be reduced slightly, due to the reduction in shrub canopy, but existing litter and duff would continue to provide an adequate amount of ground cover. Vegetation killed by herbicides would continue to provide a canopy cover until the leaves fall, which would then add to the existing ground cover.

Cumulative Effects

Glyphosate and aminopyralid are not expected to accumulate in the soils within the project area. According to the HFQLG Final Supplemental EIS, “Surface water concentrations of glyphosate and aminopyralid are anticipated to be undetectable, assuming backpack application using BMPs, and no cumulative effects are anticipated from application of these herbicides, because their delectability is anticipated to be zero” (USDA 2003a). A cumulative watershed effects analysis explores the potential for possible cumulative indirect effects on hydrologic function as a result of removing vegetative cover, ground disturbance, and soil compaction. Since the proposed herbicide treatments would not result in additional bare or compacted soil, the proposed herbicide treatments would not result in new ERAs that would change the results of the cumulative watershed effect ERA analysis. In fact, the HFQLG Final Supplemental EIS determined through modeling that the watershed effects of herbicide maintenance treatment would be small, relative to other disturbances within watersheds of the HFQLF pilot project area, and would not significantly increase cumulative watershed effects (USDA 2003a).

Previous discussion reveals that there is little chance that either glyphosate or aminopyralid is expected to reach streams because of their limited transport mobility; relatively short half-lives; buffers along streams; application criteria, which takes into account the time of year, wind velocity, and period to the next rainfall; and other BMPs for herbicide application. In conclusion, no significant adverse cumulative watershed effects associated with the herbicide application alternatives are expected.

Effects Analysis – Action Alternatives

Cumulative Effects

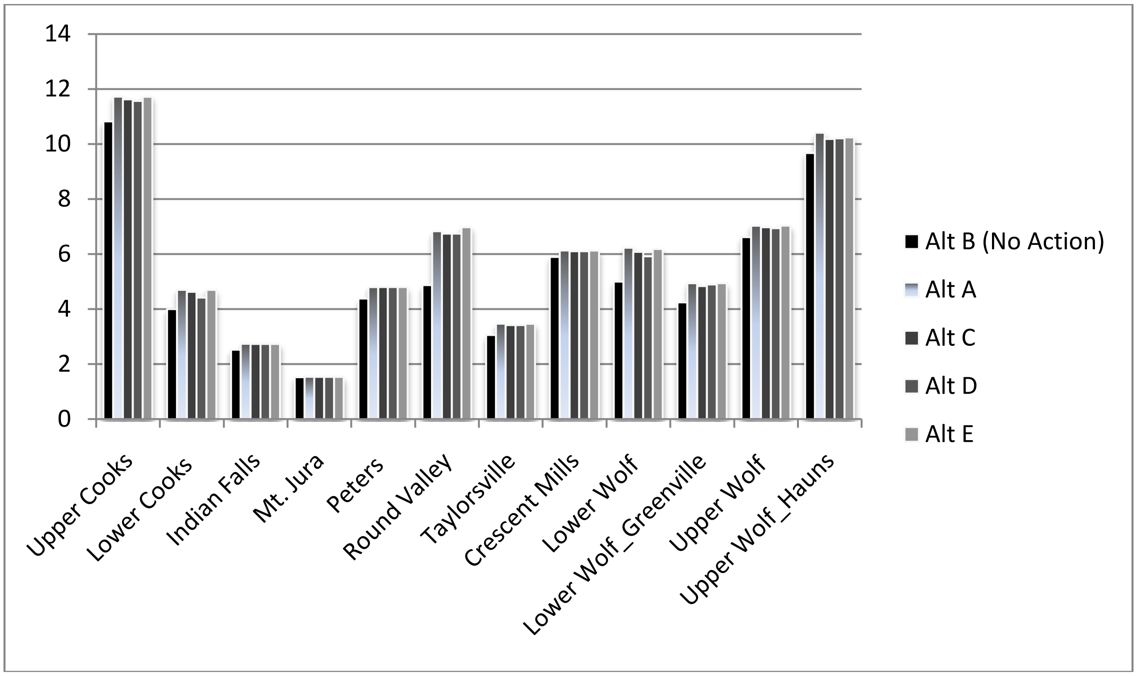


Figure 16. ERA Comparison by Alternative

Alternative A—Cumulative Watershed Effects, ERA Analysis

Direct, indirect, and cumulative effects of activities proposed in alternative A are discussed above in the section subtitled, “Effects Common to Alternatives A, C, D, and E”. Alternative A, the Proposed action, would construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs); implement 494 acres of area thinning (AT) outside of DFPZs; implement 284 acres of group selection (GS) within DFPZ and AT units. This alternative would also hand thin, pile, and burn within 9 acres of clustered lady’s slipper habitat and 76 acres of Constance’s rock cress habitat. Alternative A would additionally treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, late spring underburning and direct flaming with a backpack propane torch, and revegetation in select areas using native seed.

Under alternative A, the project-induced increase in ERA values were predicted to range from .01 to 16.3 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 12.8 to 97.6 percent of the TOC. Riparian area ERA value increases induced by alternative A would range from 0 to 1.5 percent depending on the subwatershed. Treatment activities would not cause any subwatersheds to exceed the TOC (Figure 16) and only one subwatershed (Upper Cooks) would approach the TOC. The Moonlight Fire and subsequent private salvage harvest activities raised the ERA value in the Upper Cooks Creek subwatershed to 90.2 percent of TOC, and the Keddie Ridge

Project would raise it another 8 percent. Consequently, it is at a high risk for detrimental watershed effects.

A closer look in the field at riparian areas for the Upper Cooks watershed indicate that these areas are stable and well-vegetated and would provide effective buffers for any potential project-generated sediment delivery. Proposed road reconstruction within this watershed would eliminate occurrences where road drainage enters stream courses. The observed existing condition of stream channels and adjacent riparian buffers, along with implementation of project BMPs and design features, assure that significant impacts to water quality and beneficial uses would not occur in this subwatershed. An adverse cumulative watershed effect due to implementation of alternative A is not expected for any of the project subwatersheds.

The Round Valley Reservoir subwatershed, the municipal water supply for Greeneville, is projected to experience the greatest increase in ERA—16.3 percent, bringing the ERA value up to 6.83 which equates to merely 56.9 percent of the 12.0 ERA threshold. This subwatershed is also projected to experience the highest riparian area ERA increase, 1.5 percent above existing condition and therefore pose a greater risk for cumulative effects. However, for purposes of the CWE analysis, it is important to mention that the internal equipment exclusion zones of RHCAs and were not removed from the total treatment acreage proposed in action alternatives. Therefore, ERA values for sensitive areas are conservative estimates within the analysis subwatersheds. Field surveys of the watersheds and associated stream systems that are above or near the TOC were conducted to verify stream channel and hillslope conditions and properly select project design elements that would reduce the risk of detrimental effects to the soil and water resources. RHCA and SMZ equipment exclusion zones would be delineated out and avoided in accordance to the equipment restriction zones defined in Table 70. Refer to appendix H of the final EIS for a complete list of standard management requirements associated with RHCAs.

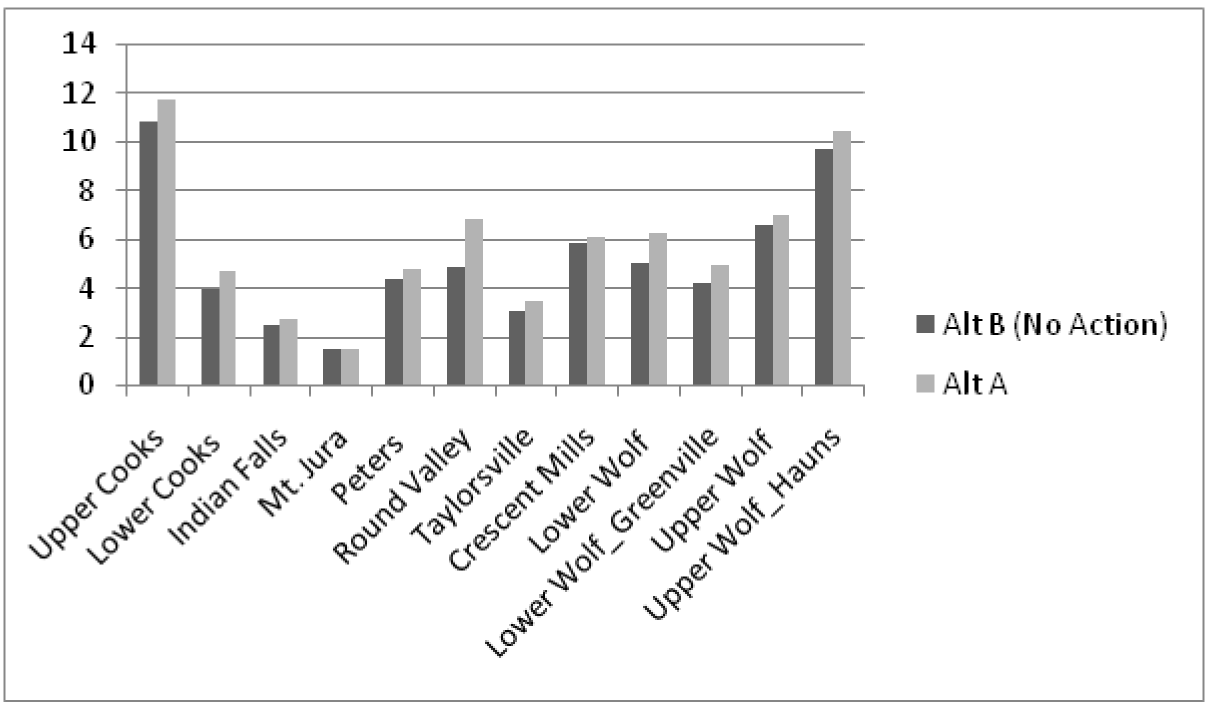


Figure 17. ERA of Alternative A Compared to the No Action Alternative

Alternative B—Cumulative Watershed Effects, ERA Analysis

Consequences of the no action alternative are thoroughly covered in the “Direct, Indirect, and Cumulative Effects of DFPZ and WUI Fuels Reduction Treatments (alternative B)” section above.

Alternative C—Cumulative Watershed Effects, ERA Analysis

Direct, indirect, and cumulative effects of activities proposed in alternative C are discussed above in the section subtitled, “Effects Common to Alternatives A, C, D, and E”. Alternative C, the non commercial funding alternative, is required in all projects with purpose and needs that include fuels reduction and excludes any activities other than fuels reduction to meet the project purpose and needs. Alternative C proposes 5,431 acres of DFPZ construction and 522 acres of AT outside of DFPZs, while retaining all live trees greater than or equal to 12 inches in both DFPZs and AT units.

ERA values for this alternative (Figure 18) are only slightly less than the Proposed action (alternative A) primarily due to the lack of the group selection (GS) prescription. The project-induced increase in ERA values were predicted to range from .01 to 15.6 percent of the TOC depending on the subwatershed. Riparian area ERA value increases induced by alternative C would range from 0 to 1.5 percent of the land area, also depending on the subwatershed (refer to “Alternative A—Cumulative Watershed Effects, ERA Analysis” for an explanation of the greater risk of cumulative effects).

Subwatershed cumulative ERA values would range from 12.8 to 96.8 percent of the TOC. The Upper Cooks Creek subwatershed is the only one that approaches TOC, and is discussed in the “Alternative A—Cumulative Watershed Effects, ERA Analysis” section above. Alternative C also neglects to treat noxious weeds with herbicides, which could allow for the spread of noxious weeds over time. In particular, the spread of Canada thistle in riparian areas could decrease the diversity and productivity of native and desired nonnative riparian plant communities.

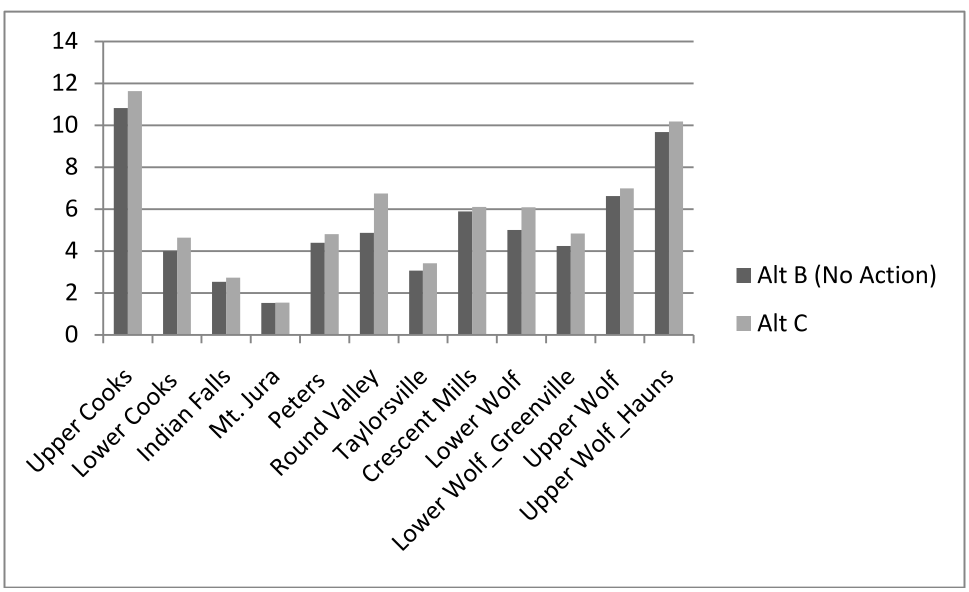


Figure 18. ERA of Alternative C Compared to the No Action Alternative

Alternative D—Cumulative Watershed Effects, ERA Analysis

Alternative D (2001 SNFPA Framework alternative) was requested for analysis during the scoping process. This alternative would construct 4,976 acres of DFPZ; implement 467 acres of AT outside of DFPZ units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory. This alternative would also treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. With respect to cumulative watershed effects, alternative D is most similar to alternative C—neither proposes group selection (GS) units and ERA values (Figure 19) consequently are similar and are discussed in the previous alternative. Riparian area ERA value increases induced by alternative D would range from 0 to 1.48 percent of the land area, depending on the subwatershed. These increases are slightly lower than RHCA ERA values for the other action alternatives due to fewer proposed acres of RHCA treatment (refer to "Alternative A—Cumulative Watershed Effects, ERA Analysis" for an explanation of the greater risk of cumulative effects).

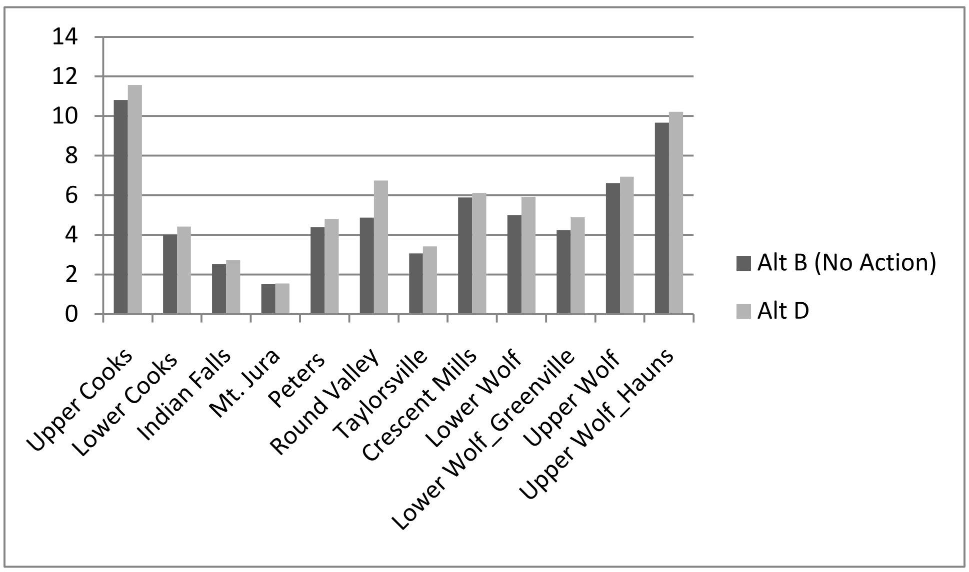


Figure 19. ERA of Alternative D Compared to the No Action Alternative

Alternative E—Cumulative Watershed Effects, ERA Analysis

Alternative E (2004 SNFPA ROD consistent alternative) was also requested for analysis during scoping and analyzes the maximum treatment allowed under the Herger-Feinstein Quincy Library Group Act. It would construct 5,112 acres of DFPZs; implement 513 acres of AT outside of DFPZ units; implement 328 acres of GS within DFPZ and AT units; and hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat and 76 acres of Constance's rock cress habitat. Alternative E would treat 90 acres of noxious weed infestations using a combination of hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicide use is proposed under alternative E. Cumulative watershed effects are expected to mirror those of alternative A, with a higher ERA value (Figure 20) in the Round Valley Reservoir subwatershed due to a larger amount of group selection (GS) acres proposed in alternative E. A discussion of activities affecting Round Valley Reservoir can be found in the “Alternative A—Cumulative Watershed Effects, ERA” analysis above. Riparian area ERA value increases induced by alternative E would range from 0 to 1.5 percent of the land area, also depending on the subwatershed (refer to “Alternative A—Cumulative Watershed Effects, ERA Analysis” for an explanation of the greater risk of cumulative effects).

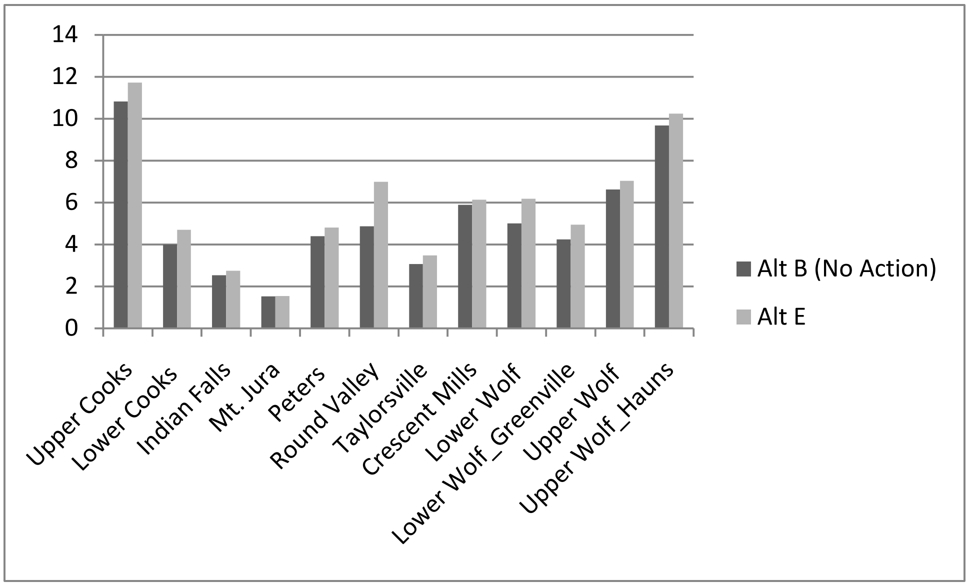


Figure 20. ERA of Alternative E Compared to the No Action Alternative

Botanical Resources

Introduction

The purpose of this section is to present a summary of the effects of the proposed project on botanically sensitive resources within the Botany analysis area. Throughout this section, the term “rare species” is used to refer to federally Endangered, Threatened, and Candidate plant species and Forest Service Region 5 Sensitive species. A complete discussion of effects to these species, as well as to Plumas National Forest special interest species, is provided in the “Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species” (USDA 2011f), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

Federal Laws

Endangered Species Act (16 USC 1531 et seq.): Under this act, federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to (a) jeopardize the continued existence of any listed species or (b) result in the destruction or adverse modification of a listed species’ designated critical habitat. Section 7 of the act requires federal agencies to consult the U.S. Fish and

Wildlife Service concerning listed (i.e. threatened or endangered) plant species that fall under their jurisdiction.

Forest Service Manual (FSM) Direction

FSM Section 2670 (USDA 2005a): provides policy for the protection of sensitive species and calls for the development and implementation of management practices to ensure that species do not become threatened or endangered because of Forest Service actions. It requires a review of all activities or programs that are planned, funded, executed, or permitted for possible effects on federally listed or U.S. Forest Service sensitive species (FSM 2672.4, USDA 2005a).

Forest Plan

Plumas NF Land Management Plan (USDA 1988, 1999b, 2004b): provides management direction for all Plumas NF Sensitive plants; that direction is to "maintain viable populations of sensitive plant species" (USDA 1988). The 1988 Forest Plan also provides forest-wide standards and guidelines to:

- protect Sensitive and Special Interest plant species as needed to maintain viability;
- inventory and monitor Sensitive plant populations on an individual project basis; and
- develop species management guidelines to identify population goals and compatible management activities / prescriptions that will maintain viability.

Management direction for sensitive plant species on the Plumas NF is also provided in the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (USDA 1999a) and the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (USDA 2004a). The standards and guidelines provided in the SNFPA include conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adhering to the Regional Native Plant Policy (USDA 2004a).

Interim Management Prescriptions

Individual species conservation strategies, or species management guidelines, for the Plumas NF have not been completed for most of the Forest's Sensitive species. Until these conservation strategies have been completed, the Plumas NF has developed Interim Management Prescriptions (USDA 2007c) that will be followed to ensure compliance with the Plumas LRMP.

Effects Analysis Methodology

Geographic Area Evaluated

The area analyzed in this document is referred to as the "Botany analysis area"; it encompasses approximately 64,000 acres and consists of all proposed treatment units and the area within one mile of treatment unit boundaries. This area was chosen to capture all rare plants that occur (a) within the proposed treatment units or (b) have suitable habitat within the Keddie Ridge Project area as well as a source population (i.e. potential for seed dispersal) located within close proximity to the proposed activities.

Species Analyzed

Those species present within the Botany analysis area were considered to have the highest potential to be impacted by the proposed project activities. Conversely, species outside of the analysis area were not considered to have a high likelihood of being impacted by the proposed project either directly, indirectly, or cumulatively. Table 71 lists all of the rare species that have been documented within the Botany analysis area. A detailed analysis of effects to these species is provided in the Biological Evaluation (USDA 2011f), which is included in the Keddie Ridge Project record. This document presents the analysis for only those rare species that occur within the proposed treatment units (Table 71).

Table 71. Rare Species Known within Proposed Treatment Units and the Keddie Ridge Botany Analysis Area

Species	Common Name	Listing Status	Known within the Analysis Area	Known within the Treatment Units
Arabis constancei	Constance's rock cress	Sensitive	X	X
Astragalus webberi	Webber's milkvetch	Sensitive	X	
Cypripedium fasciculatum	clustered lady's-slipper	Sensitive	X	X
Cypripedium montanum	mountain lady's-slipper	Sensitive	X	
Lupinus dalesiae	Quincy lupine	Sensitive	X	X
Oreostemma elatum	Plumas alpine-aster	Sensitive	X	X
Penstemon personatus	closed-throated beardtongue	Sensitive	X	

Specific Methodology

The analysis of effects on rare plant species was a three-step process (FSM 2672.43; USDA 2005a). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas NF (U.S. Fish and Wildlife 2010), USDA Forest Service Region 5 Sensitive Species List (USDA 2006a), Plumas NF rare plant records and vegetation maps, and California Natural Diversity Database records (CNDDB 2010).

The second step was field reconnaissance surveys. To date, field surveys have been conducted on approximately 16,500 acres within the Botany analysis area; this includes all of the proposed vegetation and noxious weed treatment units. For those areas outside of the surveyed areas, but within the Botany analysis area, species occurrence information was compiled using the California Natural Diversity Database (2010), Plumas NF rare plant records, and past survey reports.

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence and habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—effects analysis. Data were imported into a Global Information System (GIS) and used to analyze proximity to the proposed treatments and identify direct and indirect effects.

Data Sources

Basic information describing the life history, ecology, pollination biology, and specific habitat requirements is lacking for most of the Sensitive species that occur within the Botany analysis area. The scientific literature and internal government documents (i.e. species-specific Conservation Assessments) were utilized for the analysis whenever available; however more frequently the analysis of effects was based on observations by qualified individuals, field experience, unpublished monitoring results, and studies of comparable species.

Botany Indicator Measures

The indicator measures used in the effects analysis for rare plant species included the number of occurrences and the amount of suitable habitat impacted; these measures were similar across all of the action alternatives.

Types and Duration of Impacts

Direct Effects

Direct effects occur when plants are physically impacted. Examples of proposed treatment activities that have the potential to directly affect rare plants include timber falling; crushing by vehicles or equipment; application of borax or herbicides; temporary road and landing construction; and prescribed fire treatments. These actions can result in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, or uprooting plants.

Indirect Effects

Indirect effects are separated from an action in either time or space. These effects, which can be beneficial or detrimental to rare species, may include changes in vegetation composition, successional patterns, fire regimes, or the distribution and abundance of noxious weeds. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance and tend to occupy interior forest habitats with high canopy cover. In contrast, for those species that tolerate or are dependent upon some level of disturbance and inhabit gaps and forest openings, treatments may have beneficial indirect effects. For all rare species, negative effects may occur if prescribed burns are too hot; this has the potential to kill the seedbank and sterilize the soil. Burning hand or machine piles can also alter soil biotic and chemical properties for a number of years (Korb et al. 2004), which in turn greatly influences the degree and type of plant colonization into the fire-scarred site. Other indirect effects that are associated with herbicide treatments may include impacts to pollinators or mycorrhizae (fungi) that are associated with rare species.

Cumulative Effects

A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 section 15.1).

One crucial step in assessing cumulative impacts on a particular resource is to compare the current condition of the resource (i.e. rare plants) and the projected changes as a result of management activities (i.e. timber harvest) to the natural variability in the resources and processes of concern (MacDonald 2000). This assessment is particularly difficult for rare plant species because long-term data are often lacking. In addition, the habitats in which many rare plant species are presently found have a long history of disturbance, making an undisturbed reference difficult to find. For some rare plants, particularly those that do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site change is an effective way of reducing the potential for larger-scale cumulative impact (MacDonald 2000). If the greatest impact on a rare species is both local and immediate, then this is the scale at which the effect is easiest to detect (MacDonald 2000).

Undeniably, past, present, and future activities have and will continue to alter rare plant populations and their habitats to various degrees; however, the approach taken in this analysis is that, if direct and indirect adverse effects on rare plant species in the Keddie Ridge Project are minimal or would not occur, then they would not contribute substantially to cumulative effects on the species. In addition, the effects of future projects would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place

Duration of Effects

It is difficult to state with certainty when the effects of the proposed treatments would no longer be altering the life history dynamics (i.e. germination, seed production, etc.) of the rare species considered in this analysis. One method to estimate duration of effects is to assume that the effects of the action alternatives last as long as they are, singly or in combination with other anticipated effects, distinguishable from the effects of the no action alternative. Using this as an assumption, the duration used to estimate effects in this analysis is the recovery time of the vegetation to near baseline (current) conditions, which is approximately 100 years for group selection treatments and 50 years for fuel treatments.

The additive effects of past actions (such as wildfires, wildfire suppression, timber harvest, mining, nonnative plant introductions, and ranching) have shaped the present landscape and corresponding populations of rare plants; however, data describing the past distribution and abundance of rare plant species is extremely limited, making it impossible to quantify the effects of historic activities on the resources and conditions that are present today. Undoubtedly, some plant species have always been rare due to particular ecological requirements or geographic isolation. It is also likely that past actions have caused some species to become rarer and encouraged others to become more common. Within the Botany analysis area, documentation of rare plant surveys began in the early 1980s; therefore, the baseline used for the effects analysis of past activities is 30 years.

Affected Environment

Rare Plant Species

Constance's rock cress (*Arabis constancei)*

Constance's rock-cress is a strict serpentine endemic (Safford et al. 2005) that is considered to be seriously threatened in California (List 1B.1; CNPS 2010). It is known from 55 occurrences, which are scattered throughout several parallel bands of serpentine in Plumas and Lassen Counties. All but one of these occurrences are located on the Plumas NF; the occurrence outside of the Plumas NF is in the southernmost part of the Lassen NF (CNDDB 2010).

Occurrences are found primarily in undisturbed sites that are situated between 3,200 and 6,600 feet in elevation. They range in size from a few individuals on small serpentine outcrops to hundreds of individuals within larger areas of more productive serpentine soils. Occurrences that have not been impacted by management activities appear relatively stable over time; however analyses of monitoring data collected over a 20 year time period suggest that the number of plants can fluctuate from year to year, possibly in response to variation in precipitation or other climatic variables (USDA 2007b, 2008b).

Six occurrences of Constance’s rock cress, covering approximately 162 acres, have been documented within the Botany analysis area. Two occurrences, covering approximately 72 acres, are within treatment units 64 and 71 (Table 72). Hand thinning treatments, which have been designed to enhance Constance’s rock cress habitat, are proposed within these two occurrences. Constance’s rock cress does not occur within any of the proposed noxious weed treatment units.

Table 72. Comparison of Constance's Rock-Cress Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Arabis constancei	G3[1]	55	54	6	2

[1] G3 = vulnerable to extirpation or extinction; 21 to 80 occurrences, OR 3,000 to 10,000 individuals, OR 10,000 to 50,000 acres (NatureServe 2009)

Clustered lady’s-slipper (*Cypripedium fasciculatum)*

This orchid has a wide distribution that extends from British Columbia, south to the Sierra Nevada and Coast Ranges of California, and east to the Rocky Mountains. While the distribution of this species is broad, occurrences are often small and widely scattered. In California, the highest distribution of clustered lady’s-slipper is on the Klamath and Plumas National Forests. There are 148 occurrences on the Plumas NF; these range in size from one to over 3,000 stems. A total of 200 occurrences have also been recorded on the Six Rivers, Shasta-Trinity, Klamath, Mendocino, and Tahoe National Forests (Kaye and Cramer 2005).

In California, clustered lady’s-slipper is most commonly associated with mixed conifer forests in the mid-to-late stages of successional development. On the Plumas NF, plants most frequently occur in microsites with moist soils, steep slopes, sufficient dogwood (*Cornus nuttallii*) cover, and a relatively open overstory canopy (Brown 2008). Clustered lady’s-slipper orchids lack physiological adaptations to regulate and tolerate drought and heat stress; therefore they depend on species, such as dogwoods, to limit the amount of direct solar radiation that reaches the forest floor (Brown 2008). Mycorrhizal fungi play a pivotal role in the biology of orchids and several stages in the orchid's life-cycle, particularly the early stages of seedling development, depend on mycorrhizal fungal symbioses.

Clustered lady's-slipper appears intolerant of disturbances that directly reduce the duff layer and expose or damage the plant's rhizomes (underground stems) or mycorrhizal symbionts. It is usually found in areas that have not been disturbed, or in areas where the disturbance was light or in the distant past. Clustered lady's-slipper orchids appear to tolerate, and in some cases even benefit from, low severity fires. In contrast, high severity fires that eliminate the duff layer or destroy the overstory canopy have been shown to severely impact or kill individuals (Vance 2005).

The overall trend for this species is thought to be declining. In a recent population viability analysis of Oregon occurrences, Thorpe et al. (2010) determined that 59 percent of clustered lady's slipper populations had declined in size and 31 percent fell to zero. They also determined that smaller populations (less than 10 individuals) had a higher rate of extinction compared to larger populations. The primary threat to this species is disturbance that severely alters the light and soil moisture regime at the microsite level. Examples of other threats include: timber harvest activities that remove most of the overstory canopy; soil compaction from equipment and vehicles; high intensity, stand-replacing wildfires; and illegal collection (Vance 2005). Clustered lady's-slipper orchids can also be negatively impacted by dense, homogenous stand conditions where fire has been excluded for over a century (Brown 2008).

Seven occurrences of clustered lady's-slipper, covering approximately 7.6 acres, fall within the Botany analysis area. Of these, five occurrences (covering less than 0.5 acre total) are within treatment units (Table 73). These sites are proposed for habitat enhancement treatments, which include hand thinning of small diameter trees (i.e. those less than 8 inches DBH) in close proximity to orchids and underburning. No occurrences are within any of the proposed noxious weed treatment units.

Table 73. Comparison of Clustered Lady's-Slipper Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Cypripedium fasciculatum	G4[1]	348	148	7	5

[1] G4 = apparently secure; factors exist to cause concern, such as limited habitat or population threat (NatureServe 2009)

Quincy lupine (*Lupinus dalesiae)*

This perennial lupine species is known to occur in Plumas County and in isolated occurrences in Sierra and Yuba counties in California. Within this limited range, Quincy lupine is locally abundant. There are currently 255 occurrences documented on the Plumas NF. Outside of the Plumas NF, there are 22 occurrences, all of which occur on lands adjacent to the National Forest.

Quincy lupine is found in a variety of habitats that include undisturbed and disturbed sites (such as old skid trails and road cut banks), openings in chaparral, cismontane woodlands, and mixed conifer forests. Recent visits to old project areas have shown that this species tolerates and even thrives on disturbance;

however the intensity, extent, or frequency of the disturbance associated with these occurrences has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes.

The trend for this plant is stable. Threats include road construction and maintenance; timber harvest, release, and site preparation activities; mining; off-highway vehicle use; and development on private lands. The California Native Plant Society recently lowered the listing status of Quincy lupine (from List 1B to List 4) based on the number of mapped occurrences in the California Fish and Game's California Natural Diversity Database (CNDDB).

Three occurrences of Quincy lupine, covering approximately 45 acres, have been documented within the Keddie Ridge botany analysis area; one occurrence, comprised of six sub-occurrences and covering less than a tenth of an acre, is within proposed treatment units 78 (a and b) and 89 (Table 74). No occurrences are within any of the proposed noxious weed treatment units.

Table 74. Comparison of Quincy Lupine Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Lupinus dalesiae	G3[1]	277	255	3	1
[1] G3 = vulnerable to extirpation or extinction; 21 to 80 occurrences, OR 3,000 to 10,000 individuals, OR 10,000 to 50,000 acres					

Plumas alpine-aster (*Oreostemma elatum*)

Plumas alpine-aster occupies wet meadows, fens, and seeps within the upper montane coniferous forests of Plumas, Lassen, and Sierra counties. This perennial plant is known from 17 occurrences in California, 14 of which are located on the Plumas NF (CNDDB 2010). The California Native Plant Society lists Plumas alpine-aster as a 1B.2 species, which indicates that it is fairly endangered in California (CNPS 2010).

Plumas alpine-aster is found between 3,300 and 6,900 feet in elevation. Occurrences, which range in size from 25 square feet to over four acres, are typically found in undisturbed sites that have open overstory canopies and high soil moisture. Threats from management activities include mining, road building, livestock grazing, and recreation activities.

Six occurrences of Plumas alpine-aster, covering approximately 9.4 acres, have been documented within the Keddie Ridge botany analysis area; a small portion (0.05 acre) of two occurrences, fall within proposed treatment units 6 and 11 (Table 75). No occurrences are within any of the proposed noxious weed treatment units.

Table 75. A Comparison of Plumas Alpine-Aster Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Oreostemma elatum	G2 [1]	17	14	6	2
[1] G2 = imperiled; 6-20 viable occurrences, OR 1,000 to 3,000 individuals, OR 2,000 to 10,000 acres (NatureServe 2009).					

Environmental Consequences

General Effects on Rare Plant Species

The following provides a discussion of the direct, indirect, and cumulative effects that are applicable to all rare plant species considered in this analysis. A general discussion of cumulative effects (for all action alternatives) on rare plant species is also provided. Species-specific effects are discussed in the section titled "Environmental Consequences: Effects on Specific Rare Plant Species". The effects of the vegetation, fuels, and noxious weed treatments on rare species were similar across all action alternatives; therefore, this discussion is organized to *highlight differences* between the no action alternative and action alternatives A, C, D, and E.

Alternative B (No Action)

Direct Effects

No direct effects are anticipated because no project-related activities would be implemented.

Indirect Effects

Stands would continue to grow and become more dense, resulting in increased shading, duff, fuels accumulation, and canopy closure. These conditions could negatively impact the rare plant species that have been documented within the Botany analysis area by reducing the quality of existing habitat as well as the amount of suitable, but unoccupied habitat. These stand conditions and the continued exclusion of fire would also increase the risk of catastrophic wildfire, which could have detrimental effects on all of the rare species within the Botany analysis area.

Under this alternative, the existing noxious weed infestations would continue to expand along roadsides, in forest openings, along riparian corridors, into meadows, and within other areas of suitable habitat. Noxious weed species pose a serious threat to ecosystem function because of their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed establishment and spread in the Botany analysis area has the potential to negatively affect suitable habitat, not only for rare species, but also for all native plant species.

Alternatives A, C, D, and E (Action Alternatives)

Direct Effects of Vegetation and Fuel Treatments

Direct effects would be avoided or reduced for rare plant species to a level compatible with each species' ecology by incorporating the protection measures for individual species found in Appendix H – Standard Management Requirements and Monitoring.

Direct Effects of Herbicide Treatments

The direct effect of herbicides on rare species is considered negligible due to a combination of factors. First, all of the rare plant occurrences are greater than 0.9 miles from any of the proposed herbicide or fungicide (i.e. borax) treatment locations (Table 76). Second, with the exception of Plumas alpine-aster, the rare plants discussed in this analysis are found in upland habitat types. The herbicide proposed for treatment in these areas is aminopyralid, which is a relatively selective herbicide that affects broadleaf species, particularly those in the sunflower family. Third, the methods proposed for application (wick and backpack) would greatly reduce the possibility of any direct effects on rare and non-target native species. These factors all drastically reduce the risk of direct effects from the proposed herbicide applications.

Table 76. Estimated Distances between Region 5 Forest Service Sensitive Plant Species and Proposed Herbicide Treatments

Sensitive Species	Distance (miles) to nearest:	
	proposed herbicide treatment	proposed Borax treatment
Arabis constancei **(Constance's rock cress)**	4.2	4.2
Cypripedium fasciculatum **(clustered lady's-slipper)**	3.1	4.4
Lupinus dalesiae **(Quincy lupine)**	4.1	4.1
Oreostemma elatum **(Plumas alpine-aster)**	0.9	5.7

The ecological effects of aminopyralid, glyphosate, and borax are discussed in detail in the SERA Risk Assessments (2003a, 2006, 2007) and the HFQLG Final Supplemental EIS (USDA 2003); this analysis tiers to these documents. In general, information regarding the direct effects of the fungicide, the two proposed herbicides, surfactant, and marker dye on rare plant species is almost nonexistent (USDA 2003a).

Both of the proposed herbicides are highly effective at killing target species. Aminopyralid is a selective herbicide that affects target (and some non-target) species by disrupting the plant's metabolism and growth. In contrast, glyphosate is a nonselective herbicide that has the potential to affect both target and non-target plant species by inhibiting or halting growth and disrupting cellular processes (SERA 2003). Although the primary component in borax (i.e. boron) is an essential trace element for terrestrial plants, excessive quantities can lead to adverse effects in plants including chlorosis of leaves, leaf necrosis, and decreased germination (SERA 2003).

The proposed surfactant (i.e. Competitor® or an equivalent formulation) is a modified vegetable oil, which is very unlikely to produce secondary breakdown products that would act as toxins to rare plant species. In addition, the proposed marker dye (i.e. Hi-light® Blue or an equivalent formulation) is a water-soluble dye that contains no listed hazardous substances (SERA 1997) and is unlikely to cause adverse effects on rare plant species.

For the remainder of this analysis, the discussion of effects resulting from herbicide application takes into consideration the effects of the herbicide's active and inert ingredients (the latter of which is water), metabolites, surfactant, and marker dye.

Indirect Effects of Vegetation and Fuel Treatments

The proposed treatments would have a minor but beneficial indirect effect on rare plant species in the Botany analysis area. Implementation of the action alternatives would result in reduced forest canopy and stand density, increased light to the forest floor, and reduced risk of high-intensity wildfire. These conditions would result in larger areas of suitable habitat for rare plant species across the Keddie Ridge Project area.

Noxious weed species are oftentimes classified as "pioneer" species or invaders. Disturbance, whether it is natural (i.e. a lightning-caused fire) or associated with project activities, often creates ideal conditions for weed introduction and establishment. Although rare plant species would be buffered from the direct effects of project activities, there is still the risk of an indirect effect from weed invasion from adjacent areas that have been disturbed. Under Alternatives A and C this risk is greatly reduced through implementation of the proposed noxious weed treatments.

Indirect Effects of Herbicide Treatments

The indirect effects of herbicides on rare plant species can include accidental spills, spray drift, surface runoff, or a combination of these factors. In general, the primary hazard to non-target terrestrial plant species is herbicide drift, which can be minimized by implementing the following design features: (1) avoidance through buffers, (2) spraying when the wind is absent or blowing away from the plants, and/or (3) using an application method other than spraying (USDA 2003a).

Applications of glyphosate in 0 to 5 mile per hour (mph) winds using a backpack sprayer have demonstrated that droplets can drift as far as 23 feet; applications made in a 15 mph wind have the potential to drift up to 68 feet (SERA 2003). Based on these calculations, the geographic distance between rare species and the proposed herbicide treatments (Table 76) is sufficient to significantly reduce the risk of indirect effects due to drift.

Another potential indirect effect on rare plant species would be if an herbicide treatment were to negatively impact pollinator species. To quantify the potential impact on pollinator species, a scenario was analyzed to examine the effect of directly spraying a honey bee (assuming 100 percent absorption and over 50 percent of the body surface) with both of the proposed herbicides (SERA 2003, 2007). The level of risk was determined using the "Hazard Quotient." A Hazard Quotient less than "1" is considered to be a low risk. The results of this analysis, which are presented in Table 77, indicate that there would be a low risk to honey bees using the chemicals, rates, and volumes proposed under alternatives A and D.

Table 77. Analysis of a Scenario Involving 100 Percent Absorption of Aminopyralid and Glyphosate by a Honey Bee [Data from SERA Risk Assessments (2003, 2007)]

Herbicide Scenario (100% absorption)	Hazard Quotient
Aminopyralid	0.02
Glyphosate	0.6

There has also been some concern regarding the toxicity of surfactants on terrestrial insects. This is primarily due to the effective spreading ability of these surfactants, which may amount to the physical effect of drowning (rather than any toxicological effects). Studies have indicated that the effect on terrestrial insects is highly dependent upon the dose (Bakke 2007). Surfactants are usually applied at very low rates and, because they are very effective, are usually not applied at high spray volumes (Bakke 2007); therefore, it is unlikely that insects would be exposed to the rates and doses of concern presented in the literature.

Under alternatives A and D, there would be a low risk that the proposed herbicides or surfactant would cause widespread effects on terrestrial insects due to (1) the need for a relatively high dose for a lethal effect, and (2) the fact that individual insects, rather than entire colonies or nests, would most likely be impacted (Bakke 2007).

Indirect Effects of Borax Treatments

The SERA risk assessment for borax indicates that there is a negligible risk of borax exposure to non-target plant species, even when applied at the maximum application rate used by the Forest Service (SERA 2006). In all of the exposure scenarios for terrestrial plants, including pesticide-sensitive species, the level of risk was found to be low (that is, a Hazard Quotient of less than one).

All Action Alternatives: Cumulative Effects on Rare Plant Species

The effects of past activities on rare plant species in the Botany analysis area are largely unknown. On the Plumas NF, rare plant surveys did not begin until the early 1980s. In many cases, even when project-level surveys were conducted, there is very little documentation that describes whether past projects avoided or protected rare plant species during project implementation. In addition to these unknowns, changes have been made to the Plumas NF Sensitive species list. Therefore, in order to incorporate the contribution of past activities into the cumulative effects of the proposed Keddie Ridge Project, this analysis uses the current abundance and distribution of rare plant species as a proxy for the impacts of past actions.

Over the past 30 years, the landscape in the Botany analysis area has experienced high levels of past activity and, consequently, high levels of past disturbance. For those species that occupy open habitats and are tolerant of some level of disturbance, it is possible that past activities in the Botany analysis area have had a beneficial effect by creating openings and areas of suitable habitat across the landscape. However, these activities have also created a highly disturbed landscape, which has increased the susceptibility to noxious weed introduction and spread and increased the overall risk to native plant communities and rare species. The data presented in Figure 21was used as a contextual framework for the analysis of cumulative effects; it presents the proportion of occurrences (both in California and on the

Plumas NF) that have the potential to be affected by the proposed treatments. Overall, less than 25 percent of the known rare plant occurrences fall within the Botany analysis area and less than 15 percent fall within proposed treatment units. Under all of the action alternatives, negative cumulative effects are minimized through implementation of species-specific design criteria.

If existing management guidelines (such as field surveys, protection of known rare plant locations, and implementation of noxious weed standard management requirements) remain in place, the effects of future projects are likely to be minimal or similar to those described in this analysis. Ongoing activities, such as woodcutting, hunting, and dispersed recreation activities, are not likely to make a significant impact on rare plant species; however, these activities may act as vectors for weed spread.

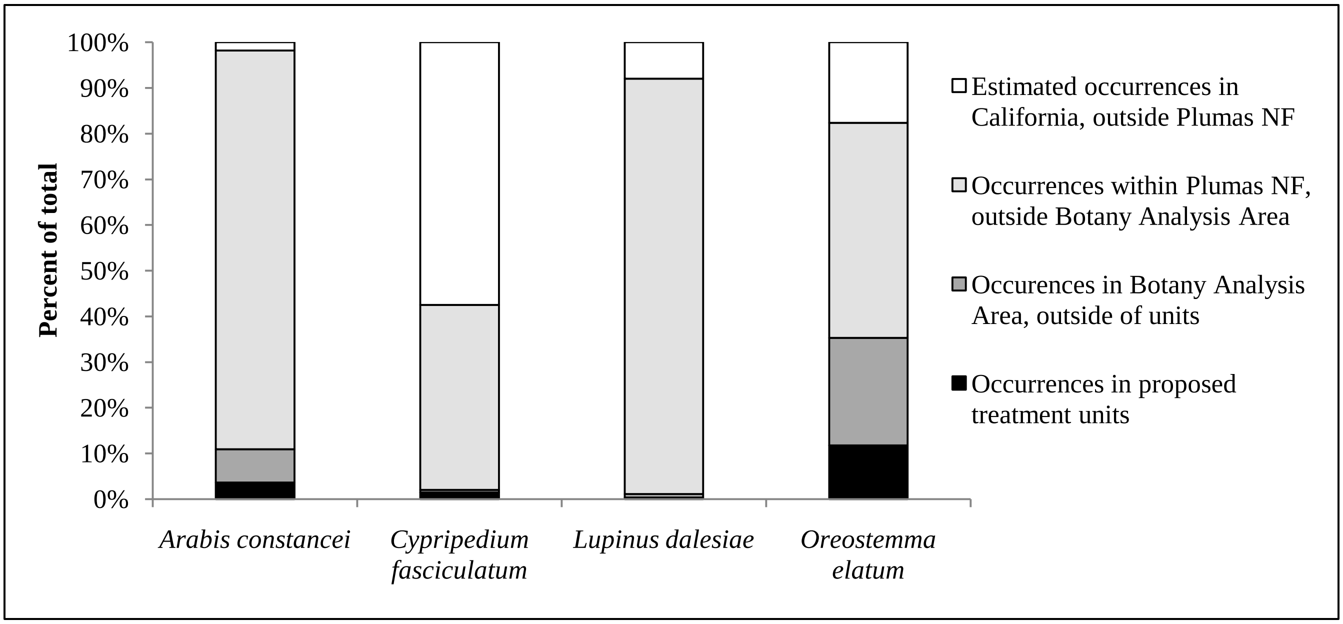


Figure 21. The Percentage of Total Known Occurrences (in California) Potentially Impacted by the Proposed Keddie Ridge Treatments

Effects on Specific Rare Plant Species

The following section provides a discussion of the direct, indirect, and cumulative effects specific to the four Sensitive species that are within the proposed treatment units. These effects are in addition to those discussed in the sections above. The effects of the vegetation, fuels, and noxious weed treatments on rare species were similar across all action alternatives; therefore, this discussion is organized to *highlight differences* between the no action alternative and the action alternatives A, C, D, and E.

Constance's Rock Cress (*Arabis constancei)*

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Under the no action alternative, small trees would not be hand thinned within the two Constance's rock cress occurrences. This could have two possible indirect effects on the species: (a) it may reduce the amount of suitable habitat within occurrences and (b) it could increase the risk and severity of wildfire.

The exclusion of fire for over a century within the rock cress occurrences has resulted in scattered areas with high concentrations of small conifer trees. Conifers on serpentine have been shown to modify the physical characteristics of their immediate surroundings by increasing the soil depth, organic matter, calcium to magnesium ratio, and lowering the pH (Chiarucci and DeDominicis 1995, Barton and Wallenstein 1997). These types of changes can result in the exclusion of rare serpentine species such as Constance's rock cress, which is most commonly found in open, sparsely vegetated areas with shallow serpentine soils. Under this alternative, areas with high concentrations of small trees, which have greater canopy cover, increased duff depth, and potentially altered soil characteristics, will continue to be marginal habitat for this rare species.

Although many serpentine species rely on fire to maintain the vegetative characteristics of their habitat, very few of the serpentine endemic plants in California are believed to be fire-dependent (Safford and Harrison 2004). In fact, many rare serpentine species are thought to be restricted to these harsh soils as a result of their intolerance to frequent or high intensity fires (Safford and Harrison 2008). Constance's rock cress appears to be no exception; monitoring data suggest that this species is tolerant of low intensity fire, but is intolerant of high intensity fire (USDA 2008c). Under the no action alternative, the risk of negative impacts from high-severity wildfire would not be reduced.

Cumulative Effects

Over the past 100 years, Constance's rock cress has undoubtedly lost individuals and areas of suitable habitat as a result of ground disturbing activities such as gold and gravel mining, timber harvest, road construction, and recreational off-highway vehicle use. Constance's rock cress has been on the Plumas NF Sensitive species list since at least 1979; therefore it is expected that projects implemented over the past 30 years would have avoided or mitigated negative effects to known occurrences. A review of past projects (appendix F) indicates that this has generally been the case. Five of the six occurrences in the Botany analysis area fall within the boundary of a past timber sale and all were avoided during project implementation. One exception to this was a mining operation expansion that occurred in the early 1980's. This project likely impacted both individuals and areas of suitable habitat within this occurrence, which occurs in the Botany analysis area but outside of the proposed Keddie Ridge Project units.

Although there may be some negative indirect effects from the no action alternative, the overall cumulative effects are expected to be minor. Even though existing occurrences would not be enhanced or protected from high-severity wildfire, the effects from the no action alternative would not be significant enough to reduce the overall viability of Constance's rock cress.

The effects of future projects on Constance's rock cress would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects are anticipated from mechanical thinning, group selection harvest, mastication, or noxious weed treatment because these activities will be prohibited within Constance's rock cress occurrences. The direct effects to Constance's rock cress from hand thinning are expected to be minimal because (a) very few individuals grow within the dense clusters of trees that are proposed for thinning and (b) all slash will be piled at a sufficient distance to protect individual plants and the seedbank from excessive heat. Some individual plants may be directly impacted from the prescribed fire treatments; however monitoring data collected before and after prescribed burning suggest that this species is tolerant of low to moderate intensity fire (USDA 2008c).

Indirect Effects

The proposed hand thinning and prescribed fire treatments could increase the amount of suitable habitat within Constance's rock cress occurrences by opening up the overstory canopy, reducing the duff layer, and thinning dense clusters of trees. Studies have shown that conifers can alter the physical characteristics of serpentine soils and make them less suitable for serpentine endemic plants (Chiarucci and DeDominicis 1995, Barton and Wallenstein 1997).

Although fires on serpentine tend to be smaller, less frequent, and less severe, periodic fire is believed to be an important factor for maintaining the vegetative characteristics of many serpentine habitats (i.e. Arabas 2000). Therefore, the reintroduction of prescribed fire will likely have a beneficial impact on Constance's rock cress habitat. Thinning the dense clusters of small trees prior to burning will reduce the fire intensity as well as the threat of future high-severity wildfires; both of these actions will reduce the potential for long-term negative impacts on Constance's rock cress.

The mechanical thinning proposed within Treatment Unit 71 will have a negligible indirect effect on Constance's rock cress habitat. The habitat within this unit is considered to be marginal for Constance's rock cress, due to historic rock deposition that has occurred over an older serpentine substrate. Due to the low quality of the serpentine substrate, thinning the surrounding stands will likely not create additional areas of suitable habitat for Constance's rock cress.

While serpentine habitats tend to be less invaded by non-native species than other habitat types, treatment activities still increase the risk of noxious weed introduction and spread within these occurrences (Harrison 1999). The control measures proposed under alternatives A and D will greatly reduce the risk of invasion into these habitats and the potential impact to Constance's rock cress. The indirect effect of herbicide treatments on Constance's rock cress occurrences would be negligible because the closest treatment site is over four miles away.

Cumulative Effects

This species has undoubtedly lost individuals and areas of suitable habitat over the past 100 years as a result of ground disturbing activities such as mining, timber harvest, road construction, and recreational off-highway vehicle use. Constance's rock cress has been on the Plumas National Forest Sensitive species list since at least 1979; therefore it is expected that projects implemented over the past 30 years would have avoided or mitigated negative effects to known occurrences. A review of past projects (appendix F) indicates that this has generally been the case. Five of the six occurrences in the Botany analysis area fall within the boundary of a past timber sale and all were avoided during project implementation. One exception to this was a mining operation expansion that occurred in the early 1980’s. Individuals and areas of suitable habitat were likely impacted within this occurrence, which occurs in the Botany analysis area but outside of the proposed Keddie Ridge Project units.

The two occurrences within the proposed treatment units represent approximately four percent of all known occurrences in California (Figure 21). Less than one percent (0.3 percent) of estimated suitable habitat for Constance’s rock cress has the potential to be impacted by the proposed project activities (i.e. falls within a treatment unit). It is expected that implementation of the action alternatives will not reduce the viability of Constance’s rock cress due to (a) this relatively small proportion of occurrences and suitable habitat impacted; (b) the low intensity of the proposed treatments; and (c) the potential for positive indirect effects. Overall, the cumulative effects from the proposed activities are expected to be minor.

The effects of future projects on Constance’s rock cress would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of determinations for Constance’s rock cress

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance’s rock cress). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance’s rock cress). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

Cypripedium fasciculatum **(clustered lady’s-slipper)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Under this alternative, the five clustered lady’s-slipper occurrences and their surrounding stands would not be treated. This could indirectly affect the species over the long-term by reducing the quality of occupied and unoccupied habitat and by increasing the risk of extirpation from high severity wildfires.

Fire has been excluded from most of the clustered lady's-slipper orchid sites within the Botany analysis area for over a century, which has resulted in densely forested stands with closed overstory canopies. Dense overstory canopy can negatively impact the abundance of understory species such as dogwood, which have been shown to have indirect impacts on the quality of orchid microsites (Brown 2008). In addition, dense clusters of small conifers can compete with clustered lady's-slippers for limited understory resources such as space, light, and water (Brown 2008). Under the no action alternative, stands would continue to become dense and could result in a decrease in habitat quality for clustered lady's slipper over the long-term.

The no action alternative would not implement treatments designed to reduce the risk of high-severity wildfires within clustered lady's-slipper orchid sites. An analysis of clustered lady's-slipper populations in northern California determined that over 75 percent of sites had an elevated risk of extirpation due to high intensity wildfire (Vance 2005). Research has also suggested that increased summer drought from climate change could increase both the frequency and severity of wildfires throughout the western United States (e.g. Whitlock et al. 2003, Marlon et al. 2009). These two factors (i.e. vulnerability to extinction from high-intensity fire and increased likelihood of wildfires) elevate the risk to clustered lady's slipper occurrences within the Keddie Ridge Project area. Severe wildfires could not only negatively impact individual plants, but could also reduce the availability of suitable habitat by removing the overstory canopy and adversely impacting soil conditions.

Cumulative Effects

Clustered lady's-slipper has likely lost individuals and a considerable amount of suitable habitat over the last 100 years due to human activities related to mining, logging, road building, fire suppression, and homesteading (Kaye and Cramer 2005). These activities, to one extent or another, have resulted in a reduction in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microclimate conditions.

Clustered lady's-slipper has been designated as a Plumas NF Sensitive or Special Interest species since the early 1980's. A review of past projects (appendix F) indicates that protection measures for this species were included when occurrences were known at the time of implementation. For example, of the four occurrences that fall within the boundary of a past timber harvest, only one was known (and consequently protected) at the time of project implementation; the remaining three occurrences, which were discovered only recently (after 2006), were not protected. This underscores the fact that many of the management activities that have occurred within the Botany analysis area have potentially impacted clustered lady's-slipper occurrences and areas of suitable habitat.

Overall, the cumulative effects from the no action alternative are expected to be negligible to minor, primarily because the direct and indirect effects are expected to be minor. Although existing occurrences would not be enhanced or protected from high-severity wildfire, the no action alternative would not significantly reduce the viability of clustered lady's-slipper.

The effects of future projects on clustered lady's-slipper would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects are anticipated from mechanical thinning, group selection harvest, mastication, or noxious weed treatment because these activities will be prohibited within clustered lady's-slipper orchid sites. The direct effects to clustered lady's-slipper from hand thinning are expected to be minor because individual plants will be avoided during implementation and hand piles will be placed at a sufficient distance from plants to ensure that radiant heat will not impact individuals or the surrounding duff layer. Some individual plants may be directly impacted from prescribed fire treatments; however surface fuels will be manipulated (i.e. pulled back) prior to treatment in order to reduce the fire intensity and consumption of the duff layer. Clustered lady's-slipper orchids appear to tolerate, and in some cases even benefit from, low severity fires; however their response has been shown to be highly dependent upon the characteristics of the site, as well as the intensity and duration of the burn.

Indirect Effects

The proposed hand thinning and prescribed fire treatments would increase the habitat quality within existing clustered lady's-slipper occurrences by: (a) increasing the amount of light that reaches understory species such as dogwood, which are thought to indirectly impact the quality of orchid microsites, and (b) removing small conifer trees (less than 8 inches DBH) that may compete with orchids for limited understory resources such as space, light, and water (Brown 2008). Under all of the action alternatives, hand thinning treatments within orchid sites are designed to maintain the essential components of the orchid's microsites; these include sufficient overstory canopy cover to reduce direct solar radiation to individual plants, decayed down logs and standing snags, an adequate duff layer, and undisturbed soils. Over the long-term, the proposed thinning treatments would also reduce the risk of negative impacts from high-severity wildfires, which could affect both individuals and areas of suitable habitat.

Five of the clustered lady's slipper occurrences are within units where mechanical thinning and group selection harvest is proposed. Although all of the known occurrences will be designated as control areas where these activities will be excluded, some areas of unoccupied suitable habitat may be negatively impacted by implementation of the action alternatives. In the short-term, areas where the overstory canopy is completely removed (i.e. in group selection units), would become unsuitable habitat for clustered lady's slippers.

The indirect effect of implementing the proposed herbicide treatments (under alternatives A and D) would be negligible because the closest treatment site is over three miles away (Table 76). While the proposed vegetation treatments will increase the risk of noxious weed introduction and spread into orchid sites, the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to clustered lady's-slipper orchids.

Cumulative Effects

Clustered lady's-slipper has likely lost individuals and a considerable amount of suitable habitat over the last 100 years due to human activities related to mining, logging, road building, fire suppression, and homesteading (Kaye and Cramer 2005). These activities have, to one extent or another, resulted in a reduction in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microclimate conditions.

Clustered lady's-slipper has been designated as a Plumas NF Sensitive or Special Interest species since the early 1980's. A review of past projects (appendix F) indicates that protection measures for this species were included when occurrences were known at the time of implementation. For example, of the four occurrences that fall within the boundary of a past timber harvest, only one was known (and consequently protected) at the time of project implementation; the remaining three occurrences, which were discovered only recently (after 2006), were not protected. This underscores the fact that many of the management activities that have occurred within the Botany analysis area have potentially impacted clustered lady's-slipper occurrences and areas of suitable habitat.

The five occurrences within the treatment units represent less than four percent of all known occurrences on the Plumas NF (

Figure 21). It is expected that implementation of the action alternatives will not reduce the viability of clustered lady's-slipper due to (a) this relatively small proportion of occurrences with the potential to be impacted; (b) the low intensity of the proposed treatments; and (c) the potential for positive indirect effects. Overall, the cumulative effects from the proposed activities are expected to be minor.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Clustered Lady's-slipper

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Cypripedium fasciculatum* (clustered lady's-slipper). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Cypripedium fasciculatum* (clustered lady's-slipper). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

***Lupinus dalesiae* (Quincy lupine)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Quincy lupine may be negatively affected by the no action alternative. This species is most commonly associated with open habitats, many of which have been previously disturbed. Although Quincy lupine has been found in undisturbed sites, it has not been documented in dense forest stands with high overstory canopy cover. Under the no action alternative, the number of trees within stands would continue to increase, resulting in areas with greater canopy cover, reduced light to the understory, and increased duff and litter deposition. Over time, this would decrease the habitat quality within existing Quincy lupine sites and result in a loss of suitable habitat for this species across the landscape.

Cumulative Effects

The ability of Quincy lupine to colonize both previously disturbed and undisturbed sites, and tolerate and even thrive on disturbance, suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory. The Quincy lupine occurrences within the Keddie Ridge Project area are found along road cuts, in old skid trails, previous timber sales, and within the perimeter of large, historic fires.

The three occurrences within the Botany analysis area represent one percent of all known occurrences on the Plumas NF and in California; the one occurrence within the proposed treatment units represents less than 0.5 percent of all known occurrences (Figure 21). Areas of suitable, but unoccupied habitat, exist in just under half (42 percent) of the proposed treatment units. Because of Quincy lupine's ability to tolerate a broad range of habitat conditions, this area represents only a small fraction (less than one percent) of the total estimated area of suitable habitat across the Plumas NF.

There would be no direct effect to Quincy lupine under the no action alternative; however the potential for indirect effects could result in negative cumulative effects over time. Under this alternative, additional areas of suitable habitat would not be created and the habitat within existing occurrences would not be enhanced. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

Quincy lupine is a perennial herb that is found in undisturbed and disturbed sites (i.e. old skid trails and road cut banks). Monitoring has demonstrated that this species tolerates and even thrives on disturbance. Individuals have often been found occupying areas that were previously disturbed by mechanical thinning activities or along road cut banks. Recent monitoring within group selection units found that the number of individuals increased following treatment, even when all of the overstory trees were removed and the plants were situated in the middle of a skid trail (USDA 2008a).

Some individual plants may be directly impacted by the hand thinning and prescribed fire treatments proposed in Units 78a, 78b, and 89. Pile burning may also impact individuals or the soil seed bank if located underneath or in close proximity to the pile (Korb et al. 2004). Overall, the likelihood of negative direct effects is considered low based on (a) the low intensity of the proposed treatments; (b) the positive response of Quincy lupine to disturbance; and (c) the small, scattered locations of Quincy lupine, which are found in openings where thinning activities are unlikely to take place.

Indirect Effects

The proposed project activities are expected to have a beneficial indirect effect on Quincy lupine. This species is most commonly associated with open habitats; it is not found under dense forest canopies. As mentioned above, Quincy lupine has been shown to readily colonize disturbed sites such harvest units, skid trails, and old roads. Past observations also demonstrate that populations respond favorably to both thinning and prescribed fire treatments. Based on these factors, the proposed treatments are expected to improve the habitat quality within existing sites and to increase the amount of suitable habitat for Quincy lupine across the landscape.

The indirect effect of implementing the proposed herbicide treatments would be negligible because the closest treatment site is over four miles away (Table 76). The proposed vegetation treatments will increase the risk of noxious weed introduction and spread into disturbed sites; however the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to Quincy lupine individuals and potential habitat.

Cumulative Effects

The ability of Quincy lupine to colonize both previously disturbed and undisturbed sites, and tolerate and even thrive on disturbance, suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory. The Quincy lupine occurrences within the Keddie Ridge Project area are found along road cuts, in old skid trails, previous timber sales, and within the perimeter of large, historic fires.

The three occurrences within the Botany analysis area represent one percent of all known occurrences on the Plumas NF and in California; the one occurrence within the proposed treatment units represents less than 0.5 percent of all known occurrences (

Figure 21). Areas of suitable, but unoccupied habitat, exist in just under half (42 percent) of the proposed treatment units. Because of Quincy lupine's ability to tolerate a broad range of habitat conditions, this area represents only a small fraction (less than one percent) of the total estimated area of suitable habitat across the Plumas NF.

Overall, the cumulative effects to this species are anticipated to be beneficial. Although implementation of the action alternatives may have some direct impacts on individuals, these effects will likely not be severe enough to negatively impact the long-term viability of Quincy lupine. This is based on the small percentage of sites with potential to be directly impacted, the species' high tolerance to disturbance, and the creation of additional areas of suitable habitat through implementation of the proposed treatments.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Quincy Lupine

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Lupinus dalesiae* (Quincy lupine). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Lupinus dalesiae* (Quincy lupine). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

Oreostemma elatum **(Plumas alpine-aster)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

The no action alternative is expected to have a negligible effect on Plumas alpine-aster. This species grows in wet meadows and small spring-fed forest openings where high soil moisture levels during the fire season and the dominance of fine fuels (i.e. grass-like species) greatly reduce the likelihood of high-severity fire (Dwire and Kauffman 2003). Based on this, the lack of treatments in adjacent stands is not expected to significantly alter the future wildfire risk or intensity within Plumas alpine-aster occurrences or areas of unoccupied suitable habitat.

Cumulative Effects

Plumas alpine-aster has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species relatively recently in 1998; therefore it is unknown whether projects implemented more than 12 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years (USDA 1988). In addition, none of the past projects (described in appendix F) occurred in or near the Plumas alpine-aster occurrences in the Botany analysis area. Based on these two factors, it is likely that the six Plumas alpine-aster occurrences have received little impact from management activities in the past few decades.

There would be no cumulative effects from the no action alternative because the direct and indirect effects are expected to be negligible. The effects of future projects on Plumas alpine-aster would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects will occur because the two Plumas alpine-aster occurrences will be flagged for avoidance.

Indirect Effects

The indirect effects from the action alternatives are anticipated to be negligible. Plumas alpine-aster is found in wet meadows and small spring-fed openings within forested habitats. These types of habitats differ from their surrounding uplands in moisture regime, microclimate, and vegetative composition (Pettit and Naiman 2007). In general, high soil moisture levels and the dominance of grass-like species (i.e. fine fuels) greatly reduce the risk of high-severity wildfire within these habitats. Based on this, the hand thinning and underburning treatments in adjacent stands are not expected to significantly alter the future wildfire risk or intensity within Plumas alpine-aster occurrences or unoccupied suitable habitat.

Positive effects of the proposed thinning treatments may include increased water percolation and groundwater, which could slightly increase the water availability within adjacent meadow habitats where Plumas alpine-aster is found. Occurrences and suitable habitat for Plumas alpine-aster will be avoided during project implementation; therefore the proposed activities are not expected to negatively affect the timing or hydrologic regime within areas of suitable habitat.

The indirect effect of implementing the proposed herbicide treatments (under alternatives A and D) would be negligible because the closest treatment site is 0.9 miles away (Table 76). Meadows and seeps are highly susceptible to invasion from noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense*). While the proposed treatments may increase the risk of noxious weed introduction and spread into these areas; the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to Plumas alpine-aster individuals and potential habitat.

Cumulative Effects

Plumas alpine-aster has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species relatively recently in 1998; therefore it is unknown whether projects implemented more than 12 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years

(USDA 1988). In addition, none of the past projects (described in Appendix F) occurred in or near the Plumas alpine-aster occurrences in the Botany analysis area. Based on these two factors, it is likely that the six Plumas alpine-aster occurrences have received little impact from management activities in the past few decades.

The six occurrences in the Botany analysis area represent 35 percent of the Plumas alpine-aster occurrences in California; the two occurrences within the treatment units represent approximately 12 percent of all known occurrences (Figure 21). All of these occurrences will be avoided during implementation of the action alternatives. In addition, areas of suitable habitat will be protected through implementation of best management practices (BMPs). Based on these protection measures, as well as the negligible direct and indirect effects to Plumas alpine-aster, no adverse cumulative effects are anticipated from implementation of the action alternatives.

The effects of future projects on Plumas alpine-aster would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Plumas Alpine-aster

No Action Alternative (B)

The no action alternative (B) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

Summary of Effects

The effects presented below are based on professional experience and judgment; the existing condition of botanical resources within the analysis area, and the potential impacts of the alternatives.

Alternative B (No Action)

- The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress), *Cypripedium fasciculatum* (clustered lady's-slipper), and *Lupinus dalesiae* (Quincy lupine). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.
- Alternative B (no action) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.
- Alternative B (no action) will not affect any other Region 5 Sensitive plant species or any Threatened, Endangered, or Candidate plant species. This determination is based on the absence of suitable habitat

within the project area for these species and the lack of individuals known or expected to occur within the project area.

Action Alternatives (A, C, D, and E)

- The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress), *Cypripedium fasciculatum* (clustered lady's-slipper), and *Lupinus dalesiae* (Quincy lupine). This determination is based on the potential for impacts to individuals and areas of suitable habitat.
- The Keddie Ridge Project action alternatives (A, C, D, and E) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.
- The action alternatives (A, C, D, and E) will not affect any other Region 5 Sensitive plant species or any Threatened, Endangered, or Candidate plant species. This determination is based on the absence of suitable habitat within the project area for these species and the lack of individuals known or expected to occur within the project area.

Compliance with the Forest Plan and Other Direction

All of the alternatives are consistent with the Forest Plan and other direction. Under these alternatives, sensitive plant species are protected as needed to maintain viability.

Noxious Weeds

Introduction

In 2003, the United States Forest Service identified invasive species as one of four critical threats to the nation's ecosystems (Bosworth 2003). Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed species have the potential to affect native plant species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) (Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard et al. 2000). Noxious weed infestations can also reduce the recreational or aesthetic value of native habitats.

Forest management activities, such as those associated with timber harvest, can contribute to the introduction and spread of noxious weed species by creating suitable environmental conditions for establishment and by acting as vectors for spread. The following section provides a discussion of the risk associated with noxious weed introduction and spread as a result of the proposed Keddie Ridge project. A complete assessment of noxious weed risk is appended to the Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (USDA 2011f), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Federal Acts and Orders

Executive Order 13112 (1999)**-** directs federal agencies to prevent the introduction of invasive species; detect and respond rapidly to control such species; and to minimize the economic, ecological, and human health impacts from invasive species on NFS lands.

Forest Service Manual (FSM) Direction

FSM Section 2081.03 **-** directs the U.S. Forest Service to prevent the introduction and establishment of noxious weeds; contain and suppress existing weed infestations; and to educate and cooperate with agencies, land owners, land managers, and members of the public to control weeds. It also requires a weed risk assessment for any proposed ground disturbing activities and calls for the incorporation of noxious weed control measures into any project that has a moderate to high risk of introducing or spreading noxious weeds.

Forest Plan

Plumas NF Land Management Plan (USDA 1988, 1999a, 2004b): The Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (USDA 2003a) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental EIS (USDA 2004b) amended the management direction in the Forest Plan to address management of noxious weeds and invasive exotic (nonnative) species.

The HFQLG EIS provides direction for noxious weed and invasive exotic weed management; this direction is to “manage National Forest System lands so that management activities do not introduce or spread noxious or invasive exotic weeds.” The HFQLG EIS also provides guidelines to follow during project planning and implementation. These guidelines are included as standard management requirements in Appendix H of this document.

The Record of Decision (ROD) for the 2004 SNFPA established goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 2081.2. The three priorities include:

1. Prevent the introduction of new invaders.
2. Conduct early treatment of new infestations.
3. Contain and control established infestations.

Provisions for implementing these goals are embodied in the noxious weed management standards and guidelines of the SNFPA 2004 Record of Decision.

Effects Analysis Methodology

Geographic Area Evaluated

The geographic area used to analyze the effects to noxious weeds is referred to as the “Botany analysis area”; it encompasses approximately 64,000 acres and consists of all proposed treatment units, including access roads to the treatment units, and the area within one mile of the treatment unit boundaries. This area was selected to focus the analysis on weed species and infestations with the highest potential for impacts within the project area. In general, weed infestations located in close proximity to proposed treatment units and access routes increase the probability of spread into treated areas as well as other parts of the Forest.

Methodology

The analysis of effects for noxious weeds followed a process similar to that described under the Botanical Resources section of this document. Field surveys were conducted within all of the proposed units and data were collected that described the spatial extent of infestations and the potential options for treatment.

The risk of noxious weed spread or introduction was evaluated for each proposed unit using the following factors: (a) amount of soil disturbance associated with the proposed project activities; (b) species invasiveness; (c) proximity to the proposed units; (d) proportion of infestations proposed for treatment; and (e) the effectiveness of the weed treatment measures. In general, a high risk was assigned based on the presence of weed infestations within a proposed unit; a high level of invasiveness; a large amount of soil disturbance associated with the proposed activities (i.e. group selections); and a lack of effective weed treatments.

Indicator Measures

The indicator measures used to compare the effects across the alternatives were: (a) the amount of soil disturbance associated with the proposed project activities; (b) the number and acres of weed sites treated; (c) the effectiveness of the proposed control treatment methods; and (d) the overall risk of noxious weed introduction and spread.

Assumptions

Recent reconnaissance surveys of noxious weed sites within the Botany analysis area suggest that many infestations have spread beyond their originally mapped boundaries; for example, within one proposed weed treatment unit, infestations increased from 2.4 acres to an estimated 4.4 acres over a period of eight years (Coppoletta, personal observation, 2010). To obtain an estimate of the amount of spread that could occur prior to project implementation, the scientific literature was reviewed and general rates of spread were estimated for each species (e.g. Roche 1992, Nuzzo 1997). These values were used to obtain an average rate of spread, which was then applied as a buffer to existing noxious weed polygons within the Botany analysis area. Consequently, all of the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years).

Affected Environment

Five invasive species of high management concern have been documented within the Botany analysis area. These weed species, which are known from roughly 118 locations, range in size from five square feet to over 25 acres. Table 78 lists the noxious weed species known to occur within the Botany analysis area. Also included in the table are the ratings from the California Department of Food and Agriculture’s noxious weed list (CDFA 2009b) and the California Invasive Plant Council’s invasive plant inventory (Cal-IPC 2006).

Table 78. Noxious Weed Species within the Botany Analysis Area

Species	Common Name	CDFA rating [1]	Cal-IPC rating[2]	Number of sites within:	
				Botany analysis area	Vegetation treatment units
Cardaria draba	hoary cress	B	Moderate	1	0
Centaurea solstitialis	yellow starthistle	C	High	53	40
Cirsium arvense	Canada thistle	B	Moderate	16	10
Cytisus scoparius	Scotch broom	C	High	4	0
Taeniatherum caput-medusae	Medusahead	C	High	44	30

[1] CDFA ratings - *A-listed weeds*: eradication or containment is required at the state or county level; *B-listed weeds*: eradication or containment is at the discretion of the County Agricultural Commissioner; *C-listed weeds*: eradication or containment required only when found in a nursery or at the discretion of the County Agricultural Commissioner.
[2] CalIPC ratings- *High*: attributes conducive to moderate to high rates of dispersal and establishment; usually widely distributed among and within ecosystems. *Moderate*: impacts substantial and apparent, but not severe; attributes conducive to moderate to high rates of dispersal; distribution may range from limited to widespread. *Limited* : ecological impacts are minor or information is insufficient to justify a higher rating, although they may cause significant problems in specific regions or habitats; attributes result in low to moderate rates of invasion; distribution generally limited, but may be locally persistent and problematic.

Cardaria draba (hoary cress)

In California, this deep-rooted perennial occupies disturbed habitats under 4,000 feet in elevation (Chipping and Bossard 2000). It is generally found in moderately moist, alkaline soils; however it can also tolerate a wide range of soil types and moisture regimes (CDFA 2009a).

Once introduced to a site, either through a seed or root fragment, hoary cress can rapidly expand through extension of lateral roots and shoot buds (USDA 2005b). Over the course of one year, a single plant growing in an open site can produce up to 455 shoots that cover an area of 12 feet in diameter (CDFA 2009a). Once established, seedlings quickly develop lateral roots, shoot buds, and tap roots, some of which reach a depth of 25 cm in less than one month. The mature root system of hoary cress can reach depths of three feet or more and can account for 75 percent of the plant’s total biomass (CDFA 2009a). This extensive root system enables plants to survive cold winter climates and periods of drought.

Seeds of hoary cress germinate in the fall after the first rains and are most commonly dispersed by wind, water, vehicles, and agricultural practices. Seeds can remain viable in the soil for up to three years (USDA 2005b).

There is one infestation of hoary cress, which covers approximately 0.2 acres, within the Botany analysis area. This infestation was hand-pulled and mowed on an annual basis between 2002 and 2005. Over this time period, the infestation increased from an estimated 300 plants to approximately 3,000 individuals. Due to the failure of these manual methods to control hoary cress, alternatives A and D propose a combination of mowing and herbicide treatment within this infestation. No treatments for hoary cress are proposed under alternatives B, C, and E due to the lack of feasible and effective non-herbicide alternatives.

Centaurea solstitialis (yellow starthistle)

This highly invasive, deep-rooted winter annual is considered a high priority for control and eradication in Plumas County as well as on the Plumas NF. In California alone, this invasive species is estimated to cover approximately 12 million acres of rangeland and wildland (Duncan and Clark 2005). Dense infestations of yellow starthistle have been shown to reduce the diversity and abundance of native plant species; decrease the value of wildlife habitat and forage; alter fuel characteristics and fire behavior; and deplete soil moisture reserves (Duncan and Clark 2005).

Yellow starthistle reproduces exclusively from seed, with most long-distance dispersal attributed to wildlife or human-related factors (Roche 1992). The control or eradication of this species requires elimination of seed production as well as depletion of the soil seedbank (i.e. seeds residing in the soil that have not germinated). The size of the seedbank is dependent upon the age of the infestation; experimental results suggest that seeds remain viable in the soil for three to ten years (DiTomaso et al. 2006). Yellow starthistle is the most abundant weed in the Botany analysis area (Table 79). It is very common in Indian Valley, which is in close proximity to many of the proposed treatment units. Of the 53 sites within the Botany analysis area, 10 are not proposed for treatment under any of the action alternatives because they are either on private property (1 site); within the boundary of a special use permit (4 sites); or are highly inaccessible (5 sites). Twenty of these yellow starthistle sites have been treated in the past with manual methods as part of the Mt. Hough noxious weed program. Of these, four have decreased and 16 have increased over time; fifteen are currently considered too large to treat with manual methods.

Cirsium arvense (Canada thistle)

This aggressive, perennial thistle is common throughout northern California, where it infests a variety of habitat and soil types (Bayer 2000). It is most competitive in moist, well-aerated, productive soil types, but can also tolerate dry habitats and sandy soil conditions (Bayer 2000). Canada thistle negatively affects native plant species through direct competition for nutrients, light, and water; production of allelopathic chemicals (compounds that inhibit the growth of other plants); and the accumulation of nitrates, which can cause poisoning in animals (Bayer 2000).

Canada thistle spreads either by seed or vegetatively by producing long horizontal underground roots that give rise to aerial shoots (Bossard et al. 2000). Canada thistle's extensive root system has been shown to produce over 66 feet of new roots over a two-year period, some of which have been shown to grow 15 to 20 feet deep. The rates of Canada thistle spread that are documented in the scientific literature range from less than two feet to over 40 feet per year (Donald 1990, Nuzzo 1997, Bond and Turner 2004, USGS 2005)

Canada thistle is a shade-intolerant species, and its growth has been shown to be discouraged in areas where there are low levels of disturbance and sufficient competition from native species. For example, in Rocky Mountain National Park, dry upslope conditions, thick canopies from woody species, and well-established grassy meadows inhibited Canada thistle invasion and population size over time (Beck 1994); however it was also noted that only a minor amount of disturbance (such as from elk grazing) was necessary to promote Canada thistle invasion and establishment.

There are 16 Canada thistle sites within the Botany analysis area. Of these, two are not proposed for treatment because they occur on private property. The remaining 14 sites, which cover an estimated 4.3 acres, are proposed for treatment under alternatives A and D with a combination of aminopyralid and glyphosate applications and prescribed fire. No treatments for Canada thistle are proposed under alternatives B, C, and E.

Cytisus scoparius (Scotch broom)

Since its introduction into California as a landscape ornamental in the mid to late 1800s, this yellow-flowered shrub has aggressively invaded many of the State's disturbed sites and natural areas (CDFA 2009a). Scotch broom is a strong competitor that can quickly form dense thickets, which decrease native plant diversity and have the potential to modify fire frequency and intensity (Bossard et al. 2000). The flowers and seeds of this shrub are also toxic to humans and livestock (CDFA 2009a).

Scotch broom spreads by producing large quantities of seed; one medium-sized plant can produce over 12,000 seeds (Bossard et al. 2000). Seeds are long-lived and can remain viable in the soil for up to 30 years (Bossard et al. 2000). After germination, the initial growth of seedlings can be rapid with some individuals growing over one meter in the first year. Scotch broom is also capable of stump sprouting after cutting, freezing, or fire.

There are four Scotch broom sites within the Botany analysis area. Of these, one occurs on private property and two are included under a previous project; these three sites are not proposed for treatment under the Keddie Ridge Project. The remaining site is proposed for hand-pulling under all of the action alternatives. Although no Scotch broom plants have been seen since the site was discovered and hand-pulled in 2006, follow-up monitoring and treatments are necessary due to the longevity of the soil seed bank.

Taeniatherum caput-medusae (medusahead)

Over the past 20 years, managers of public lands in the western United States have witnessed an explosive spread of this invasive grass species. Medusahead is currently documented in more than 20 counties in California, as well as in Oregon, Washington, Idaho, Nevada, and Utah (Kan and Pollak 2000).

Medusahead is a winter annual grass; its seeds germinate with the first rains of fall, over winter as seedlings, flower in late spring to early summer, and set seed and die by late summer or early fall. This species reproduces by seed, which is primarily dispersed by wind and water, although it can be dispersed to more distant sites by grazing animals, machinery, vehicles, and clothing (Bossard et al. 2000). Medusahead is able to grow in a wide range of climatic conditions and has been documented in plant communities up to 7,000 feet in elevation. On the Plumas NF, most medusahead occurrences are found in relatively disturbed areas along roadsides and railroad tracks; however this grass has also been documented in a few native plant communities.

Medusahead is the second most abundant species in the Botany analysis area (Table 79). It is also common in Indian Valley, which is in close proximity to many of the proposed treatment units. Of the 44 sites within the Botany analysis area, 28 occur within units that will be treated with prescribed fire under all action alternatives. Medusahead is a species of significant concern within the project area because it occurs in sites where there is increased potential for spread (i.e. along roadsides and within units) and available treatment methods are not practical or effective for control.

Environmental Consequences

Effects of the Proposed Weed Treatments on Individual Noxious Weed Species

The following section provides a summary of information for the five noxious weed species that occur within the Botany analysis area; it also provides a discussion of the effectiveness of the different noxious weed treatment measures. The effect to noxious weed species from the five proposed alternatives is presented in a later section. To highlight the differences among the proposed treatments, alternatives that proposed similar noxious weed control measures (i.e. alternatives A and D) were lumped together for the discussion.

Cardaria draba (hoary cress)

Effects from proposed noxious weed treatments

Alternatives A and D

The weed treatments proposed under alternatives A and D will control or eliminate the hoary cress infestation within the Botany analysis area. When used alone, mowing and glyphosate applications provide only variable levels of control; however when they are integrated, these two treatments can be highly effective at reducing hoary cress infestations. Studies of closely related species have shown that mowing followed by glyphosate application can reduce biomass by more than 80 percent after only one year of application (Renz and DiTomaso 2004, 2006). The inclusion of effective weed treatments under alternatives A and D will decrease the risk of hoary cress spread within the Botany analysis area.

Alternatives C and E

Alternatives C and E do not include treatments for hoary cress due to the fact that non-herbicide treatments, such as hand-pulling or prescribed fire, are either impractical or ineffective. Prescribed fire is not an effective control measure because the extensive root system allows hoary cress to survive even a severe fire (Zouhar 2004). Manual treatments, without follow-up herbicide applications, have been unsuccessful at this site in the past. Individuals were hand-pulled and mowed annually over a four year time period, during which the number of plants increased from 300 to 3,000. Manual treatments are also considered infeasible because they require considerable effort. Treatments must occur within 10 days of emergence throughout the growing season, be repeated for two to four years, and be thorough enough to prevent vegetative propagation from small root fragments (USDA 2005b). The lack of effective weed treatments proposed under alternatives C and E will increase the spread of hoary cress within the Botany analysis area.

Centaurea solstitialis (yellow starthistle)

Effects from proposed noxious weed treatments:

Alternatives A and D

The weed treatments proposed under alternatives A and D will significantly reduce large infestations and eradicate small occurrences of yellow starthistle within the Botany analysis area. Under these alternatives, 43 sites (covering approximately 58 acres) are proposed for treatment with a combination of aminopyralid applications, hand pulling, and prescribed fire.

Prescribed burning can be an effective tool for controlling yellow starthistle infestations if timed to occur early in the flowering period, prior to seed production (DiTomaso et al. 1999). Successful control usually requires more than one year of consecutive burning; however some studies have suggested that integrating one year of burning with a follow-up herbicide treatment can be the most effective strategy (DiTomaso and Johnson 2006). Recent studies have shown that aminopyralid provides excellent control of yellow starthistle after one year of treatment, even at low application rates (DiTomaso and Kyser 2006, DiTomaso et al. 2006). Hand pulling, which can be effective for controlling yellow starthistle in small infestations, will be a practical tool for follow-up treatments.

The inclusion of effective weed treatments under alternatives A and D will decrease the risk of yellow starthistle spread within project treatment units and the Botany analysis area.

Alternatives C and E

The weed treatments proposed under alternatives C and E will not eradicate and may not reduce yellow starthistle infestations within the project area. Under these alternatives, only 24 infestations (covering approximately 44 acres) are proposed for treatment with a combination of prescribed fire and hand pulling.

As mentioned above, long-term control of yellow starthistle with prescribed fire alone usually requires more than one year of burning; for example, DiTomaso et al. (1999) determined that three consecutive year of burning were required to reduce the yellow starthistle seedbank by 99 percent. Although a single year of burning can reduce the seedbank by as much as 75 percent, this is not usually sufficient to significantly reduce the infestation (DiTomaso and Johnson 2006).

Hand pulling can be effective for controlling yellow starthistle; however because it is very time-intensive and requires multiple follow-up visits, it is only recommended for small infestations or for those areas of steep terrain where other methods are infeasible. The limited amount of hand-pulling proposed under this alternative will not be sufficient to reduce the extent of yellow starthistle within the project area.

The lack of effective weed control measures will greatly increase the spread of yellow starthistle under alternatives C and E.

Cirsium arvense (Canada thistle)

Effects from proposed noxious weed treatments:

Alternatives A and D

The weed treatments proposed under alternatives A and D will reduce or eradicate Canada thistle infestations within the project area. Under these alternatives, 14 infestations (covering approximately 4.3 acres) are proposed for treatment with a combination of aminopyralid and glyphosate applications and prescribed fire.

Herbicide treatments are the most effective method for Canada thistle control. Aminopyralid has been shown to reduce the density of Canada thistle by over 99 percent in as little as 10 months time, with little impact on the native plant community (Samuel and Lym 2008, Almquist and Lym 2010). Glyphosate is also effective at reducing both shoot and root growth in Canada thistle (Carlson and Donald 1988 *in*

Nuzzo 1997). In their study, Krueger-Mangold et al. (2002) determined that a fall wick application of glyphosate effectively decreased Canada thistle (by an average of 82 percent) while maintaining native species richness.

The effectiveness of prescribed fire treatments at controlling Canada thistle range from positive to negative, and appear to be dependent upon season, soil moisture, and location (Nuzzo 1997). Repeat burning in late spring has shown some reduction in established Canada thistle infestations; however, the overall control is generally considered less than satisfactory and early spring burns have been shown to increase sprouting and reproduction (Zouhar 2001). While fire often kills the above-ground portion of the plant, the roots are often able to survive even high-severity fires and colonize recently burned sites (Zouhar 2001). Prescribed fire alone is not considered to be a viable option for Canada thistle control; however it can be an effective tool when combined with follow-up herbicide applications.

The inclusion of effective weed treatments under alternatives A and D will decrease the risk of Canada thistle spread within project treatment units and the Botany analysis area.

Alternatives C and E

No weed treatments are proposed for Canada thistle under alternatives C and E because non-herbicide treatment alternatives (i.e. manual treatments or prescribed fire) are considered either infeasible or ineffective. Effective long-term control of Canada thistle must focus on killing the roots and root buds, preventing seed production, and preventing re-infestation by seedlings (Zouhar 2001).

Canada thistle is considered particularly difficult to eradicate with mechanical methods due to its ability to spread vegetatively and produce an extensive root system. Repeated hand pulling, which is believed to drain the plant’s reserves because it forces underground roots to produce new shoots (Bond and Turner 2004), has shown variable levels of success for long-term Canada thistle control. On the Plumas NF, one Canada thistle site, selected because of its location within a botanically significant area, has been repeatedly hand pulled since 2003. Over a three-year time period, this site was treated an average of six times during the field season at an average interval of 21 days. To date, treatment of this 2,000-square-foot area has produced little discernable impact on the Canada thistle population.

As mentioned above, Canada thistle’s response to prescribed fire treatment is highly variable and repeated treatments are generally necessary (Nuzzo 1997). Because of the variability of control, prescribed fire treatments alone are not considered a viable option for treatment of Canada thistle infestations.

The lack of effective weed control measures will greatly increase the spread of Canada thistle under alternatives C and E.

Cytisus scoparius (Scotch broom)

Effects from proposed noxious weed treatments:

Alternatives A, C, D, and E

The manual treatments proposed under all of the action alternatives will provide long-term control of the Scotch broom infestation within the analysis area. If manual treatments are feasible, hand pulling can be a highly effective tool for broom removal (CDFA 2009a). On the Plumas NF, eleven Scotch broom sites have been hand pulled annually for an average of five years. Of these, nine have been reduced by an average of 99 percent.

Taeniatherum caput-medusae (medusahead)

Effects from proposed noxious weed treatments:

Alternatives A, C, D, and E

The effectiveness of the prescribed fire treatments at controlling medusahead within the proposed project units is highly dependent upon the timing of the burn. A number of studies have demonstrated that burning medusahead in late spring, prior to seed dispersal can significantly reduce infestations (Rice 2005). In contrast, prescribed burns initiated in the summer and fall, have not been effective due to the fact that the seeds have been dispersed and are on or above the soil where they are protected from the heat of the fire (Kan and Pollak 2000). In many cases, the increased light availability and nutrients as a result of prescribed burning, acts to encourage weed species growth and spread (Hatcher and Melander 2003). From a management perspective, prescribed fire is not always a viable option for medusahead control because the optimal time for controlling infestations is often outside the burn permit parameters (Rice 2005).

Flaming with a propane torch has been tested on medusahead at a limited number of sites on the Plumas NF. Results from these treatments suggest that if flaming is conducted in the spring, over small areas of infestation, it may provide some level of medusahead control (Coppoletta 2006). The major limitation with this method is that it is very time intensive and can only be used on very small, isolated infestations. Flaming may be used in areas that are at a high risk of spread from equipment or personnel.

Other treatments, such as mowing or herbicide application, are not considered practical for medusahead control within the Keddie Ridge Project area. Mowing is nonselective, oftentimes fails to remove the active portion of the plant where new growth originates, and is not recommended along roadsides after seed set because of increased potential for seed dispersal (CDFA 2009a). Glyphosate has shown some level of medusahead control; however its effectiveness has been variable and it is not recommended in native communities where there is a high potential for impact to non-target species.

Based on the variability of the prescribed fire treatments, as well as the low number of sites proposed for treatment (64 percent of the sites in the Botany analysis area), there is a high risk of spread from medusahead under all of the proposed action alternatives.

Effects to Noxious Weeds

The proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed spread by creating disturbed conditions that favor noxious weed establishment and spread. The implementation of standard management requirements (appendix H) and noxious weed treatment measures would reduce the risk of noxious weed spread; however, this would be highly dependent upon the effectiveness of each proposed control method. For the discussion below, alternatives that resulted in similar effects were grouped together for purpose of the analysis

Alternative B (No Action)

Direct Effects

There would be no direct effects to noxious weed species under this alternative. Of the 118 noxious weed locations that have been documented within the Botany analysis area, 22 have been treated in the past with manual methods. Due to the ineffectiveness of these treatments, only one (Scotch broom) is treated on an on-going basis. Therefore the remaining infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead would continue to spread within the analysis area at their current rates.

Indirect Effects

This alternative would not result in any new ground-disturbing activities so the amount of suitable noxious weed habitat would remain at its current level. Infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead, which are not treated on an on-going basis, would continue to spread at their present rates.

Noxious weed species are oftentimes classified as pioneer species or invaders. Disturbance, whether it is natural (i.e. lightning-caused fire) or associated with management activities, often creates ideal conditions for noxious weed introduction and establishment. Under this alternative, soil disturbance would be minimized and the existing cover of native plant species maintained. These factors could reduce the rate of noxious weed invasion within the analysis area. Some studies have shown that the spread of medusahead may be slowed by competitive perennial vegetation (Davies et al. 2010) while others suggest that Canada thistle invasion can be inhibited by dense canopy cover and well-established competitive meadow species (Beck 1994).

While the no action alternative may decrease the short-term risk of noxious weed invasion by minimizing the amount of disturbance, it will not reduce the long-term risk of disturbance from high-severity wildfire. High-severity wildfires aid in the establishment and spread of noxious weeds by increasing the availability of resources, such as light and nitrogen, and decreasing competition from native plant species. In their comparison of low-severity and high-severity burns, Turner et al. (1997) found that the density of Canada thistle after severe surface and crown fires was two to four times greater than the density after a light surface fire.

Even in the absence of proposed treatments, habitats that are in close proximity to roads, trails, or private land will remain vulnerable to noxious weed invasion and spread. At present, an estimated 37 percent of the noxious weed sites in the Botany analysis area, including three of the largest infestations, occur in close proximity (within 0.1 mile) to the National Forest System land boundary. In addition, approximately 81 noxious weed infestations or almost 70 percent of the known sites, are situated within 100 feet of a road or trail. Roads, whether they are major highways, general forest roads, or motorized vehicle trails, are often the primary conduit for weed introduction and establishment. Roads and motorized trails contribute to dispersal of noxious weed species because they (1) create suitable habitat by altering environmental conditions, (2) make invasion more likely by stressing or removing native species, and (3) allow for easier movement by wild or human vectors (Trombulak and Frissell 2000). Under this alternative, these infestations could act as entry points or seed sources for weeds moving into less-invaded parts of the analysis area.

Cumulative Effects

The effect of specific past management actions on noxious weed species is largely unknown. Targeted noxious weed surveys at the project-level began relatively recently on the forest. Aside from an occasional appearance on a plant list, the first targeted noxious weed survey on file for the Botany analysis area occurred in 2000.

Records for past projects that occurred in the Botany analysis area over the past 20 years were examined to (1) determine if noxious weed species were surveyed for and documented prior to project implementation and (2) if noxious weed species are currently present within the boundary of past projects. Approximately 41 percent of the Botany analysis area weed infestations (48 sites) fall within the boundary of a past project. Of these, only five infestations were documented prior to project implementation. One specific project incorporated standard management requirements, such as equipment cleaning and avoidance measures and conducted manual weed treatments; the infestations within this particular project increased from an estimated 2.4 acres prior to project implementation to approximately 4.4 acres eight years after project completion. While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity, combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie Ridge Project area.

The lack of ground disturbing activities under the no action alternative would reduce the amount of suitable weed habitat in the short-term; however the lack of weed treatments would allow hoary cress, yellow starthistle, Canada thistle, and medusahead to persist and expand in their current locations and would increase the risk of spread into un-invaded native habitats within the Botany analysis area.

The large number of past activities, the close proximity to private land, and the spatial extent of weed infestations all increase the vulnerability of the landscape to noxious weed invasion, even in the absence of project activities. Vectors for noxious weed spread that are unrelated to the proposed project, such as recreational activities and ongoing forest management (e.g. road maintenance), would continue to aide in the dispersal and spread of noxious weed species in the Botany analysis area.

Alternatives A and D

Direct Effects

The proposed weed treatments, which include manual removal, prescribed burning, and herbicide application, are expected to greatly reduce or eliminate infestations of hoary cress, yellow starthistle, Canada thistle, and Scotch broom within the Botany analysis area. The risk of medusahead spread, which currently lacks a feasible or effective control method, would remain high under all of the action alternatives. The specific treatments, which are proposed for 87 weed sites covering approximately 107 acres, are described in detail in chapter 2. The effectiveness of each method is also discussed in the section above. No direct effects to noxious weed species are anticipated from the proposed vegetation and fuels treatments because infestations will be treated or avoided during project implementation.

Indirect effects

The proposed vegetation, fuels, and road treatments would result in areas with reduced native plant cover and increased soil disturbance; these conditions favor noxious weed establishment and spread. During implementation, project equipment and vehicles could facilitate the spread of noxious weeds by transporting seed and propagative plant parts into un-invaded portions of the project area. In one National Park in Australia, weed seed was found to be most often transported into and around the park by vehicles that had been driven off-road (Lonsdale and Lane 1994).

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each treatment unit. For example, group selection units (i.e., those with relatively high amounts of soil disturbance and vegetation removal) may be at higher risk of invasion than hand thinning units. The amount of soil disturbance associated with the proposed project activities is considered high for alternative A and moderate for alternative D (Table 79).

The five weed species that currently exist within the Botany analysis area can rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present. Donald (1990) demonstrated that Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species. Additionally, some habitats with sparse native vegetation have been shown to be more susceptible to medusahead invasion than more diverse plant communities (Young and Evans 1971). Monitoring of one medusahead site in montane chaparral on the Plumas NF has shown a three-fold increase in infested acres over a period of six years (Coppoletta, personal observation, 2010).

The elevated risk of noxious weed introduction and spread under alternatives A and D would be greatly reduced through implementation of the standard management requirements (refer to appendix H) and the proposed noxious weed treatments. Although these control measures would not remove the risk of noxious weed invasion and spread entirely, they would greatly reduce the potential for noxious weeds to impact native plant communities within the project area. Post-implementation monitoring of past projects with similar vegetation and fuels treatments has shown that aggressive treatment of noxious weeds prior to and through project implementation and incorporation of the standard management requirements have been successful in eradicating small populations of noxious weeds as well as preventing new occurrences (USDA 2006b).

Cumulative Effects

While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity within the Botany analysis area (discussed under the no action alternative), combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie landscape.

As discussed above, the proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed establishment and spread in the Botany analysis area by increasing the amount of suitable habitat for weeds. In addition, the close proximity of the project to private land, the existence of on-going activities such as recreation and road maintenance, and the spatial extent of existing weed infestations, all increase the vulnerability of the Keddie Ridge landscape to noxious weed invasion, even in the absence of project activities.

Implementation of the proposed noxious weed treatment measures and standard management requirements, as well as post-project monitoring, would greatly reduce this risk. By directly reducing the density and extent of weeds within the Botany analysis area over time, the cumulative effect of noxious weed spread would be greatly reduced.

Overall, an estimated two percent of the treatment units proposed under alternative A are considered to have a high risk of noxious weed invasion or spread; none of the proposed units under alternative D were classified as high risk. These risk determinations take into account factors such as the amount of soil disturbance associated with the proposed activities; the invasiveness and proximity of the weed to the proposed units; the proportion of infestations proposed for treatment; and the effectiveness of the proposed weed treatment measures. Overall, the risk of noxious weed spread and introduction under alternatives A and D would be (a) slightly greater than the estimated risk under the no action alternative and (b) lower than that predicted under alternatives C and E, where vegetation, fuels, and road treatments are proposed with no effective weed treatment measures in place (Table 79).

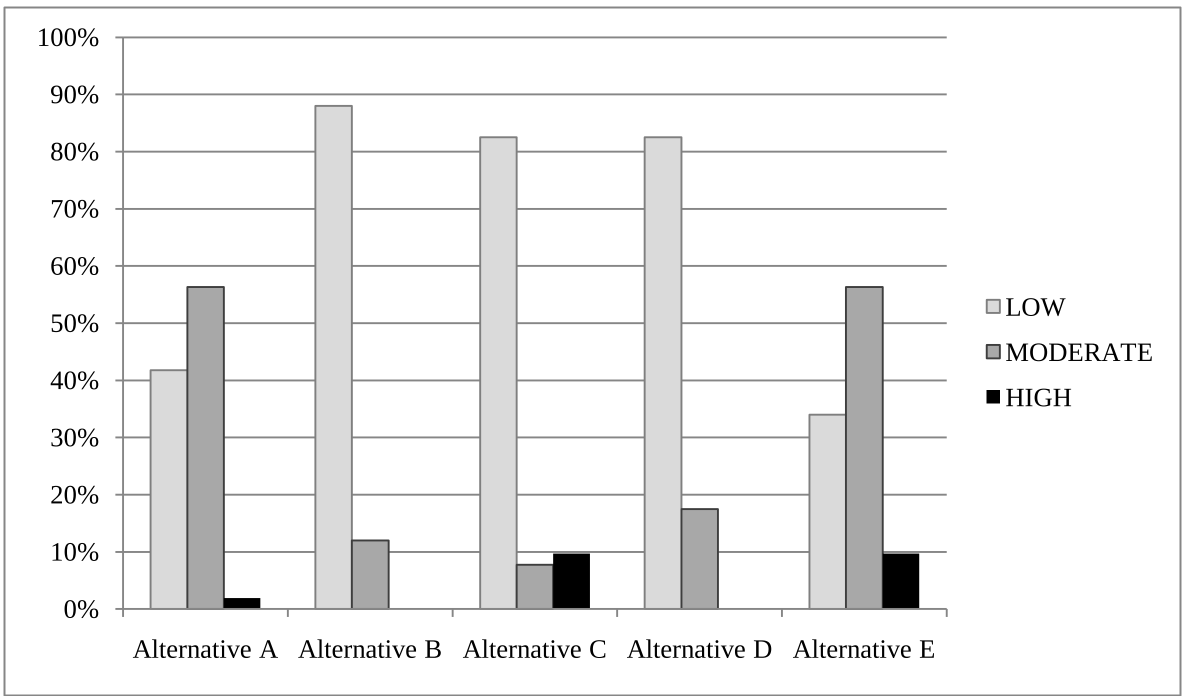


Figure 22. Percentage of Units with Low, Moderate, or High Risk of Noxious Weed Introduction or Spread, Compared Across the Five Alternatives

Alternatives C and E

Direct Effects

The proposed noxious weed treatments, which include manual removal and prescribed burning, would not significantly reduce the existing noxious weed infestations within the Botany analysis area. Less than half (45 percent) of the existing infestations will be treated under these alternatives, primarily due to feasibility constraints and the lack of effective, non-herbicide control methods. Some species that are considered particularly difficult to eradicate with non-herbicide methods, such as hoary cress and Canada thistle, are not proposed for treatment under these action alternatives.

Implementation of standard management requirements (refer to appendix H) would reduce the risk of noxious weed introduction and spread into the project area; however there may be direct effects to noxious weeds from the proposed treatments if they are unable to avoid infested areas during project implementation.

Indirect effects

The vegetation, fuels, and road treatments proposed under these alternatives would result in similar conditions as those described under alternatives A and D. The resulting soil disturbance and removal of native vegetation would increase the probability of noxious weed establishment and spread. In addition, project equipment and vehicles could facilitate weed spread by transporting seed and propagative plant parts to un-invaded portions of the project area (Lonsdale and Lane 1994).

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each treatment unit. For example group selection units (i.e., those with relatively high amounts of soil disturbance and vegetation removal) may be at higher risk of invasion than hand thinning units. The amount of soil disturbance associated with the proposed project activities is considered high for alternative E and moderate for alternative C (Table 79).

The five weed species that currently exist within the Botany analysis area can rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present. Donald (1990) demonstrated that Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species. Additionally, some habitats with sparse native vegetation have been shown to be more susceptible to medusahead invasion than more diverse plant communities (Young and Evans 1971). Monitoring of one medusahead site in montane chaparral on the Plumas NF has shown a three-fold increase in infested acres over a period of six years (Coppoletta, personal observation, 2010).

The elevated risk of noxious weed introduction and spread under alternatives C and E would not be greatly reduced through implementation of the standard management requirements (refer to appendix H) or the proposed noxious weed treatments. Fewer sites (45 percent) are proposed for treatment under these alternatives and the treatments that are proposed are not highly effective. . Infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead, which are not treated on an on-going basis, would continue to spread at their present rates. Infestations that are situated within proposed treatment units will have the highest probability of spread due to these species' ability to rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present (i.e. Young and Evans 1971, Donald 1990).

Under alternatives C and E, the proposed treatment activities combined with the limited non-herbicide weed treatments, would be increase the risk of noxious weed invasion and spread and the potential for negative impacts native plant communities.

Cumulative Effects

While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity within the Botany analysis area (discussed under the No action alternative), combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie landscape.

As discussed above, the proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed establishment and spread in the Botany analysis area by increasing the amount of suitable habitat for weeds. In addition, the close proximity of the project to private land, the existence of on-going activities such as recreation and road maintenance, and the spatial extent of existing weed infestations, all increase the vulnerability of the Keddie Ridge landscape to noxious weed invasion, even in the absence of project activities.

Implementation of the proposed noxious weed treatment measures and standard management requirements, as well as post-project monitoring, would not be sufficient to reduce this risk. The proposed weed treatments would not reduce the density or extent of weeds within the Botany analysis area over time; therefore the cumulative effect of noxious weed spread would not be reduced.

Under alternatives C and E, approximately ten percent of the proposed vegetation and fuels treatment units are considered to be at high risk of noxious weed invasion or spread (Figure 22). These risk determinations take into account factors such as the amount of soil disturbance associated with the proposed activities; the invasiveness and proximity of the weed to the proposed units; the proportion of infestations proposed for treatment; and the effectiveness of the proposed weed treatment measures. Overall, the risk of noxious weed spread and introduction under alternatives C and E would be (a) greater than the estimated risk under the no action alternative and (b) greater than that predicted under alternatives A and D, where vegetation, fuels, and road treatments are proposed in combination with effective weed treatment measures (Table 79).

Summary of Effects

The proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed spread by creating disturbed conditions that favor noxious weed establishment and spread. The implementation of standard management requirements (appendix H) and noxious weed treatment measures would reduce the risk of noxious weed spread; however, this would be highly dependent upon the effectiveness of each proposed control method. Table 79 provides a summary of the effects of the proposed alternatives.

Overall, alternatives C and E carry the highest risk of noxious weed introduction and spread, primarily due to implementation of the vegetation, fuels, and road treatments with no effective weed treatment measures in place. Alternatives B (no action) and D have the lowest risk of noxious weed introduction and spread. This is mostly due to the lack of, or reduction in, soil disturbing activities. Alternative A proposes treatments that will likely result in high levels of soil disturbance; however it also proposes to implement highly effective weed treatment measures. In comparison to the other alternatives, alternative A carries a more moderate risk of noxious weed introduction and spread.

Table 79. Summary of Potential Effects on Noxious Weeds.

Indicator Measures	Rankings of Alternatives for Each Indicator[1]				
	Alternative A	Alternative B (No Action)	Alternative C	Alternative D	Alternative E
Amount of soil disturbance associated with the proposed project activities	High	Low	Moderate	Moderate	High
Number of noxious weed infestations proposed for treatment	87	None	53	87	53
Approximate (maximum) number of acres proposed for treatment	107	None	89	107	89
Overall treatment effectiveness	High	None	Variable	High	Variable
Overall Risk Ranking[1]	**3**	**1**	**4**	**2**	**5**

[1] A score of 1 indicates the alternative has the lowest overall risk of noxious weed introduction and spread; a score of 5 indicates that the alternative has the highest overall risk.

Compliance with the Forest Plan and Other Direction

The action alternatives are consistent with the Forest Plan and other direction. A noxious weed risk assessment has been completed for each alternative (FSM 2081.03 and USDA 2004b); the public has been informed of the risk and effects from the proposed project and noxious weeds (USDA 2004b); noxious weed treatment measures have been proposed under some of the alternatives; and control measures (i.e. appendix H) have been identified in areas of high risk (FSM 2081.03).

Economic and Social Environment

Introduction

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

Forest Plan

The guidance for economic and social environment is provided in the 1988 Plumas National Forest Land and Resource Management Plan, as amended by the 1999 Record of Decision on the final environmental impact statement for the Herger-Feinstein Quincy Library Group Forest Recovery Act, the 2004 Record of Decision on the final environmental impact statement EIS for the Sierra Nevada Forest Plan Amendment.

Effects Analysis Methodology

Specific Assumptions

This economic analysis focuses on those revenues and treatment costs associated with implementing fuel reduction treatments and forest health activities, in the Keddie Ridge Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality, or fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used.

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Keddie Ridge Project area would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, and fuel suppliers. Induced effects are driven by wages, and are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs and monetary outputs. It was assumed for this analysis that 10 to 15 jobs are created per million board feet of timber harvested. This number includes direct, indirect and induced jobs. It was assumed for this analysis that most products from the Keddie Ridge Project area would be processed locally due to high hauling costs of products. Likewise, it is also assumed that most employment would largely be derived from Plumas County for the timber harvesting activities.

Specific Methodology

Timber harvest values used in this economic analysis were based on the pond values (delivered log prices) of local mills from the State Board of Equalization. Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Reforestation treatments are based on the latest service contract prices and Knutson-Vandenberg sale area improvement plans. The “IMPLAN” software program was utilized in the input/output analysis for monetary outputs to the local economy.

Data Sources

The social and economic figures were obtained from State and Federal maintained databases. The most current reports were run as well as several years earlier in order to correlate with current year’s information. Statistics were obtained from the U.S. Census Bureau, America Community Survey, Censtats, Business and Industry, Bureau of Labor Statistics, Bureau of Economics, and California Department of Finance.

Affected Environment

The Plumas National Forest contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Plumas National Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets.

Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. Table 80 shows the percentage of Plumas National Forest land in local counties. The National Forest System lands account for approximately 72 percent of Plumas County. Consequently, management of National Forest System lands has a notable effect on the regional economy of Plumas County.

Table 80. Percentage of National Forest System Lands by County (Based on GIS Data)

County	County Acres	Beckwourth Ranger District (acres)	Feather River Ranger District (acres)	Mount Hough Ranger District (acres)	Total National Forest System Lands in Each County (acres)	National Forest System Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

Industry/Employment

The two employment sectors most related to forest planning processes are the timber industry and tourism. Forest planning processes can positively affect the farm industry (logging operations), manufacturing (mills), transportation (trucks and railroad) and utilities (biomass power plants). They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal statistical gathering agencies generally do not break down employment data specific to logging and lumber; rather it is lumped under farm manufacturing and transportation industries. industries.

The timber industry resides within two industries, (1) Farm and (2) Manufacturing. According to the Bureau of Economic, Farm and Manufacturing earnings in Plumas County represent 11.73 percent of the major industries in Plumas County. Earnings in these two industries have decreased and are experiencing negative growth. Employment in farm and manufacturing represents 7.87 percent of the jobs in Plumas County. The per capita personal income in 2008 was $38,525. The total personal income for Plumas County was $784 million. Output for all industries in Plumas County is $1.1 billion. There are six employers in logging operations, and seven employers related to forestry services totaling 104 jobs. There are two large mills in the local area within distance of the project area combined employment is under 500 employees. The value of the mills total production is at $91 million.

Plumas County labor statistics reflect a seasonal labor force with employment up during the warmer months. In the winter unemployment rises as the timber harvesting season stops, contributing to the unemployment rate as reflected in Table 81 and Table 82. The housing downturn has had an impact on the unemployment rates in Plumas County; nearly doubling the unemployment rate during the months when normal employment rates go up. In 2009 between May and September the unemployment rates nearly doubled as reflected in the information obtained from the Bureau of Labor Statistics. This project can have a significant effect on the numerous industries' employment in the local labor force and transient labor force.

Table 81. Bureau of Labor Statistics, Plumas County Unemployment Rate

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	12.3	12.6	12.2	9.8	7.4	6.3	6.7	6.1	5.8	6.4	8.2	10.3
2008	14.2	14.2	14.0	11.6	8.3	7.9	7.8	7.7	7.3	9.1	12.0	14.0
2009	18.9	19.5	20.8	17.8	16.2	15.3	14	13.9	13.6	14.6	16.7	18.9
2010	22.3	22.8	22.9	20.1	17.5	16	16.1p					

(p) preliminary

Table 82. Bureau of Labor Statistics, Plumas County Labor Force

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	9363	9268	9220	9799	10188	10740	11023	11007	10475	10178	9763	9583
2008	9400	9375	9356	9705	10090	10447	10703	10559	10260	10232	9983	9843
2009	10033	10209	10125	10152	10180	10416	10561	10141	10033	9788	9549	9442
2010	9456	9579	9608	9468	9363	9473	9380p					

(p) preliminary

Energy

Plumas County has two co-generation plants and two biomass power plants operating within a reasonable haul distance. The Wendell facility is 35 megawatt plant and when operating at full capacity uses 550 bone dry tons/ day or 37 truck loads. The Wendell facility sells to PG&E approximately 30 megawatts a day when they can produce at full capacity. Presently they cannot produce full capacity due to the lack of biomass material. The Westwood facility is a 10 megawatt plant that employs 10 to 19 people. The Westwood facility when operating at full capacity uses 200bone dry tons/day.

County, State and Federal Taxes

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, a standard rate, (2) (2) *Receipt Act* payments or payments from the *Secure Rural Schools and Community Self-Determination Act of 2008* ,a fixed rate, (3) timber yield taxes that fluctuate based on timber sold.

Payments in Lieu of Taxes

The Bureau of Land Management administers the Payments in Lieu of Taxes, which apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county.

Secure Rural Schools and Community Self-Determination Act

The *Secure Rural Schools and Community Self-Determination Act* 2008, offers counties an alternative to the *Receipt Act*. A county may choose to continue to receive payments under the *Receipt Act* or to receive its share of the state's full payment amount under the *Secure Rural Schools and Community Self-Determination Act*. Table 83 reflects Plumas County's payments of $7,000,000 for the past several years.

The *Secure Rural Schools and Community Self-Determination Act* payments are set to expire September 2011. This Act provides payments to counties regardless of the amount of timber harvested. The payment is based on a complicated formula that takes into account in part acres of National Forest System lands, population and per capita income. When or if this Act terminate then counties will continue to receive payments under the Receipt Act at 25% of the harvested value from the National Forest System lands contained within the county. Table 83 list payments made to counties partially based on acres of National Forest System lands within the county boundary. If Plumas County reverts back to the Receipt Act collections then each project and the timber harvested become significantly important to Plumas County and its residence, as education and road safety will be impacted with each commercial project the Plumas National Forest implements.

Table 83. *Secure Rural Schools and Community Self-Determination Act* Full Payment Amounts to Counties for Fiscal Years 2001-2007

	Butte	Lassen	Plumas	Sierra	Yuba
2001	$866,419	$3,751,241	$7,024,648	$1,788,350	$231,268,
2002	$873,350	$3,781,250	$7,080,847	$1,802,657	$233,118
2003	$883,830	$3,826,626	$7,165,816	$1,824,289	$235,915
2004	$895,320	$3,876,372	$7,258,972	$1,848,005	$238,982
2005	$915,912	$3,965,528	$7,425,928	$1,890,509	$244,479
2006	$925,071	$4,005,183	$7,500,187	$1,909,414	$246,924
2007	$923,173	$3,996,963	$7,484,795	$1,905,495	$246,417
2008	$832,565	$3,604,665	$6,750,168	$1,718,472	$222,231
2009	$749,308	$3,244,198	$6,075,151	$1,546,625	$200,008
2010	$675,302	$2,923,783	$5,475,136	$1,393,872	$180,254
Total	$8,540,250	$36,975,809	$69,241,648	$17,627,688	$2,048,328

Timber Yield Taxes

The third source of revenues to local government is the timber yield tax, which is administered by the State Board of Equalization. The Forest does not pay this tax; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and NFS lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state, and approximately 80 percent is returned to the counties from which the timber was harvested. The amount of revenues disbursed to the counties can be affected by decisions about the amount of timber to be offered for sale each year on the Forest. The volumes harvested from Plumas County indicate a downward trend with a notable positive shift of volume harvested from NFS lands in 2009, due to the salvage of timber from numerous fires. In Table 84 a downward trend of volume harvested on NFS lands has occurred since 1994 as reported by the Board of Equalizations tax records.

Table 84. Plumas County Percent of Volume from National Forest System Lands

Year	Percent
1994	37%
2005	15%
2006	22%

2007	11%
2008	10%
2009	29%

Source: California Board of Equalization

Plumas County in 2005 produced 107,817 mmbf of timber which is 6 percent of the volume produced in the State of California as documented in the California Department of Finance. According to the California Board of Equalization 15 percent of the volume from Plumas County came from NFS lands including the Forest Service; a total of 16 mmbf.

Timber Harvest Trends

The harvest of trees provides commercial and noncommercial wood products, such as sawlogs and biomass, to the local economy. Local sawmills that rely, at least in part, on logs from National Forest System lands include Sierra Pacific Industries in Quincy and Collins Pine Company in Chester. Figure 23 displays the volume of timber harvested on the PNF since 1978. Local sawmills have processed most of this volume although mills as far away as Weaverville and Roseburg have bid or purchased timber from the Forest.

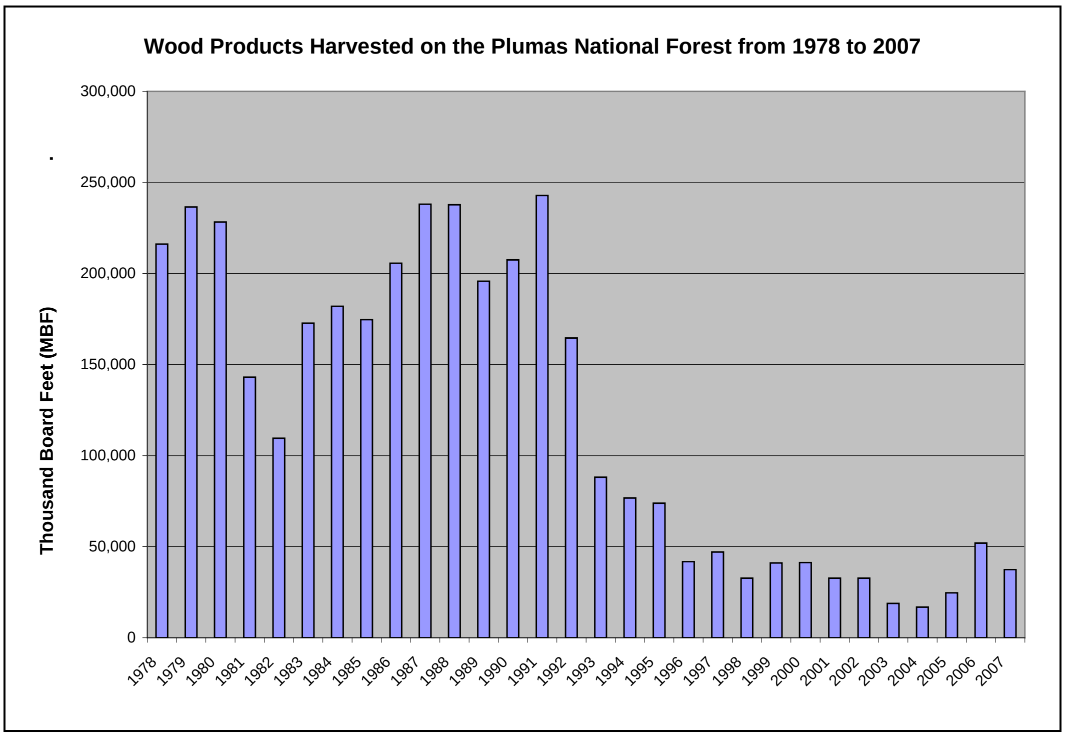


Figure 23 Annual Amount of Wood Products Sold on the Plumas National Forest from 1978 to 2007

Environmental Consequences

Alternative A – Proposed Action

Direct and Indirect Effects of DFPZ and WUI Fuels Reduction Treatments

Economic effects are determined by the value of products and services for each alternative (which includes the no action alternative) considered in this analysis. The level and mix of goods and services available to the public varies by alternative. The effects discussed in this section include estimated government expenditures for cost of services and revenues from the value of timber and biomass, as well as monetary impacts on local communities.

Direct monetary effects are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments; and direct, indirect, and induced job opportunities. In general, the monetary value of each alternative depends on the amount and method of timber harvest, type of treatment and the acreage planned for treatments.

The anticipated timber volume, value, costs, service treatment costs, and jobs, are displayed for all alternatives in Table 85. The revenue generated would also depend on the availability of logging equipment, haul distances to available mills, and fuel prices. This analysis assumes equipment cost and not full ownership of equipment, and hauling to the closest mill. However, haul to other mills is feasible as evidenced by past and current timber sales. Table 85, summarizes the economic effects to the local economy that would occur from implementation of alternative A, C, D, and E.

Table 85. Comparison of Economic Effects by Action Alternative

Revenue/Cost Employment	Alternatives			
	Alternative A	Alternative C	Alternative D	Alternative E
Sawlog Volume	10.37 mmbf	231 mbf	1.9 mmbf	15.48 mmbf
Biomass Volume	21,000 gt	24, 000 gt	13,000 gt	18,000 gt
Sawlog and Biomass Value (cost deducted)	$2,127,902	$556,180	$580,450	$3.001,415
Additional Operation Cost	$2,186,298	$1,442,220	$1,184,091	$2,453,130
Potential Advertised Value to the Government	$130,301	$2,772	$22,800	$202,488
Percent Above Value	-3%	-160%	-104%	18%
Fuels Reduction Project Costs	$5,496,675	$5,496,675	$5,334,351	$5,496,675
Potential Direct and Indirect Jobs	189	60	66	252
Potential Employee Income	$6,799,620	$2,161,134	$2,374,303	$9,082,986
Receipt Act Plumas County Estimate Collections	$32,575	$693	$5,700	$50,622

All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) that serve the timber industry. The local economy, driven by wages would improve stability for the small communities throughout the county. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses.Harvesting and forest health improvement treatments would generate 189 direct and indirect jobs with alternative A. Some of the other industries to benefit from activities associated with alternative A are retail, newspaper, data processing, banks, real estate, waste management, college, doctors, hospitals, child care services, lodging, electric power, and gas distribution.

This project would generate $1,595,051[1] in Federal Tax collections and $730,189[2] in state and local tax. The Keddie Ridge Project area would create an induced income of $2,537,185 throughout numerous business sectors and generate induced outputs of 18 percent of the total project inputs for other businesses in the community.Potential electricity produced from the biomass is 550 MWH with a potential retail value of $75,900. Table 86 displays the value generated by this alternative by industry, as well as the indirect effects and the induced effects on the local economy.

[1] “”Values generated through IMPLAN software an Economic Modeling Program

[2] “”

Table 86. Alternative A Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$3,918,422	$959,888	$784
Support activities for forestry	$5,498,075	$45,431	$499
Sawmill	$3,860,026	$285,285	$4,780
Transportation	$1,177,803	$57,855	$12,703
Other Business Sectors		$697,683	$2,522,419
Total value to Plumas County Economy	$14,454,326	$2,046,142	$2,537,185

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries used by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

This alternative would have a positive effect on the overall economic activity in Plumas County. This project would help provide stability and revenue to the manufacturing industry, farming industry (logging operators), transportation (haul trucks and equipment), and indirect industries (housing, food, education, etc.). Alternative A would help sustain employment for families and generate harvest revenues for local businesses and provide the state and county timber yield taxes. These collections would help the county provide services such as road maintenance and education. The saw-timber provided by the action alternatives contributes to the stability of local economy by providing a supply of wood products to local industries dependent on forest management activities. Refer to appendix D of this EIS for the complete economic analysis by alternative.

Alternative B – No Action

Under alternative B, no treatments would be implemented. There would be no implementation costs. Under the no action alternative, no funds would be generated for the U.S. Treasury or returned to local counties through the receipt tax. No additional employment opportunities or wages paid to primary and service industry employees would circulate through the local economy.

The no action alternative would result in a negative effect on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. Local industries would have notably reduced opportunities related to forest management activities such as timber harvesting and forest health projects. Additionally, the local economy would not receive benefits from associated employment, such as in food, lodging, and transportation businesses. The unemployment rate could potentially stay constant throughout the year, at double the national unemployment rate. The income loss for families would trickle throughout the local economy affecting many of the local industries in a negative way.

The economic resiliency of Plumas County is low. The major industries manufacturing lumber, the logging operators, transportation, the Forest Service and the county are all inter-connected and represent nearly 40 percent of employment. If manufacturing of lumber is diminished or stopped, then all of these industries would be affected by the lack of production by the mill. There is not another industry which can carry the community through economic lows.

Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures and corresponding loss of logging companies could significantly reduce or eliminate future economic and environmental opportunities from National Forest System lands. The Plumas National Forest is unique in that the infrastructure is still in place; however these industries in the county are experiencing numerous years of negative growth and may be faced with lay-offs, mill closures, and operators liquidating equipment. The loss of this industry will have a negative effect on managing NFS lands in a cost effective manner. The continuation of current conditions under alternative B would preclude and/or notably limit opportunities for long-term employment and rural community stability.

Alternative C – Non-Commercial Funding Alternative

The sole purpose of alternative C is to reduce hazardous fuels. The jobs generated would be from service contract providers with some harvesting jobs. This alternative would generate 60 direct and indirect jobs. Alternative C would have the least employment potential in comparison to the other action alternatives. This alternative is in strong support of forestry labor intensive opportunities in service industries (such as logging supply companies, and fuel suppliers) that serve the support forestry activities. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,259,732[3] in federal tax collections and $530,643[4] in state and local tax. The Keddie Ridge Project area would create induced income of $581,108 for other business sectors in Plumas County. This project would generate induced outputs for the business sectors of 26 percent of the total project inputs. Table 87 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Potential electricity produced from the removed biomass is 600 MWH with a retail value of $82,800. Some of the other business sectors to benefit from activities associated with alternative C are similar to alternative A, housing, food, and education.

3 “”

4 “”

Table 87. Alternative C Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$960,270	$199,996	$628
Support activities for forestry	$5,496,675	$10,988	$400
Sawmill	$745,239	$55,821	$3,825
Transportation	$499,290	$16,376	$10,165
Other Business Sectors		$228,062	$2,015,277
Total value to Plumas County Economy	$7,701,474	$511,243	$2,030,295

Values generated through IMPLAN software an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Alternative D – 2001 SNFPA ROD Consistent

Alternative D is predominantly forest health and hazardous fuels reduction treatments with timber product removal. The jobs generated would be from service contract providers with some harvesting jobs. This alternative would generate 66 direct and indirect jobs. Alternative D would have slightly larger job creation in comparison to alternative C. This alternative is in strong support of forestry labor intensive opportunities in service industries (such as logging supply companies, and fuel suppliers) that serve the support forestry activities. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,193,944[5] in federal tax collections and $498,524[6] in state and local tax. The Keddie Ridge Project area would create induced income of $554,297 for other business sectors in Plumas County. This project would generate induced outputs for other business sectors of 27 percent of the total project inputs. Table 88 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Energy that may be produced from the removed biomass is approximately 325 MWH of electricity with a retail value of $44,850. Some of the other business sectors to benefit from activities associated with alternative D are similar to alternative A include food, housing and education.

5 “”
6 “”

Table 88. Alternative D Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$783,903	$158,357	$599
Support activities for forestry	$5,334,351	$8,961	$381
Sawmill	$580,450	$43,571	$3,649
Transportation	$383,308	$12,957	$9,696
Other Business Sectors		$187,543	$1,922,299
Total value to Plumas County Economy	$7,082,012	$411,389	$1,936,624

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Alternative E – 2004 SNFPA ROD Consistent

This alternative has a mix of harvesting and forest health improvement treatments. The jobs generated would be from service contract providers, the logging sector and manufacturing sector. This alternative would generate 252 direct and indirect jobs. This alternative is similar to alternative A in support of forestry labor intensive opportunities and the manufacturing of lumber. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,561,911[7] in federal tax collections and $698,403[8] in state and local tax. The Keddie Ridge Project area would create induced income of $683,886 for other business sectors in Plumas County. This project would generate induced outputs for other business sectors of 20 percent of the total project inputs. Table 89 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Energy that may be produced from the removed biomass is approximately 450 MWH of electricity with a retail value of $62,100. Some of the other business sectors to benefit from activities associated with alternative E are similar to alternative A, are food, education, and housing.

7 “”
8 “”

Table 89. Alternative E Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$1,935,785	$712,288	$738
Support activities for forestry	$5,496,675	$24,806	$470
Sawmill	$3,260,992	$238,207	$4,502
Transportation	$1,291,108	$49,325	$11,963
Other Business Sectors		$610,372	$2,371,710
Total value to Plumas County Economy	$11,984,560	$1,634,998	$2,389,383

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Heritage Resources

History of the Project Area

General Prehistoric Overview for the Plumas National Forest

The following is a broad historical overview of the human or heritage mechanisms that have influenced the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project). Ecosystem models based solely on biological and physical elements often disregard the complex interaction between humans and their environment. More than any other phenomenon, heritage landscapes provide a unique opportunity to interpret the history of the effects humans have had on the environment. Together, natural and heritage influences have shaped the overall character of the project vicinity. Prehistory Period is defined as generally from 8,000 years ago to the 130s. Historic Period is defined as generally between the 1930s to 50 years ago.

Prehistory Period

Archaeological studies on the Mt. Hough Ranger District have primarily been limited to heritage resource inventories for proposed Forest Service activities. Intensive archaeological research in the Keddie Ridge Project area, allowing for a refined definition of prehistoric complexes and establishment of a reliable heritage chronology,is sparse. Therefore, heritage assessments and interpretations for the Keddie Ridge Project area rely upon extrapolations from several studies that were completed for lands adjacent to the Keddie Ridge Project area.

Archeological investigations on the Plumas National Forest have revealed Native American occupation spanning at least 8,000 years. Heritage resources include flaked-stone artifact scatters, which reflect resource procurement activities and seasonal campsites, habitation sites with cultural deposits, and in some instances, house pits.

Only a few projectile points have been identified within Plumas County that date to the Paleo-Indian period between 9000–6000 B.C. (Nilsson et al. 1996). Later assemblages are summarized under two comprehensive archaeological periods, the Archaic Period and Emergent Period. These two periods date between 6000 B.C.–A.D. 500 and A.D. 500–Historic Contact, respectively. The Archaic is also generally divided into Lower (6000–3000 B.C.), Middle (3000–1000 B.C.), and Upper (1000 B.C.–A.D. 500).

Prehistoric material culture in the northern Sierra region of California has been further categorized according to local chronologies that define technological, economic, social and ideological elements. This northern Sierra region includes the drainages of the upper Feather, Yuba, Bear, and American Rivers and Lake Tahoe. The Martis-Kings Beach chronological sequence was first developed by Heizer and Elsasser (1953) after an extensive survey of the area around Lake Tahoe. The sequence was revised later by Elsasser (1960), Elston (1971), Elston et al. (1977), Humpreys (1969), Ritter (1970), and Elsasser and Gortner (1991).

The Tahoe Reach chronological sequence by Elston et al. (1977) has been adopted and used by the majority of archaeologists working in the north-central Sierra mountains and foothills, though questions have been raised about its validity (for example refer to Jackson et al. 1994). Some of these issues were examined recently by Basgall (2003). A second chronological scheme (Mesilla-Bidwell-Sweetwater-

Oroville-Historic) was developed for the west slope of the Sierra foothills, summarized by Ritter (1970) based on work at Lake Oroville, and later by Kowta (1988) based on his work at Lake Almanor. Prehistoric influences from both the high Sierra and Great Basin to the east (Martis Complex) and from the Sacramento Valley to the west have been recognized within this western foothill sequence. Recently, for example, as a result of shoreline surveys at Lake Almanor, Compas (2003) identified Martis, Mesilla, Sweetwater, and Kings Beach assemblages, among others.

Although assemblages earlier than the Martis Complex (Spooner and Tahoe Reach phases) have been tentatively identified as part of the Tahoe Reach sequence (Elston et al. 1977), the Martis Complex is the earliest well-documented phase. The sequence attempted to show continuity in development of culture, using projectile point typologies, from the Martis and Kings Beach complexes through ethnographic times. Using this argument, the Kings Beach is taken to represent the Washoe, with ancestral Washoe represented by the Martis Complex (Elston et al. 1977; Kowta 1984). This assessment, however, is not universal (Moratto 1984). Elston and others also suggest that prehistoric occupation of the Sierras may have occurred as a result of the movement westward of peoples from the Great Basin. Kowta (1988) suggested Penutian-speaking peoples from the east displaced indigenous Sierran Hokan speakers about A.D. 1000.

The seven phases of the Tahoe Reach sequence (Elston et al. 1977), which spans most of the Holocene, are summarized in Table 90. The Martis and Kings Beach complexes account for five of the seven phases; these two complexes are detailed below.

Martis Complex (2000 B.C. – A.D. 500)

This well-documented complex has been identified from the Lake Tahoe area, extending northward into Plumas and Lassen Counties, as well as southward into Alpine County (Elsasser 1960). Radiocarbon dates and obsidian hydration measurements indicate the complex was present from 2000 B.C. to A.D. 500 (Elsasser and Gortner 1991). Excavation of Martis Complex sites included the Chilcoot Rockshelter in Plumas County (CA-PLU-44; Payen and Boyolan 1961). Characteristics of the Martis Complex include an emphasis on hunting and seed collecting. Projectile points were large, heavy, and roughly flaked; they also varied in form (although they resemble Great Basin forms, including the Elko series). An abundance of distinctive tool forms included finger-held drills or punches, large biface blades and cores, spokeshave-notched tools with a concave edge, and basalt pressure-retouched flake “scrapers.” For the manufacture of flaked tools, there was an apparent preference for using local basalt other than chert or obsidian. The milling equipment used to process seeds was predominantly grinding slabs and handstones.

Table 90. Cultural Phases of the Tahoe Reach Chronology

Age	Phase	Characteristics	Climate
A.D. 1200–Historic Contact	Washo-Late Kings Beach	Desert Side-notched and Cottonwood Series points, chert cores, utilized flakes, and other small chert tools.	Neoglacial; wet and cool but with little summer precipitation
A.D. 1200–500	Early Kings Beach	Eastgate and Rose Spring series points, chert cores, utilized flakes, and other small chert tools.	Nonglacial; dry, trees growing in former bogs; Tahoe does not overflow often
A.D. 500–500 B.C.	Late Martis	Corner-notched and eared points of the Martis and Elko series Large side-notched points Large basalt bifaces and other basalt tools.	Neoglacial; wet but not necessarily cooler, increased summer precipitation
500 B.C?–1500 B.C.	Middle Martis	Steamboat points, other types in Elko-Martis series Large basalt bifaces and other basalt tools.	Possible warm, dry interval centered on 1500 B.C.
1500–2000 B.C.	Early Martis	Contracting stem points of the Elko-Martis series Large basalt bifaces and other tools. Light-colored basalt artifacts	Beginning of Meditherimal; Neoglacial, wet but not necessarily cooler, increased summer precipitation; Tahoe begins to overflow
2000–5000 B.C.	Spooner	Point in the Pinto and Humboldt series, light-colored basalt artifacts.	Altithermal; generally hot and dry; Tahoe does not overflow for long periods of time
6000 B.C.	Tahoe Reach	Parman points.	Anathermal; warming trend, climate similar to later Neoglacial intervals

The most important mountain valleys inhabited by the Maidu included American, Big Meadows (now under Lake Almanor), Butt, Genesee, Indian, Mountain Meadows, and Red Clover (Riddell 1978). One or more permanent villages were established in these valleys, winter weather permitting. Occupation was restricted to seasonal use in other valleys, including Sierra and Mohawk. The nearest recorded Maidu villages to the Keddie Ridge Project area would have been Tse'lim-nah and Yow'-koo, located in the North Arm of Indian Valley.

Political organization of the Maidu was limited to a settlement pattern of village communities (Kroeber 1925; Riddell 1978). A central village housed a circular, semi-subterranean ceremonial assembly structure and the home of the community spokesman. A community was composed of 3–5 villages, and the villages were apparently self-sufficient. Kroeber (1925) estimated village size as less than 200. Houses were either semi-subterranean or conical bark structures. Because of water discharge during the spring and summer snowmelt, villages were situated on the edges rather than the center of the valleys. Each village community owned and defended their common hunting and fishing grounds near these mountain valley settlements. Some fishing holes and deer fences were owned by individual families and inherited by male descendants.

The fundamental economy of the Maidu was one of subsistence hunting, fishing, and collecting plant foods in an area where abundant natural resources varied seasonally (Riddell 1978). Acorns were a dietary staple, and were collected from oak groves at lower elevations. Oak varieties in the area included the black oak (*Quercus kelloggii*), canyon or golden oak (*Q. chrysolepis*), and interior live oak (*Q. wislizenii*). The Maidu gathered nuts from the sugar pine and yellow pine and ate them raw or cooked into a soup or patties. In the northeastern part of their territory near Susanville, nuts from the huckleberry oak (*Q. vaccinifolia*) and bush chinquapin (*Chrysolepis sempervirens*) were also collected. Other vegetal resources included (*Corylus cornuta var. californica),* hazelnuts, buckeye nuts, wild nutmeg, grass seeds, berries, and underground roots and bulbs. Roots included camas, Indian root, cattail root, and tule root. Camas roots were harvested early in the summer and roasted in rock-lined cooking basins (Waechter 2005). Salmon, eel, birds, waterfowl, grasshoppers and other insects, as well as large and small mammals, were also consumed. Large animals included deer, elk, and grizzly bears.

A wide variety of tools, implements, and enclosures were employed by the Maidu to gather and collect food resources. These included the bow and arrow, traps, nets, slings, snares, clubs, and blinds for hunting land mammals and birds; salmon gigs, traps, and nets for fish. During communal drives, deer were driven over cliffs or shot by concealed hunters. Woven tools, including seed beaters, burden baskets, and carrying nets, as well as sharpened digging sticks, were used to collect plant resources. Snowshoes were used for winter travel, and dugout canoes or log rafts for navigating or crossing the mountain waterways (Riddell 1978).

The Maidu processed food resources with a variety of tools, including portable stone mortars, bedrock mortars and pestles, anvils, woven strainers and winnowers, leaching baskets and bowls, storage baskets, woven parching trays, wooden mortars, and knives. Baskets were either coiled or twined. They also traded between neighboring Konkow for various resources and implements, and with the Achumawi for beads, obsidian, money beads, and green pigment dye.

Log drums, rattles, flutes and whistles accompanied Maidu ceremonial dances. Mortuary practices among the Maidu included extended burials, generally facing east, that were accompanied by grave offerings (Riddell 1978).

Maidu lifestyles were little affected by exploration into mainly Konkow territory by Spanish explorers and missionaries of the early 1800s. Fur trappers and explorers introduced malaria and other diseases including the great 1833 Sacramento Valley epidemic. After the discovery of gold in 1848 at Sutter’s Mill, tens of thousands of gold seekers brought diseases previously unknown in the area. In addition, the concentration and increase in population resulted in the concentration of diseases, decimating the Maidu population. The results were devastating and included the loss of land and territory, including the traditional hunting and gathering locales, violence, malnutrition, and starvation. The Maidu then worked for miners for low wages. The Maidu were forcibly marched to the Round Valley Reservation in 1863, with few provisions or water over a long, hot dry trail. By 1910, estimates indicate the Maidu population had been reduced to only 200 individuals from perhaps 2,300 prior to contact (Kroeber 1925; Riddell 1978).

Today, a small percentage of Maiduan people live on seven Rancherias (Auburn, Berry Creek, Chico, Enterprise, Greenville, Mooretown, and Susanville) and the Round Valley reservation, located in Plumas and Butte counties. The Greenville Rancheria was restored to federal recognition in 1983, and three or four of the original land allotments were also restored to its members. Nearly 200 members are serviced today by this federally recognized group in Greenville, Plumas County.

Historic Period

Early Period, General California History and Specific to the Keddie Ridge Project area
Following the settlement of San Diego in 1769, the Spanish made steady progress in the exploration and settlement of the coastal regions of California. The Central Valley, however, remained largely uncharted. Spaniards made occasional forays into the San Joaquin Valley in pursuit of natives who had fled the forced labor imposed on them at coastal missions. Between 1804 and 1823 the Spanish made numerous trips into the Valley prospecting for new mission sites, attempting to recover stolen horses and cattle, or making punitive raids on the local natives believed responsible for the theft of livestock. In 1820 the Feather River was named by a Spanish exploration party heading up the Sacramento Valley, led by Captain Louis A. Arguello. After spying many waterfowl feathers floating up the water of the river, the party dubbed the watercourse Rio de las Plumas. Subsequent to 1820, Spain's control over California grew ever more tenuous.

A law was passed on September 13, 1813 for secularization of the missions of California. However, at that time there was no expectation that this law would be acted on or enforced (Caughey 1953). That same year Mexican forces prevailed in their struggle for independence and declared California part of the Mexican state. This event marked the beginning of the short-lived Mexican period in California history. Governor Figueroa, by proclamation on August 9, 1834 ordered ten missions secularized. Half the property was to be distributed to the Indians; however, they were not given power to dispose of it and were required to work on "essential community enterprises" (Caughey 1953). The final blow for the missions came in 1844 when Governor Micheltorena ordered the disposal of the remaining mission properties (Caughey 1953). With the decline of the mission came the rise of the ranchos. These Spanish land grants, which were really Mexican, were known as ranchos and encompassed hundreds of acres. Little attention was paid to boundaries (Caughey 1953). The ranchos enriched those fortunate enough to receive one, while effectively subjugating the native labor forces.

Exploration and Settlement

The opportunity to establish an American presence in the interior of California was seized in the decades after Jedediah Smith blazed an overland trail in 1826. Subsequent American settlement of the region was enabled, in large part, by the introduction of exotic diseases that decimated the native populations of California. Early Euro-American pioneers to brave the difficult overland routes to California are exemplified by the Bartleson-Bidwell Party of 1841, the John Work party of 1833 (Englich fir trappers) and the Stevens-Murphey Party of 1844.

In 1839, Swiss emigrant John A. Sutter established a permanent settlement in the Sacramento Valley. In 1841 Sutter applied for and was granted eleven leagues of land near the confluence of the American and Sacramento Rivers where he established the settlement of New Helvetia. In short order he built a small colony which served as the nucleus for economic and political activity in the Sacramento Valley (Hoover et al. 2002). In 1848 Sutter relinquished control of his property to his son, John A. Sutter, Jr.

With the aid of Captain William A. Warner, the younger Sutter laid out the town of Sacramento on the eastern bank of the Sacramento River. That same year gold was discovered in the millrace of Sutter's Mill at Coloma, sparking a massive migration into California as thousands rushed to the goldfields. The California Gold Rush, which fed the economic vitality of northern California, further fueled the decline of the native populations. As thousands rushed to California in search of gold and established businesses, the local indigenous population was overwhelmed and displaced.

In 1848, Peter Lassen and his associate, Isadore Meyerwitz, passed through what is today Plumas County (Fariss and Smith 1882). Later that year Lassen began promoting his route over the Sierra to the goldfields beyond, which traversed Plumas County. The route was variously referred to as Lassen's Cut-off, the Lassen Road, and Lassen's Horn (Fariss and Smith 1882). While many emigrants opted for Lassen's Cut-off in the first year following the discovery of gold at Coloma, prospecting within the streams and rivers of the county would not be successfully conducted until June 1850 (Fariss and Smith 1882). Further down the Feather River, John Bidwell directed a number of Native Americans in his employ to begin working the gravels on his rancho near Chico in 1848, after visiting Coloma (Caughey 1953).

In 1850, Peter Lassen and an associate were the first to establish a settlement in Indian Valley. At the north margin of the valley, immediately south of the Keddie Ridge Project area, they build a small cabin that would serve as a trading post. The men named the broad expanse that lay before them "Caché Valley," although the name did not stick. The Noble party, passing through the area in 1851, referred to the area as "Indian Valley" for the significant population of Maidu people living there. Lassen and his associate took to cultivating the valley and raised a number of vegetables to be sold at their trading post.

In March of 1852 a settlement at Taylorsville was established. During the next few years Indian Valley grew appreciably, and large portions of it were claimed for agriculture. Taylorsville was the site of much of the activity, and it was there that the first sawmill and grist mill were established in the valley in 1855 and 1856, respectively. A private school was opened in 1859, and by 1863 a public school had been built (Fariss and Smith 1882.

Greenville was established to support the thriving quartz mines being operated in its vicinity. The most important mines at the time of Greenville's founding included the Bullion, the Lone Star, and Ellis mines. A four stamp mill was built at Greenville in 1862 by Alfred McCargar, and the town eventually grew up around this location. By 1882 Greenville was home to roughly 500 people and a newspaper, a post office, a church, water-works, a physician, dentist, soda factory, boarding house, barbers, a market, wagon maker, shoemaker, blacksmiths, a sawmill, flour mill, saloons, restaurants, threes stores, and one large hotel (Fariss and Smith 1882). A third town in Indian Valley, Crescent Mills, was established early in the county's history as a quartz mining and processing center. Mining and milling of quartz ore were conducted up until 1926 (Hoover et al. 2002).

Plumas County was organized in 1854, by partitioning Butte County. An official survey and mapping of the recently formed county was authorized in 1871, to be carried out by the County Surveyor, Arthur W. Keddie. Keddie surveyed portions of Plumas County beginning in 1864, including the road between Indian and American Valleys. In addition, he surveyed a projected rail line connecting Oroville to Reno, Nevada. Finally settling in Quincy he served in his official capacity for a number of years (Fariss and Smith 1882).

The population of Plumas County (then still a part of Butte County) grew rapidly following the discovery of gold and the subsequent diversification of the economy. The population of the county in 1860 was 4,554 persons; by 1880 the population had grown by 35 percent to 6,180 individuals (Fariss and Smith 1882). During the 1860 census the population of Indian Valley was reported as 479; this included 362 White, 12 Chinese, and 105 Indian (Fariss and Smith 1882).

Mining in Plumas County

Plumas County has been blessed with an abundance of mineral wealth, which was the impetus for its settlement and early economic development. Mining provided the economic base that allowed other industries, such as agriculture and timber, to evolve in the county. The earliest placers worked in what is now Plumas County include diggings at Nelson's, Poorman's, and Hopkin's Creeks, as well as the vicinity of Rich Bar. Within a few years the easily accessible placer gold deposits were exhausted. New operations sprang up using hydraulic and drift mining techniques, which required much more capital expenditure and expertise. As a result, many of the small mining operations were unable to compete. Many immigrants left the goldfields to seek more steady work in the county's diversifying economy, or to chase new strikes elsewhere, such as the Comstock in Nevada.

Particular to the Keddie Ridge Project area, major gold-bearing quartz ledges were discovered in the Indian Valley area beginning in the early 1860s, which came to be known as the Cherokee Mining District. In 1862 the Green Mountain ledge was discovered near Crescent Mills, which led to greater mineral exploration in the area. The mine was owned by the Green Mountain Gold Mining Company, which also operated the Cherokee Mine near Round Valley and the Gold Stripe mine near Crescent Mills (Fariss and Smith 1882). Mining required a great deal of water, and it was generally supplied by ditches in Plumas County. Fariss and Smith (1882) report that by 1857 there were 45 miles of ditch in the county; by 1880 that figure had reached 1,000 miles county-wide.

Gold mining continued to be the dominant industry in Plumas County until the turn of the twentieth century, when it began to lose ground to other industries such as timber production. Copper deposits discovered in Plumas County in 1865 had not yet begun to turn the economic tide back towards mining due to the relatively low value. Around the turn of the century, the value of copper had increased and one entrepreneurial family was poised to take advantage. The Engels family, led by Henry Engels, had worked for many years to establish a copper mining operation in Lights Canyon, and in 1906 incorporated the Engels Mine. The region experienced a boom in copper production roughly between 1915 and 1930, and Plumas County was the state's largest producer. The Engels Mine proved to be very successful, and led to the construction of the first rail line in Indian Valley. The town of Englemine developed around the operation and was home to roughly 1,200 people in the 1920s. The Engels Mine closed in 1930 (Foote 1991; Smith 1970; Young 2003).

Other significant copper mines operated in the region, notably the Walker Mine. Located about halfway between Grizzly Valley and Genesee, the Walker Mine produced more than $23 million in copper ore in more than three decades of operation. Discovered in 1904, the Walker Mine began producing sizable quantities of copper in 1911. A nine-mile tramway was completed in 1919 to transport ore to a Western Pacific siding in Spring Garden near Quincy. A company town sprang up around the mine, known as Walkermine, owned by the Anaconda Copper Mining Company. The mine and adjacent town went into rapid decline with the sharp drop in copper prices in 1939. By 1941 the mine had shut its doors for good (Bullard-Watson 2006).

Like many places in the Sierra Nevada, Plumas County experienced a resurgence of small-scale gold mining during the Depression. Known as "Snipers", disenfranchised people looking to make enough money to eat, returned to the hills of Plumas County to unearth small amounts of gold. Despite the small resurgence, gold mining never regained the prominent position it once held in the county's economy.

Transportation

In the formative years of the county, there were two primary transportation routes from theCentral Valley to the gold mines and population centers. The two routes are described by Fariss and Smith (1882): "one from Marysville, through Strawberry Valley to Onion Valley, and the Middle Fork of the Feather River, and thence on to American Valley; and one from Bidwell's Bar to Buck's Ranch, Spanish Ranch, American and Indian Valleys, and the mines on the North Fork and East Branch. The former was the first one opened, but the latter has been the most important." The early routes were little more than trails and travel proved difficult. In subsequent years wagon roads were established that made travel easier, thus contributing to the economic health of the area by providing for the transportation of goods. Early wagon roads were private ventures that relied upon tolls to recoup the costs of construction and maintenance. Early notable wagon roads in the region included the Quincy and Spanish Ranch Wagon Road, the Pioneer Wagon Road, the Plumas Turnpike, the Chico and Humboldt Wagon Road, Quincy and Indian Valley Wagon Road, the La Porte and Quincy Wagon Road, and the Red Clover Wagon Road.

In 1849, James Pierson Beckwith (Beckwourth) an African American explorer, was operating a trading post in Sonora, but the next spring he joined the search for a "Gold Lake" said to be somewhere in the northern part of the state. This prospecting trip lead directly to the development of the Beckwourth Trail. In 1850, he discovered a new pass over the Sierra Nevada. In 1854 Beckwith related his life story to Thomas D. Bonner and at the same time changed the spelling of his name to Beckwourth. Crossing the Sierra Nevada was an arduous and dangerous task, so the discovery of the lowest pass across the range, at a mere 5,221 feet in elevation, was an important accomplishment. The Beckwourth Trail branched off from the main California Trail at Truckee Meadows (site of Sparks in Reno, NV) and ended in Bidwell's Bar (mining camp now under waters of Lake Oroville) (Plumas County Visitors Bureau, Oregon-California Trails Association, Plumas National Forest, n.d.).

As mentioned above, the success of the Engels Mine led to the creation of the Indian Valley Railroad, which was built to haul ore from the mine to a siding at Paxton. The standard gauge railroad operated from 1917 – 1938 (Fickewirth 1992). Following the closing of the Engels Mine in 1930, the line continued carrying passengers until 1938. On December 1, 1909, Western Pacific Railroad inaugurated through freight service. Prior to this there had been local freight service between Salt Lake City and Shafter for the Nevada Northern Railroad connecting to the mines in Ely, Nevada. Passenger service did not operate until late summer of that year. There was much fanfare in the towns along the line. DeNevi states that "In Quincy, where the original concept came into fruition, Authur Keddie, now 68 years old almost wept as he spoke in enthusiastic welcome from the courthouse steps" (DeNevi 1978). The Northern California Extension of the Western Pacific Railroad, which was known as the "Inside Gateway," consisted of a 112 mile section through some of the most rugged and isolated sections of California. This section of line between Keddie and Bieber was completed on November 10, 1931 in order to provide the Western Pacific Railroad (in connection with the Great Northern Railroad), a north/south route, competitive with the Southern Pacific Railroad (DeNevi 1978).

Agriculture and Timber Production

After the founding of Taylorsville, agriculture came to play a major role in the economy of Indian Valley. The fertile soil on the valley floor, which was fed by the many tributaries to Indian Creek, had to be reclaimed before farming and ranching could take place on a large scale. By 1853, Indian Valley was on its way to becoming a significant producer of cereal crops as people realized that the mountain valleys of Plumas County were well suited to growing wheat, oats, and barley. By 1855 a variety of agricultural products were being produced by the county including corn, potatoes, hay, butter, cattle, swine, sheep, beer, apples, pears, peaches, and honey (Fariss and Smith 1882). Cattle were raised to provide beef and dairy products. The first flourmill was built in Indian Valley at Taylorsville in 1856, and was followed by a second mill in Greenville.

Timber production in Plumas County dates back to the Gold Rush when wood for flumes, wing dams, and structures was in high demand. The first lumber mill was established by J.B Batchelder at Rich Bar to serve the booming mining community. The development of quartz mines in places like Greenville contributed to the steady demand for the commodity. Early timber operations were small, with a fairly local market (Young 2003).

One of the first companies to acquire significant amounts of timberland in the county was the Reno Mill and Lumber Company, who amassed more than 7,000 acres of forest by 1889 (Young 2003). The industry grew gradually until 1909 when the Western Pacific Railroad was completed in Plumas County and the timber industry expanded rapidly. A number of small, narrow gauge railroad lines were built into the heavily timbered hills of the county to extract the valuable resource. The steam donkey arrived in Plumas County in the early twentieth century, thus making even more timber available for the busy mills. From that point on, timber was the dominant industry in the county and continues to be an economic force to this day (Young 2003).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Section 110 of the National Historic Preservation Act (NHPA) requires the federal government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies use the Section 106 process associated with the National Historic Preservation Act (NHPA). Passed by Congress three years before the National Environmental Policy Act (NEPA), the NHPA sets forth a framework for identifying and evaluating historic properties and assessing effects on these properties. This process has been codified in 36 Code of Federal Regulations (CFR) 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8.

NEPA includes reference to "... important historic, cultural, and natural aspects of our national heritage." This terminology includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l)(1)). Therefore, agencies use the NHPA Section 106 process to consider, manage, and protect historic properties during the planning and implementation stages of federal projects. The Plumas National Forest uses the Regional Programmatic Agreement (RPA) to implement the Section 106 process.

Additional direction is provided by *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement (June 2004).*

Effects Analysis Methodology

Specific Methodology

The heritage resources geographic analysis area is the Keddie Ridge Project area (6,160 acres)., also the Area of Potential Effect (APE). Area of potential effects as defined by 36CFRPart 800.16(d) means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. An Undertaking as defined by 36CFR800.16(y) means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approvalThis boundary was chosen because sites within the Keddie Ridge Project area would be protected during the implementation of the action activities. The temporal boundary is determined by the life of the project. This boundary was chosen because sites within the Keddie Ridge Project area would be protected during the implementation of any of the action activities.

Three levels of analyses were completed to understand the significant themes and extent of heritage resources associated with the Keddie Ridge Project. First, research into the greater history of the Keddie Ridge Project area was conducted to understand historic themes or events that have transpired in time and space (refer to the "History of the Project Area" section above). Second, a heritage resource survey was conducted for the Keddie Ridge Project area to identify heritage properties associated with these themes. Lastly, heritage properties were assessed to determine potential effects associated with implementation of the project. The results and relevant rationale for each of these analyses are presented below. Inventory survey methodology consisted of pedestrian transect spacing of 0-20 meters (Complete), 20-40 meter transects (General), and 40-60 meter transects (Cursory).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past

actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

Affected Environment

The majority of the Keddie Ridge Project area was previously surveyed during thirty three earlier projects (3,742 acres). The remaining 2,418 acres of the Keddie Ridge Project area were inventoried in 2006, 2007, and 2010 by Pacific Legacy Inc., the Plumas National Forest, and TEAMS Enterprise. Based on previous studies and the inventories conducted for this undertaking, the entire area has been adequately assessed for heritage resources. All identified heritage resources have been fully recorded and are on file at the Mt. Hough Ranger District office.

There are a total of forty-seven known heritage resource sites (historic properties) located within the Keddie Ridge Project area. Thirty-six of these sites are located within proposed treatment units. Ten sites are not located within treatment units but are located within the Keddie Ridge Project area. One site is located both within and outside of a Treatment Unit and is also located within the Project area. Of the 47 known heritage resource sites, three are classified as prehistoric; one is classified as multi-component (both prehistoric and historic attributes); and 43 sites are classified as historic. The prehistoric sites consist of bedrock mortars, a traditional bear grass gathering site, and a village site. The multi-component site consists of house depressions and a historic artifact concentration. The historic sites consist mainly of artifacts and features associated with mining activities that took place within and adjacent to the project area. All known heritage resources within the Keddie Ridge Project area of potential effect (APE) were field visited and the site boundaries flagged with the exception of three sites within three of the treatment units.

Treatment units 68, 72 and 79 are slated for hand thinning, piling and burning. Two of the units contain large mining complexes and one of the Units contains a town site. Within these large historic sites, there are areas devoid of heritage features where hand piles can be carefully placed without affecting the integrity of the heritage resources. Each of the features has been flagged for avoidance within the heritage resource site boundaries. In addition, an Archaeologist from the Mt. Hough Ranger District Heritage Resources Staff will be on site monitoring placement of hand piles within Units 68, 72 and 79. Vegetation treatment within site boundaries is allowed under certain conditions stated in the *Standard Resource Protection Measures V.B.8, Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects* (June, 2004). A total of 53 isolated finds were recorded in 2006 and in 2010. Isolated finds are not heritage resource sites (historic properties) and therefore require no protection. Isolated finds are defined as single artifacts, a small group of a few artifacts no associated with a larger heritage resource site or single archaeological features.

Native American Consultation

Consultation was initiated on March 31, 2010 with the following tribes: Honorable Gary Archuleta (Chairman, Concow Maidu tribe of Mooretown Rancheria), Honorable Glenda Nelson (Chairwoman, Estom Yumeka Tribe of Enterprise Rancheria), Honorable Kyle Self (Chairman, Greenville Indian Rancheria), Honorable Stacy Dixon (Chairman, Susanville Indian Rancheria), Honorable Jim Edwards (Chairman, Tyme Maidu Tribe of Berry Creek Rancheria), and the Honorable Waldo Walker (Chairman, Washoe Tribe of Nevada and California). In addition, consultation was initiated with Lorena Gorbet (Chairwoman, Maidu Cultural and Development Group).

Responses to Native American Consultation

Responses were received from Mike DeSpain, (Director of the Office of Environmental Plannning and Protection, Mechoopda Indian Tribe of Chico Rancheria, California), Melany Johnson (Tribal Historic Preservation Officer, Susanville Indian Rancheria) and Ren Reynolds (Environmental Coordinator Estom Yumeka Tribe of Enterprise Rancheria).

Herbicide Use on Basketry Material Collectors

On June 10, 2010, a field trip to the Keddie Ridge Project area was undertaken. Two heritage resource sites were visited and the boundaries re-flagged at this time.

There is one known bear grass location south of Canyon Dam. No herbicides will be applied in or around the Canyon Dam bear grass areas. No other plant collection areas are known in the Keddie Ridge Project area. No weed infestations have been documented within Bear Grass collecting sites.

The hazards associated with the proposed herbicides and fungicide (aminopyralid, glyphosate, and borax) have been compiled in a group of risk assessments completed by Syracuse Environmental Research Associates (SERA 2003, 2006, 2007) and are incorporated by reference into this section. This risk assessment was completed for the entire USDA Forest Service. In addition, Appendix I presents project-specific results from an analysis conducted for the Keddie Ridge Project to further characterize the risk of herbicide exposure to members of the general public. One of the scenarios that produced a hazard quotient above one (i.e. had an elevated level of risk) was one that involved the consumption of glyphosate-contaminated vegetation. Under normal circumstances, particularly in the case of noxious weed treatment applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. One exception to this could be plants collected by Native Americans for basket weaving or medicinal use. However, in most instances, particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure. In addition, there are no individuals with permits to collect in these areas, which further reduces the risk of exposure. Signs may also be posted prior and post herbicide application. All relevant federal, state, and local laws will be followed with respect to herbicide application. For a complete discussion of the risks associated with the proposed chemicals, refer to Appendix I.

Environmental Consequences

Direct and Indirect Effects (All Action Alternatives)

Heritage Resource site boundaries are flagged and the Standard Resource Protection Measures as outlined in the RPA (March, 2001) would be followed during implementation of any of the Action alternatives (Alternatives A, C, D and E). All artifacts and features would be avoided during project implementation therefore there would be no effect to heritage resources.

Cumulative Effects (All Action Alternatives)

Heritage resource sites will be protected using Standard Resource Protection Measures as outlined in the RPA. However, by protecting heritage resource sites from fuel treatments under all action alternatives, there may be a cumulative effect of creating islands of un-thinned, unburned fuels. These islands may burn hotter and longer that treated areas in the event of a fire.

In general, past, present and foreseeable future events have had cumulative effects of varying degrees on heritage resources. There is no substantive difference in cumulative effects predicted for heritage resources between the alternatives.

Alternative B – No Action Alternative

Direct and Indirect Effects

No project treatment activities would occur under the no action alternative; hence, there would be no effects on heritage resources.

Cumulative Effects

No project treatment activities would occur under the no action alternative; hence, there would be no effects on heritage resources.

Compliance with the Forest Plan and Other Direction

The effects of the project on heritage resource sites were assessed in compliance with Section 106 of the National Historic Preservation Act as mended (1966).

No effects are anticipated, since the following Standard Resource Protection Measures (SRPMs), *First Amended Regional Programmatic Agreement* (March, 2001) and *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement* (June, 2004) would be implemented, as appropriate, for all heritage resources within the Keddie Ridge Project area that could potentially be affected by project implementation. Application of the following SRPMs would result in the project having "no effect" on heritage resources (*First Amended Regional Programmatic Agreement* (March, 2001):

- All proposed activities, facilities, improvements, and disturbances shall avoid heritage resource sites. Avoidance means that no activities associated with the project that may affect heritage resource sites shall occur within a site's boundaries, including any defined buffer zones. Portions of the project may require modification, redesign, or elimination to properly avoid heritage resource sites.
- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
- When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes shall be completed prior to initiating any activities.
- Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

From *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement* (June, 2004):

- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
- Fire crews may monitor sites to provide protection as needed.
- Fire lines or breaks may be constructed off sites to protect at risk historic properties.

- Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized, and features are avoided, as specified by the Heritage Resource Manager.
- Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties.
- Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines.
- Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels.
- Trees which may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents.
- Vegetation to be burned shall not be piled within the boundaries of historic properties unless the location (e.g., a previously disturbed area) has been specifically approved by the Forest’s HRM.
- Mechanically treated (crushed/cut) brush or downed woody material may be removed from historic properties by hand, through the use of off-site equipment, or by rubber-tired equipment approved by the HRM. Ground disturbance shall be minimized to the extent practicable during such removals.
- Woody material may be chipped within the boundaries of historic properties so long as the staging of chipping equipment on-site does not affect historic properties.
- The Forest’s HRM shall approve the use of tracked equipment to remove brush or woody material from within specifically identified areas of site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with the HRM’s authorization of certain equipment types within site boundaries.

Recreation

Introduction

The purpose of this section is to present a summary of the effects of the proposed project on developed and dispersed recreation. Less than one percent of the proposed Keddie Ridge Hazardous Fuels Reduction Project area falls within recreation areas. The Recreation Opportunity Spectrum (ROS) is used as an indicator to measure beneficial or adverse effects on recreation. The ROS class for areas within the recreation analysis area is identified in the Plumas National Forest Land and Resource Management plan (PNF LRMP) (USDA 1988).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Federal Laws

Travel Management Rule

The 2005 Travel Management Rule requires that in designating National Forest System (NFS) roads, trails, and areas, responsible officials consider the provision of recreational opportunities; public access needs; conflicts among uses of NFS lands, including other recreational uses; and the compatibility of motor vehicle use with existing conditions in populated areas (36 CFR Part 212, Subpart B).

Forest Plan

The 1988 PNF LRMP provides goals, objectives, and management direction for recreation activities on the Plumas National Forest. The PNF LRMP was amended by the 1999 Record of Decision on the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental EIS. The PNF LRMP identifies standards and guidelines for the Indian Valley area, Round Valley Lake, and Keddie Ridge Restricted Vehicle Access Area. The actions proposed for the Keddie Ridge Project would need to meet PNF LRMP standards and guidelines in order to maintain recreational opportunities. The 1988 PNF LRMP classifies recreational opportunities for the Forest under the Recreation Opportunity Spectrum (ROS). ROS classes in the project area include “Semi-Primitive Non-Motorized,” “Roaded Natural,” “Rural,” and the majority of the project area falls under “Roaded Modified.” The existing condition of the landscape for the recreation analysis area is described in the “Forest Vegetation, Fire, Fuels, and Air Quality” section of this DEIS. Past management activities are common where recreation occurs, but a naturally appearing landscape still dominates the project area.

Sierra Nevada Forest Plan Amendment: Final Supplemental Environmental Impact Statement Record of Decision: Forestwide Standards and Guidelines (2004)

There are no Forest-wide standards and guidelines from SNFPA 2004 that are applicable to recreation.

Specific Methodology

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.(Refer to appendix F for past, present and future projects).

The geographic area analyzed for effects on recreation is the area in the immediate vicinity of the treatment units, haul routes, and roads proposed for reconstruction. The recreation analysis area boundary incorporates campgrounds, dispersed recreation areas, roads, trails, lakes, creeks, and vegetative landscape that could be affected by the activities listed under each alternative.

Data Sources

All the data displayed in the recreation analysis was obtained from the special use permit files, National Forest System records (trails, roads, etc.), and corporate and project GIS data (treatment areas, prescriptions, etc.) which is stored at the Mount Hough Ranger District.

Affected Environment

The Greenville Campground, and Indian Falls Interpretive Trail are developed recreation sites within the project area, but they are not in the vicinity of any treatment units and therefore will not be analyzed in this document. The Round Valley Recreation Area and the Peters Creek Trail are developed recreation sites within the recreation analysis area. The Round Valley Recreation Area has a “Roaded Natural” ROS class. The Roaded Natural ROS class is: “a predominately natural environment where resource modification and utilization practices are evident. Evidence of the sights and sounds of man is moderate and in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from sights and sounds of man” (USDA 1988). The Peters Creek Trail area has a “Roaded Modified” ROS class. The LRMP defines the Roaded Modified ROS class as: “those Roaded Natural areas that are also coded as Middleground, Background or Unseen, and Sensitivity Level II or III. This is the general resource management area of the Forest, typified by pick-up trucks and many miles of dirt and gravel roads. Other than trails and trailheads, virtually no improvements are present. Users experience low interaction” (USDA 1988).

The Round Valley Run, Indian Valley Century Bike Ride, and the Patriots Day Ride are three permitted, annual recreation events that occur partially or entirely within the project area. The Round Valley Fishing Derby is a Forest sponsored event.

- Round Valley Run/Walk-foot Race – The event route is around Round Valley Lake (5.3 miles) and also includes a walk along County Road 204 for two miles. This one day event date is scheduled for August and involves approximately 100 participants and hosts approximately 30 spectators.
- Indian Valley Century Bike Ride – This 100 mile bike ride begins in Greenville, continues to Genessee Valley, then to Boulder Creek Work Station and returns to Greenville. This one day event is scheduled for May, and involves approximately 100 participants and hosts approximately 40 spectators.
- Patriots Day Ride - This is a 100 mile horse endurance ride. This event is scheduled for September. and involves approximately 60 participants and 50 spectators. This event operates on existing Forest System roads and trails and is spread over two days. The event course will take place on both the Mount Hough and Almanor Ranger Districts, the latter of which is on the Lassen National Forest.

Currently there are 39 special use permits within the project area that include: road easements, power lines, railroad right-of-ways, waterlines, telephone lines, barn/shed, private residences, irrigation ditches, transfer stations, livestock areas, natural resource monitoring, weather stations, weather modification devices, storage yards, industrial microwaves, a campground concession permit, and recreation events. Most special use permits require maintenance of the permitted area by permittees and include activities such as hazard tree removal, brush removal, road and improvement maintenance.

Dispersed recreation activities within the recreation analysis area include camping, hiking, swimming, boating, fishing, wildlife watching, horseback riding, mountain biking, off-highway vehicle (OHV) use, snowmobile riding, ice skating, hunting, rock hounding, driving for pleasure, Christmas tree cutting, and firewood cutting.

There are two non-motorized system trails within the recreation analysis area, the Peters Creek Trail and the Round Valley Interpretive Trail. Annual trail maintenance work consists of logging out, maintaining water bars or other erosion control devices, and maintaining and replacing signs. Work is typically accomplished by Forest Service crews and volunteers.

Woodcutting for personal and commercial use is permitted throughout the recreation analysis area. In the past nine years it is estimated that approximately 20 percent of the Mt. Hough Ranger District’s fuel wood permit sales are within the project area. Approximately 25 percent of the Christmas tree cutting is within the project area.

Environmental Consequences

Alternative B – No Action

Direct Effects

There would be no direct effects on recreation under this alternative because there would be no change in current recreation opportunities or ROS classifications.

Indirect Effects

Alternative B would not cause any short-term indirect effects on recreation opportunities. However, taking no action could result in long-term effects on recreation opportunities due to the increased risk of large-scale wildfires and reduced forest health, which could degrade scenic landscapes within recreation areas.

In the absence of the proposed treatments, forested stands would continue to grow and become dense, resulting in increased fuels accumulation and elevated risk of severe wildfire. Depending on the scope and severity of a wildfire, this type of event could cause temporary or long-term closures to recreation areas and inconvenience the recreation user. In the worst case, fire damage could be so extreme that recreation areas could take several decades to recover; these situations could result in displacement of forest visitors due to destruction of recreation facilities or loss of access to trailheads and dispersed or developed campgrounds.

Past observations on the Plumas NF suggest that large-scale fires could have adverse effects on recreation opportunities for 20 to 30 years. For example, areas that burned in the recent Moonlight Fire near Antelope Lake can still be seen from Forest System roads and campgrounds. Vegetation in these areas has been slow to return and has created a barren-looking landscape. Corrals at the Antelope Trailhead were burned by the fire and fallen snags along the trail prevented equestrians and mountain bikers from using the trails for a several years until crews finished restoration work

Reduced forest health in over stocked stands can result in insect infestations which create hazard trees as well as diminish aesthetic values.

Alternatives A, C, D, and E

Direct Effects

The four action alternatives are very similar in their effects on recreation resources. Although alternatives A and D propose the use of two herbicides and a fungicide, the risk to Forest visitors is expected to be negligible. The Human Health Risk Assessment, completed for the Keddie Ridge Project (appendix I), provides a detailed summary of the low risk that these chemicals present to human health and safety. The ROS Roaded Natural and Roaded Modified both allow for resource modification and utilization practices being evident, therefore the ROS classification would not be directly effected.

Developed Recreation

All of the action alternatives would result in minor direct effects on developed recreation areas at Round Valley Reservoir. There is a total of 134 acres of mechanical and hand thinning treatments proposed around the Round Valley Reservoir (units 72, 73, 74, and 107). These treatment activities would require an increased presence of heavy equipment and logging trucks on National Forest System roads; however signs would be posted to alert visitors of potential safety hazards. The Interpretive Trail at Round Valley Reservoir would be closed temporarily during the treatment activities. Signs will be posted in advance to notify the public. Heavy equipment and logging trucks may be noisy at times, which could have a minor temporary effect on a visitor’s opportunity for a peaceful recreation experience.

Dispersed Recreation

The action alternatives would result in minor short-term direct effects on dispersed recreation activities. A total of 136 acres of treatment are proposed around the Peters Creek Trail (unit 84); treatments include hand thin, underburn, and herbicide application. The trail system would be closed for the duration of the treatment activities. Advanced placement of warning signs as a safety precaution would help reduce any potential impacts on recreation users. Treatment activities would have long-term beneficial effects on the Peters Creek trail by helping to reduce fuels buildup, reduce debris along the trail and improve forest health

Project implementation activities could displace visitors seeking to use dispersed camping areas or day use areas. This is considered a minor short-term effect since visitors could use other areas of the Forest. Advanced placement of signs as safety precaution would help reduce any potential impacts on recreation users.

Existing NFS maintenance level 2 roads within the recreation analysis area would be used during operations as haul routes. Currently these routes are open to all vehicles. Prior to operations these routes may be improved to facilitate logging trucks. These improvements are not expected to diminish the recreation experience, and would have a beneficial effect on the NFS roads within the recreation analysis area. The impacts to recreational users during operation on these roads would be temporary road closures, increased traffic, dust, and noise. Signs would be posted in advance to notify the public and help avoid any potential impacts on recreation users. This is considered a minor short-term effect since visitors can use other areas of the Forest.

Portions of NFS road 28N38A (0.6 miles) and non-system road (continuation of 28N38A) (0.4 miles) are proposed for decommissioning. The routes decommissioned with the Keddie Ridge Project would remain closed to all motorized traffic. These routes are not OHV routes and decommissioning them would not have any effect on recreation and minimal impacts on public access due to the fact that it is a small dead end spur.

Indirect Effects

The proposed treatments would reduce hazardous fuels and create a more diverse and fire-resilient forest, which would have an overall beneficial effect on recreation opportunities by helping to maintain and preserve the landscape of existing recreation sites and areas. Reducing hazardous fuels adjacent to Round Valley Picnic Area and Peters Creek Trail would likely reduce the risk of a wildfire that could threaten existing improvements. Reducing the risk of wildfire would help ensure that recreation opportunities for developed and dispersed recreation would be maintained at existing conditions.

Underburning in treatment units could cause short-term negative effects on visual quality in developed and dispersed recreation areas. Smoke caused by underburning could also affect recreation events such as the Round Valley Run, Indian Valley Century Bike Ride and Patriots Day ride; however these three events happen in May, August and September, when burning is generally prohibited or considered infeasible. Herbicide applications would not cause any indirect effects on recreation users and are expected to present a low risk to human health and safety as demonstrated in the Human Health Risk Assessment (Appendix I).

Cumulative Effects

Alternatives A, C, D, and E would have no long-term cumulative effects on recreation resources in the recreation analysis area. Although effects of past vegetation management activities are common in the recreation analysis area, the proposed DFPZ, area thinning, group selection, and fuels treatments would have minor long-term beneficial effects on meeting the desired conditions for recreation opportunities. The desired conditions are to provide forest-related recreation for the public with facilities: preserve, protect or improve the surrounding forest around all recreation sites. There may be minor short-term effects on view sheds from campgrounds, trails, or roads, but long-term effects would meet forest standards and guidelines for identified ROS classes. Future vegetation management projects in the recreation analysis area would likely reduce hazardous fuel conditions that could threaten recreation areas, facilities, and view sheds.

The thinning activities would have a beneficial effect of reducing the risk of wildfire and aesthetically improving the stands of trees. Improving forest health would insure that this area remains well stocked and pristine. These values promote and benefit recreation.

Range

Introduction

The range resource encompasses permitted livestock that are authorized to graze within an allotment boundary through a ten year Term Grazing Permit issued by the Forest Service. Included in the range resource are:

- permitted livestock;
- range improvements needed to manage the allotment including fences, gates, exclosures, cattle guards and water developments;
- the permittee, that is, the rancher who owns and manages the cattle;
- creeks and springs from which livestock drink;
- and forage (grass, forbs, and shrubs) eaten by permitted livestock.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

The guidance for range management is provided in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b).

Effects Analysis Methodology

The analysis area for direct, indirect, and cumulative effects on range resources includes the Lights Creek Allotment. Effects were not considered for the Taylor Lake Allotment, which is currently vacant.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past

actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

The Plumas National Forest is divided into 67 allotments. An allotment is an area of land that has been designated for the permittee to graze their cows. The area of land contains both primary and secondary range. Primary range is land that is less than 40 degrees slope and produces more than 200 pounds of forage per acre. Secondary range is the timbered areas within an allotment. Transitory range can be created when timbered areas are treated. Keddie Ridge Project treatment areas are located in secondary range. There are no range improvements in the Keddie Ridge Project area.

The Lights Creek Allotment is 9,612 acres. The overlap with the Keddie Ridge Project is 678 acres (Figure 24). The Lights Creek Allotment is considered small for the Plumas National Forest. An average allotment on the east side of the forest characterized by more open timbered East Side Pine type vegetation and flatter ground grazes about 200 cattle pair during a four month season. The Lights Creek Allotment grazes only 24 pair (On) and 16 pair (Off) with a three month season. An On/Off permit grazes Natioanl Forest System lands as ‘On’ and leased private lands as ‘Off’. Only limited use has occurred in the treatment area. Use has not been monitored or reported within the treatment area because it is not primary range.

The current permittee has been grazing the same herd, with replacement heifers on this allotment for decades. With the current permittee, the cows tend to use the northern portion of the allotment because it is flatter, has meadows, and ties in with his adjacent allotment on the adjacent Lassen National Forest to the north of the project area. The portion of the allotment the cows use is approximately 4 miles from the treatment area. Figure 24 shows the spatial relationship between the project area, the allotment boundary, and the monitoring area. The cows tend to prefer meadows over timbered areas and therefore tend to use the project area very little because it is timbered. The monitoring area for the Lights Creek Allotment is Indicator Meadow, which is approximately 4 miles north of the project area (Figure 24).

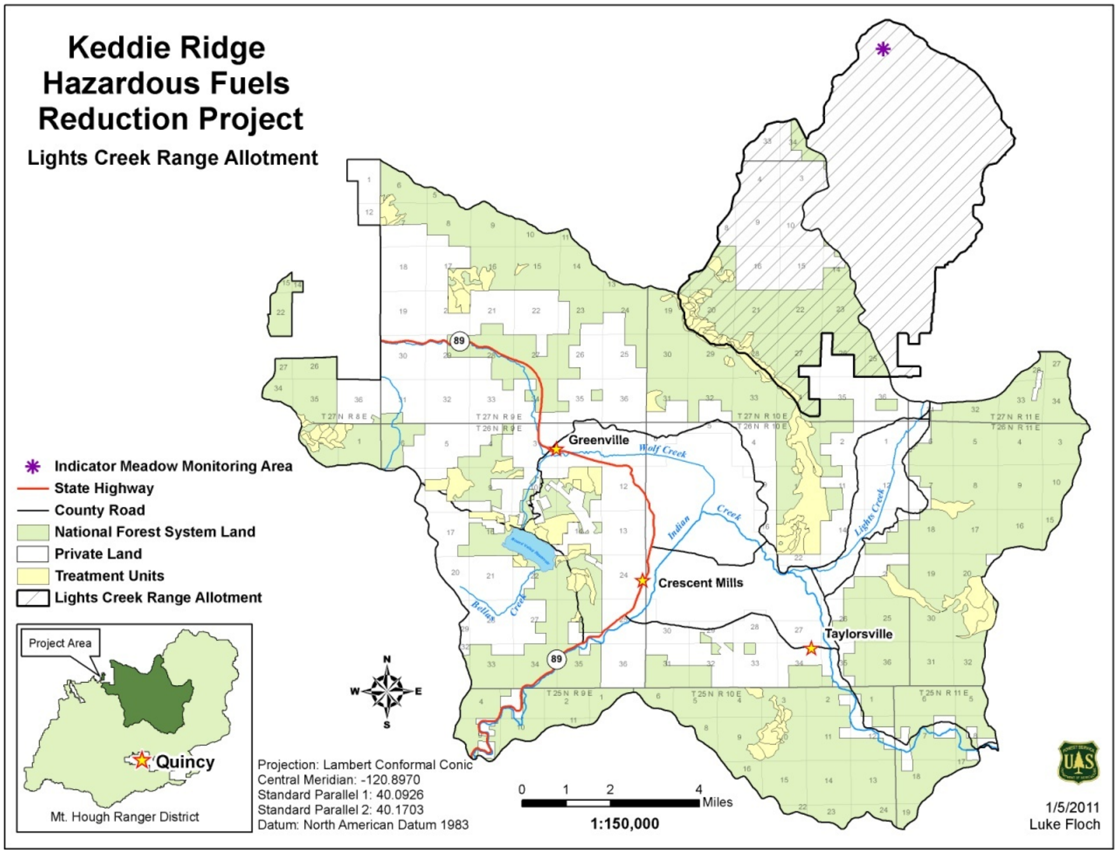


Figure 24. Map of Lights Creek Allottment, Keddie Ridge Project Area, and Indicator Meadow Monitoring Area

Environmental Consequences

Alternatives A, C, D, and E

Direct and Indirect Effects

Alternatives A, C, D, and E would have minor short-term direct effects on range resources. The Lights Creek Allotment would continue to be managed at current levels. Direct and indirect effects of hand thin, mechanical thin, group selection, mastication, and prescribed fire treatments to permitted cattle are displacement from the noise and activity. Since cattle use in the treatment areas is minimal, there will be little short-term displacement. Area thinning, group selections, and DFPZ units that involve timber falling and prescribed burning would require coordination between the Forest Service range specialist and the range permittee to ensure that livestock are kept away from active operations.

There could be an increased risk of vehicle collisions with livestock on haul routes and access roads to the treatment areas. Vehicle collisions could be avoided by ensuring that contracts contain safety specifications for traffic and by alerting contractors where cattle may be present.

The herbicide treatments proposed in alternatives A and D would have negligible adverse indirect effects on livestock. Although the potential is low (since livestock do not typically graze on noxious weeds, such as starthistle or Canada thistle), it is possible that livestock could consume vegetation contaminated by glyphosate or aminopyralid. In order to quantify the potential effect on livestock, a scenario was analyzed to examine chronic or longer-term exposure to contaminated vegetation with both proposed applications of pesticides for glyphosate and aminopyralid (SERA 2003, 2007). The level of risk was determined by using a "Hazard Quotient," which is calculated based on proposed application rates. A Hazard Quotient of less than one is considered to be a low risk. The results of this analysis are presented in Table 91. These results indicate that the Hazard Quotients for applications of glyphosate and aminopyralid would be less than one; therefore, the risk to livestock exposed over the long-term to glyphosate or aminopyralid would be low.

Table 91. Scenario Involving Long-Term Exposure of a Large Mammal to 100 Percent Contaminated Vegetation

Herbicide Scenario (long-term exposure to contaminated vegetation)	Hazard Quotient		
	Central	Lower	Upper
Aminopyralid	0.002	0.0002	0.03
Glyphosate	0.05	0.006	0.5

Sources: SERA 2003, 2007

Herbicide labels and Human Health and Ecological Risk Assessments Final Reports for aminopyralid, glyphosate, and borax were reviewed for the Keddie Ridge Project. There are no label restrictions for range cattle. Since there are no label restrictions for range cattle, Hazard Quotients are low, and livestock use within the treatment area is limited, there will be negligible direct or indirect effects to permitted livestock. The District will coordinate treatments with Forest Range Staff who will let the permittee know when treatments are planned.

Cumulative Effects

Alternatives A, C, D, and E would not contribute to adverse cumulative effects on range resources. Past, present and future vegetation management activities (listed in appendix F) have and would continue to help maintain or improve transitory range. The proposed area thinning treatments combined with future vegetation management projects would help maintain transitory grazing opportunities for livestock. Future DFPZ maintenance would continue to allow short-term opportunities for openings and transitory rangelands.

Alternative B No Action

Direct and Indirect Effects

There would be no adverse effects on range resources under the no action alternative. The Lights Creek Allotment in the Keddie Ridge Project area would continue to be managed under current direction and guidelines in the Forest Plan.

The short-term benefits of taking no action would be that the permittee or their livestock would not be affected by project activities.

There could be minor short-term indirect effects on suitable habitat without the underburning treatments, since burning helps encourage growth of available forage (grasses). Without implementing area thinning treatments, there could be long-term minor effects on range resources through decreased suitable habitat.

In the absence of noxious weed treatments, it is possible that noxious weed populations could spread and have long-term effects on available native forage species. However, without herbicide use, there would be no risk of exposing cattle to herbicide spills or vegetation that has been treated with herbicides.

Cumulative Effects

Alternative B could increase the potential short-term cumulative effects on range resources. The risk of future fires causing damage to forage would be a short-term effect on grazing because forage would return after a fire. Cows may need to be temporarily removed for one to three years until new vegetation and soils are better stabilized.

Minerals

Introduction

There are approximately 168 active mining claims in the Keddie Ridge Project area[9]. The Mt. Hough Ranger District currently administers three active plans of operation and four notices of intent for active mining claims in the project area. In addition, there are 5 claims for which plans have been submitted and completed, but are on hold by the owner operator. These could be activated at any time. This area has a long history of mining. There are several claims which are not currently being worked but which may be worked in the future. There are two abandoned mines in the project area that may be identified for closure next year. Many more exist but are not yet identified.

This mining analysis includes the effects of the Keddie Ridge Project on mining claimants and mine operators. The short-term and long-term effects, including beneficial effects, are included in this analysis.

[9] http://www.blm.gov/lr2000/

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Federal Laws

Management of mining operations on the Plumas National Forest falls under several regulatory authorities. The Mining Law of 1872 established the category of locatable minerals. It authorized placer and lode mining claims, mill site claims and tunnel site claims and modified the ability for patenting upon proven discovery. It also required at least $100 worth of work on each claim annually in order to maintain a possessory title.

The Forest Service Organic Administration Act of 1897 gave the Forest Reserves the basic authority to regulate surface uses, including mining.

Other regulatory Acts which affect minerals administration on the Forest include the 1947 Materials Act, the 1955 Multiple Use Mining Act (Surface Use Act), and the Clean Water Act, Section 401.

Daily operations are regulated under 36 CFR 228 regulations, Subpart A and Subpart C.

State Laws

The California Surface Mining and Reclamation Act of 1975 (SMARA) requires that anyone, including government agencies, engaged in surface mining operations in California (including those on federally managed lands) which disturb more than one acre or remove more than 1,000 cubic yards of material must submit and be subject to a Reclamation Plan. This includes, but is not limited to: prospecting and exploratory activities, dredging and quarrying, streambed skimming, borrow pitting, and the stockpiling of mined materials.

Mining operators are responsible for the preparation and submission of reclamation plans and financial assurances for reclamation to the lead agency. Annual reporting to both the State and the lead agency on the status of mining and reclamation activities, annual updates of financial assurances, and annual inspections (to be conducted under the auspices of the lead agency), are required. Following completion of mining activities, and in accordance with the approved reclamation plan and relevant permit conditions, mining operators return mined lands to a second, productive use. Examples of post-mining uses may include, but are not limited to, open space, wildlife habitat, agricultural lands, grazing, park lands, and preparing the land for industrial or commercial uses[10].

Forest Plan

Herger-Feinstein Quincy Library Group Forest Recovery Act

No specific references to mineral and geology resources are made within the HFQLG Forest Recovery Act.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

No specific references to mineral and geology resources are made within the HFQLG Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts.

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10 http://www.consrv.ca.gov/omr/smara

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

The Sierra Nevada Forest Plan Amendment (2004) expands upon direction outlined in the Forest Plan and further delineates standards and guidelines for mining with requirements for reclamation, inspections and monitoring. These guidelines ensure that plans of operation, reclamation plans and reclamation bonds fully address all costs of reclamation and that reclamation is accomplished in a timely manner; ensure that mine operators and owners limit new road construction, decommission unnecessary roads and maintain needed roads consistent with Forest Service policy; require inspections and monitoring on a regular basis consistent with potential severity of mining related impacts; and limit clearing of trees and other vegetation to the minimum necessary for operations (pages 58-59).

Forest Plan Direction

The 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the "Forest Plan"), as amended by the 1999 HFQLG final EIS Record of Decision, and as amended by the 2004 SNFPA Final Supplemental EIS Record of Decision, guides the proposed action and alternatives. Forest wide Standards and guidelines for minerals and geology are outlined in the Forest Plan and help move the project area towards desired conditions described in that plan. General direction is to "Encourage mineral and materials development that reasonably protects surface resources, and provides for land reclamation; maintain and update a materials source inventory for Forest uses; recommend withdrawal from mineral entry areas valued for other purposes; protect public safety and Forest resources from slope failure; and prevent loss of groundwater quality and quantity", Chapter 4, Forest Wide Standards and Guidelines (page 4-46 to 4-49).

Effects Analysis Methodology

Specific Assumptions

The project boundary encompasses several areas where Plan of Operations have been submitted and approved but are currently on hold by the owner or operator for a variety of reasons. These plans may be activated at any time. These plans include Golden Wolf #2, Golden Wolf #7, Forman's Jackpot #1, Forman's Gold #2, and Three Golden Stars #4. Analysis of the project area will assume that these plans will be activated during the course of Keddie Ridge Project implementation.

Specific Methodology

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Scope of the Analysis

Geographic Analysis Area: The geographic boundary for the Minerals Effects Analysis is the Keddie Ridge Project area. This project area encompasses 103,309 acres on the Mt. Hough Ranger District. The rationale for this boundary is that mining claims do not stop at treatment boundaries and the effects of traffic, heavy equipment and smoke would occur across the project area.

Timeframe of Analysis: In the analysis of the project, current ongoing mining projects and reasonably foreseeable actions were considered. The existing condition encompasses the past history of the area including a long and intensive use of the land for mining purposes. The timeframe that these cumulative effects would impact mining is during the project and for 10 years beyond its completion. During the project there will be disturbance from logging, hand piling and burning.

Analysis Methodology

Mining claim data and claim locations were acquired through the Bureau of Land Management (BLM) LR2000 database [11] and the BLM GeoCommunicator database [12]. Information from these sources was cross referenced with the Keddie Ridge Project map to determine areas of impact. Acreages were taken from project specific GIS data.

Affected Environment

The Keddie Ridge Project area has experienced extensive copper and gold mining over the last century, and some gold mining and copper exploration continues today. There are approximately 168 active mining claims in the project area: most of these are placer claims with a few lode claims. Most claims are worked by small time operators who mine for gold utilizing gold pans and sluice boxes. Historically, many claims have been worked with suction dredges; however, there is currently a moratorium on suction dredging in the state of California. Several operators have larger operations involving trenching and

[11] http://www.blm.gov/lr2000/
[12] http://www.geocommunicator.gov/GeoComm/index.shtm

processing through trommels and power sluices. Some underground mining takes place as well. Exploratory copper mining (core drilling) has occurred in the Moonlight area over the past 10 years. These claims are still active, but are not currently under a Plan of Operations.

The Mt. Hough Ranger District currently administers three active Plans of Operation and four Notices of Intent for active mining operations in the project area. In addition, there are multiple claims for which plans have been submitted and completed, but are on hold by the owner operator. These could be activated at any time.

Historic and current day mining creates deep horizontal adits and vertical mine shafts that dot many locations in the project area. Terrain, ground cover, and a lack of surrounding structures make many of these mine shafts difficult to see, and because the open shafts are not readily visible, they pose a direct hazard to Forest visitors. There are two known abandoned mines in the Keddie Ridge Project area; with many more likely but not yet identified.

Environmental Consequences

Alternatives A (Proposed Action), C, D and E

Direct and Indirect Effects (Alternatives A, C, D and E)

With all action alternatives, the main impacts will be on mining activities at 3 separate claims. These claims include El Rico Mina, Forman’s Jackpot #1 and Forman’s Gold #2. At El Rico Mina, haul routes along National Forest System (NFS) road 26N81 road could directly affect mining operations. This mining operation is directly adjacent to treatment unit #66. Mining is authorized under a Plan of Operations along the shoulders of the road and may be interrupted during periods of haul travel. Smoke may be an additional concern for the mine operators during peak burning periods.

At the Forman’s Jackpot #1 and Forman’s Gold #2 claims, mining operations are planned for areas along the southwest side of NFS road 26N02, between the road and the South Fork of Lights Creek. Exploratory trench work has been authorized under a Plan of Operations. These claims fall within treatment unit #85. Impacts to this mining operation would include shared use of the NFS road and shared use of the surface in areas proposed for mining. Logging trucks, heavy equipment and water trucks will increase the potential hazards encountered by miners and other users of the road systems within the project area. Impacts to mining operations could also occur at Forman’s Ravine claims during periods of underburning. Potential conflicts could be resolved through notification of the operator regarding project timeframes and coordination of project efforts. The placing of signs in treatment areas would also help to reduce conflicts.

Part of the Keddie Ridge Project is to underburn certain areas and pile burn in others. The smoke from burning would have a temporary impact on air quality in the area. Most mining operations take place during the summer months, typically Memorial Day weekend through mid-October. Burning that occurred outside this typical mining season would have less of an impact on claimants.

There are several mining claims in the vicinity of the proposed road construction and road decommissioning.[13] These six claims are located in T27N, R8E, east 1/2 of Section 35. [14] However, these claims may be accessed via NFS road 27N92 and therefore there should be no direct effect on mining due to road decommissioning. Road maintenance and improvements undertaken during the project will benefit mining claimants and improve claim access.

Forest visitors are not at substantial risk from direct contact with herbicides under normal conditions. The Human Health Risk Assessment demonstrates that application of the herbicides Glyphosate and Aminopyralid and the fungicide borax, as proposed by the Keddie Ridge Project, is expected to present a low risk to human health and safety of forest visitors and therefore would not have a direct affect upon mine operators (appendix I).

The indirect effects of all action alternatives within the area boundary would be to reduce fuel loading and improve access to the surface. This would have a beneficial effect for mining claimants as it would thereby improve access to subsurface resources. There would be a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. Road maintenance would also improve mining access. There may be some indirect effect on mining operators as there would be with any forest visitor due to heavy equipment and haul traffic in the area during the life of the project. There may be some indirect effects on access to future mining claims from road decommissioning but it would be minor and limited.

Herbicide applications would not cause any indirect effects on mine operators. Herbicide applications are expected to present a low risk to human health and safety as demonstrated in the Human Health Risk Assessment (appendix I).

Cumulative Effects (Alternatives A, C, D and E)

In the analysis, cumulative effects of past actions, the action alternatives, current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of the area including mining throughout the project area. Future fuels reduction projects would serve to reduce hazardous fuel conditions that could threaten mining areas, historic structures and equipment. Reasonably foreseeable future projects (identified in appendix F) that would close or fence off abandoned mine shafts would help reduce safety risks to Forest visitors. Overall, there will be no significant cumulative effects from implementation of the action alternatives.

Alternative B – No Action Alternative

Direct and Indirect Effects (Alternative B)

Forest ground cover and fuel loading not addressed by fuels reduction may impact the accessibility of areas for exploratory mining utilizing trenching methods. Many mine operators tend to target areas with minimal understory vegetation when selecting areas for exploratory trenching. Dense stands are more problematic for heavy equipment and an open canopy allows for better access to surface resources. The no action alternative would be less beneficial to miners seeking improved accessibility.

[13] http://www.blm.gov/lr2000/
[14] http://www.geocommunicator.gov/GeoComm/index.shtm

Road access would remain the same under the no action alternative. Roads will deteriorate further without maintenance.

Although there are currently no active mining claims accessed by roads selected for decommissioning under the action alternatives, the no action alternative would allow access to potential new claims in these areas.

Cumulative Effects (Alternative B)

There would be no reduction in available mineral resources or mining opportunities under this alternative because there would be no change in current conditions. However, a large-scale fire could have adverse effects on the miner's environment. Hazardous fuel conditions contributed to the severity of the Moonlight Fire near Antelope Lake. Vegetation in these areas has been slow to return and has created a barren looking landscape. Snags from the fire still pose a safety hazard to miners in the Lights Creek and Indian Creek areas.

Scenic Resources

Introduction

Viewing scenery consistently rates as a popular recreation activity on the Plumas National Forest. Scenic resources contribute indirectly to local quality of life, tourism, and economic vitality. Scenic quality within the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) is important to people who enjoy views from the communities in Indian Valley, including Greenville, Crescent Mills, and Taylorsville.

This evaluation applies current National Forest Landscape Management methodology in conjunction with existing *Plumas National Forest Land and Resource Management Plan* (Forest Plan) direction. The Keddie Ridge Project will help achieve Forest Plan direction for scenic resources by perpetuating the area's landscape character (attributes, qualities, and traits that make a landscape identifiable or unique), and conserving its scenic integrity (natural appearance).

Analysis Framework: Forest Plan Direction

Regulatory Framework

The 1988 *Plumas National Forest Land and Resource Management Plan* established goals, policies, and objectives for the management of the forest (USDA 1988, pages 4-3 to 4-11 and 4-13 to 4-20). The following specific Forest Plan goal applies to scenic resources:

- "Allow management activities to dominate the visual landscape of lands committed to intensive timber or other commodity production. Maintain high visual quality on lands committed to other uses or readily apparent from recreation developments, major travel routines, and other high use areas" (USDA 1988, page 4-4).

Visual Quality Objectives

The Visual Quality Objectives (VQOs) contained in the Forest Plan are used to identify and classify scenic resources in the Keddie Ridge Project area.

VQOs were mapped as part of the forest planning process using Agriculture Handbook 462 – Visual Management System, volume 2, chapter 1 (USDA 1974). The VQOs describe different degrees of acceptable alteration of the natural and characteristic landscape. The objectives are considered the measurable standards for the management of the "seen" aspects of the land. Standards and Guidelines outlined in the Forest Plan provide direction for managing land classified under different VQO definitions (USDA 1988). Standards and Guidelines for managing land classified under the four VQOs present within the Keddie Ridge Project area are as follows:

- **Retention** – Provide a natural-appearing landscape where management activities are not visually evident.
- **Partial Retention** – Provide a natural-appearing landscape where management activities remain visually subordinate.
- **Modification** – Allow management activities to dominate the landscape; however, keep visual elements comparable to those of natural occurrences.
- **Maximum Modification (MM)** – Allow management activities to dominate the landscape; however, keep background visual elements comparable to those of natural occurrences.

Methodology for Assessing Impacts on Scenic Resources

Geographic Area Evaluated for Impacts

The geographic area analyzed for effects on scenic resources (the analysis area) is the Keddie Ridge Project area. The analysis area is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye. The analysis area encompasses two developed recreation sites: Greenville Campground and Round Valley Picnic Area. There are approximately 7 miles of non-motorized system trails within the analysis area. These trails include Peters Creek Trail, Round Valley Interpretive Trail, and Indian Falls Interpretive Trail.

Indicator Measures

Visual Quality Objectives (VQOs) are the indicators analyzed in detail for scenic resources. Aesthetic identity (landscape character) and natural appearance (scenic integrity) are two indicators used to measure scenic quality changes and effects. Landscape character is defined as the attributes, qualities, and traits that make a landscape identifiable or unique, and scenic integrity is considered the natural appearance of a site.

Analysis Methods

The Visual Management System (which includes VQOs) presents a vocabulary for managing scenery and a systematic approach for determining the relative value and importance of scenery and associated recreation in a National Forest. High-quality scenery, especially scenery with naturally appearing landscapes, enhances the lives of local community members and forest visitors. Ecosystems provide the environmental context for this Visual Management System. The system is used in the context of ecosystem management to inventory and analyze scenery in a National Forest, assist in the establishment of overall resource goals and objectives, monitor the scenic resource, and ensure high-quality scenery for future generations.

Duration

The timeframe considered for cumulative effects is based on past and present vegetation management activities dating back to 1980 and past wildfires dating back to 1979 (appendix F). As discussed in the "Forest Vegetation and Fire, Fuels, and Air Quality section of chapter 3, past management activities have contributed to the existing scenic landscape. Future activities were considered (appendix F) in this analysis, but only until the time that Keddie Ridge Project implementation has been completed. Unanticipated future wildfires and other treatments could occur prior to completion of the Keddie Ridge Project, potentially affecting the area's scenic character.

Affected Environment

The landscape in the Keddie Ridge Project area ranges from the flat areas in and around Indian Valley, to moderately and extremely steep slopes. The forests are primarily mixed conifer types, with some pine dominated stands. Red and white fir-dominated forests exist at higher elevations. Valued scenery attributes include the diverse and largely continuous tree canopy of mixed conifer and understory vegetation. Past activities such as mining, grazing, and timber harvesting, fire exclusion, and high-severity wildfires have heavily influenced the existing landscape character of the project area. These past activities have created many areas where dense even-aged stands of trees dominate the landscape. Vegetation is often dense, largely due to historic fire suppression, making for a moderate risk that valued scenery attributes may be lost for decades or centuries through wildfire events.

Scenic resources include views of naturally appearing landscapes such as landforms, vegetation, rock formations, and water features. Scenic resources in the Keddie Ridge Project area are important to forest visitors who may enjoy views anywhere from the floor of Indian Valley to ridges such as Keddie Ridge. Scenic attractiveness is common in many locations in the project area and is used as a measure of the scenic importance of the landscape.

Visual Quality Objectives

Four Visual Quality Objective (VQO) definitions apply to the landscape in the project area: Retention (14,675 acres), Partial Retention (28,225 acres), Modification (38,201acres), and Maximum Modification (1,009 acres).

The Forest Plan describes the types of activities that may occur within Keddie Ridge treatment units:

- **Retention (189 acres in treatment units)** – activities are not to be evident to the casual forest visitor.
- **Partial Retention (2,970 acres in treatment units)** – activities may be evident but must remain subordinate to the characteristic landscape.
- **Modification (2,599 acres in treatment units)** – activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the foreground or middleground.
- **Maximum Modification (35 acres in treatment units)** – activities may dominate the characteristic landscape but should appear as a natural occurrence when viewed as a background.

Sensitive Places, Viewsheds/Viewpoints

Several areas within the analysis area are defined by a VQO of Retention. These areas include a portion of Highway 89 near Indian Falls, a portion of Highway 89 outside of Greenville, an area along Highway 89 at the turnoff from Highway 70, a portion of land in the Arlington Heights area, and land surrounding Round Valley Reservoir within the Round Valley Picnic Area.

The only treatment units proposed on land with a VQO of Retention surround Round Valley Reservoir. The purpose and need for these units (71, 72, 73, 74, 75, 75a, 106 and 107) includes fuel reduction, forest health, and protection/enhancement of habitat for sensitive plant and wildlife species.

Existing Scenic Integrity

Overall, the scenic integrity in the Keddie Ridge Project area meets the VQOs for Maximum Modification, Modification, Retention, and Partial Retention. However, the Moonlight Wheeler Fire of 2007 greatly compromised scenic integrity within the northeastern portion of the analysis area. Many scenic values were lost as approximately 64,960 acres of National Forest System land burned. Many of these acres burned with stand-replacing high severity fire. The charred landscape is visible from many places within the analysis area.

Desired Landscape Character

The desired landscape character for the Keddie Ridge Project area is a slightly more open forest cover, displaying and sustaining an uneven-aged, multistoried, fire-resilient, largely continuous mature tree canopy of mixed conifer and understory vegetation (USDA 1988 pp. 4-95 and 4-105). Dense vegetation in stands classified under Retention and Partial Retention VQOs would be managed to meet the Visual Retention and Visual Partial Retention prescriptions (USDA 1988 pp. 4-95 and 4-105), while reducing the risk that valued scenery attributes may be lost for decades or centuries through wildfire events.

Environmental Consequences

All Action Alternatives (A, C, D, and E)

Direct Effects

Area thinning and group selection would all have a minor beneficial effect on the landscape character. Scenic quality would be improved, and the desired landscape character of a more open and diverse forest would be achieved.

Underburning, group selection, and area thinning activities may have a short-term negligible effect on the scenic integrity of the landscape where burned areas, skid trails, and tree stumps would be visible from forest roads in the analysis area. The desired Visual Quality Objectives (VQOs) for areas in the treatment units may not be met initially after treatments due to project activities, and burning may cause color contrasts between green and brown needles. These effects would diminish over time as VQOs are achieved, and scenic quality would eventually be improved.

Indirect Effects

Fuels treatments in the analysis area would likely have long-term beneficial effects on scenic resources by reducing the risk of a wildfire destroying the existing landscape. Reducing hazardous fuels in the analysis area would likely help ensure that existing scenic landscapes are preserved.

Cumulative Effects

Past activities (grazing, mining, and vegetation management) in the analysis area have all had minor cumulative effects on the landscape character. These past activities have played a large part in creating the landscape that forest visitors identify with. Implementation of area thinning, group selection, and underburning treatments in any of the action alternatives would not drastically change this landscape but would help improve and maintain the desired landscape character that has been shaped by past activities. Future risks of catastrophic fire would be reduced by implementing area thinning and underburning treatments proposed in the action alternatives. Any future vegetation management projects and DFPZ maintenance (appendix F) would slightly benefit the scenic quality of the landscape over the long-term.

Alternative B – No action Alternative

Direct Effects

There would be no direct effects on scenic resources in the analysis area under this alternative because no actions are proposed that would change the landscape character. Scenic quality, however, could be directly affected without area thinning and group selection treatments because lack of treatments would perpetuate existing dense forest canopy and even-aged stand conditions throughout the analysis area.

Indirect Effects

The no action alternative would likely not cause any short-term indirect effects and possibly no indirect effects for years to come. However, without hazardous fuels reduction treatments in the analysis area, the continued risk of a catastrophic fire would increase the potential for long-term adverse effects on the scenic quality of the landscape.

Cumulative Effects

Past activities (vegetation management, grazing, and mining) in the analysis area have cumulatively helped shape the scenic landscape character of the analysis area. The no action alternative would perpetuate adverse cumulative effects on the scenic quality of the analysis area over time because the existing conditions (dense, even-aged stands) would continue, thus increasing the risk of wildfire.

A large-scale fire could have adverse effects on scenic quality for several years. Past hazardous fuel conditions contributed to the severity of the Moonlight and Antelope Complexes of 2007, and the Stream Fire of 2001. The effects from these fires can still be seen from forest roads and campgrounds in and near the analysis area.

Transportation

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Framework

The two roads (0.6 miles of National Forest System (NFS) road 28N38A and the 0.4 miles of a non-system road continuation of NFS road 28N38A) in the Keddie Ridge Hazardous Fuels Reduction Project area (Keddie Ridge Project area or project area) that are proposed for decommissioning are causing significant resource impacts. These roads are not needed because other roads are available to provide the necessary access to implement group selection harvests and construct Defensible Fuel Profile Zones (DFPZ) as directed in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) (section 401(b)(1), (d)(1), and (d)(2)) and the Sierra Nevada Forest Plan Amendment (USDA 2003a, 2003b 2004a, 2004b). The Forest Service is directed to reduce impacts on resources caused by transportation by implementing road relocation or improvements as part of the Riparian Management Plan (Appendix R of the HFQLG Final Environmental Impact Statement) as required by the HFQLG Act (sections 401(b)(1), (c)(2)(B), and (d)(4)).

Methodology for Assessing Impacts

Geographic Area Evaluated for Impacts on the Transportation System

The geographic area analyzed for effects on the transportation system (analysis area) is the Keddie Ridge Project area (project area). The analysis area is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye.

Analysis Methods

The transportation system for the Keddie Ridge Project area was evaluated through a roads analysis. The interdisciplinary process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A—Administration of the Forest Transportation System, 16 U.S.C. 551, 23 U.S.C. 205). The following needs were identified based on that analysis and known access needs for proposed treatments:

- Road reconstruction and maintenance (i.e. brushing) are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to treatment areas. Reconstruction and road maintenance are necessary to reduce erosion and sedimentation and to provide for public safety.
- Road decommissioning is needed to reduce erosion, sedimentation, and soil compaction and to reduce road density and wildlife impacts.
- Out sloping road segments, installing armored rolling dips, and replacing culverts is needed to reduce road induced erosion and improve aquatic organism habitat.
- Temporary road construction is needed to access project units where existing road access is absent.
- Harvest landing construction and reconstruction are needed to facilitate removal of wood products.

Design Criteria

Roads are the largest single human-caused source of sedimentation and habitat degradation within the project area. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through road reconstruction and maintenance) include the following:

- Roads that are needed are maintained and improved to accommodate vehicle traffic. The proposed treatments would provide roads that will ensure safe travel for forest users, and provide a transportation system adequate for all resource management needs.
- Unneeded roads would be eliminated, closed, or obliterated in accordance with the 1988 Forest Plan, as amended, and the Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD)(September 2010) (USDA 1988a, b; USDA 2010 a, b).
- Roads that are causing a high level of resource damage would be decommissioned or improved.
- Poorly located roads would be relocated to stable areas.
- Increase habitat connectivity for aquatic species by eliminating roads which degrade habitat.

Affected Environment

Transportation System

One major arterial route accesses the project area, California State Highway 89. Seven collector roads access the project area. The project area is considered to have a fully developed arterial and collector road system.

There are a total of approximately 172 miles of existing National Forest System (NFS) roads in the project area. The system roads are inventoried, mapped, constructed to a specific design level, and categorized into a maintenance schedule. Maintenance levels are identified by road construction use and type. The following miles of roads by road system level categories exist in the Keddie Ridge Project area:

- 27.5 miles of Level 1 roads assigned to intermittent service.
- 118.1 miles of Level 2 roads managed for limited passage of traffic.
- 8.6 miles of Level 3 roads managed for safe travel by a prudent driver in a passenger car.
- 17.6 miles of Level 5 roads where management direction requires the road to provide a high degree of user comfort and convenience at moderate travel speeds.

In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads, and skid trails in the project area. These nonsystem roads, abandoned roads, and skid trails are not part of the annual road maintenance schedule and budget.

The purpose of the NFS road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. In addition, needs for the road system include minimized adverse effects on watershed and wildlife resource values. Roads near streams have the greatest probability of intercepting, concentrating, and diverting flows from natural flow paths and should therefore be minimized, where feasible. Road/stream crossings with the potential to fail and divert water should be minimized, where feasible.

Off-Highway Vehicle (OHV) Routes in the Project Area

The Plumas National Forest Motorized Travel Management Project Final Environmental Impact Statement and Record of Decision was completed and signed in fall of 2010. This decision added 234 miles of trails to the existing National Forest Transportation System, creating a total of 4,482 total miles of road and trail access on the Forest. Of that total, 4,118 are available for passenger car use; 4,383 are available for 4-Wheel Drive use; 3,802 are available for unlicensed All Terrain Vehicles (ATV) use; 3,855 are available for unlicensed motorcycle use; and, 4,482 are available for licensed motorcycle use. A subset (165 miles) of the 234 miles will be available immediately while the remainder will need maintenance before they can be used. Implementation of the Plumas National Forest Motorized Travel Management Project will occur when appeals have been resolved and a Motor Vehicle Use Map (MVUM) is published. The MVUM will show which routes are available for use by what types of vehicles and any seasonal restrictions that may apply. Pending any appeal resolution, the MVUM is expected in the spring of 2011. Until then, the current Forest Order regulating use remains in place.

Within the project area, there are 22.2 miles of existing roads and trails open to all vehicles, 12.6 miles of proposed roads and trails open to all vehicles, and 2.6 miles of proposed roads and trails open to vehicles less than 50 inches wide for a total of 37.4 miles of OHV roads and trails in the project area (Table 92). Within project treatment units, there are 5 miles of existing roads and trails open to all vehicles, 2.2 miles of proposed roads and trails open to all vehicles, and 1.3 miles of proposed roads and trails open to vehicles less than 50 inches, for a total of 8.5 miles of OHV roads and trails within treatment units. Haul routes (routes used to transport forest products generated from project implementation) overlap with 13.8 miles of existing OHV roads and trails open to all vehicles. Temporary roads overlap with .8 miles of existing roads and trails open to all vehicles, .6 miles of proposed roads and trails open to all vehicles, and .4 miles of proposed roads and trails open to vehicles less than 50 inches, for a total of 1.8 miles.

Table 92. Miles of OHV Routes Affected within the Project Area and Project Units

Miles of OHV Routes Affected						
	Project Area	Units	TES	Weed Treatment	OHV/Haul Route Overlap	OHV/Temp Roads Overlap
Existing Roads and Trails						
Open to all vehicles	22.2	5.0	0.03	0.9	13.8	0.8
Open to vehicles 50" width or less	0.0	0.0	0.0	0.0	0.0	0.0
Motorcycles only	0.0	0.0	0.0	0.0	0.0	0.0
Proposed Roads and Trails						
Open to all vehicles	12.6	2.2	0.0	0.7	0.0	0.6
Open to vehicles less than 50"	2.6	1.3	0.0	0.5	0.0	0.4
Motorcycles only	0.0	0.0	0.0	0.0	0.0	0
Total	37.4	8.5	0.03	2.1	13.8	1.8

Environmental Consequences

Action Alternatives – A, D and E

Direct Effects

The Keddie Ridge Project proposes road decommissioning of two roads: 0.6 miles of NFS road 28N38A and 0.4 miles of of a non-system road continuation of NFS road 28N38A. These roads are not needed for the long-term transportation system. Decommissioning could include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, restoring hydrological connectivity and/or blocking access. Decommissioning of roads would reduce Equivalent Roaded Acre (ERA) values, thereby lowering cumulative watershed effects and soil compaction. The roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts.

Roads that are to remain open but are improperly constructed or unmaintained will be improved. Improvements to the road drainage system and road surface prism will be considered for 100 miles of road within the watershed analysis area. Reconstruction would consist of brushing and/or drainage improvements including: out sloping road segments, installing armored rolling dips, or replacing culverts. Rolling dips, which will likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road, depending on the grade/slope of the road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips will be determined by District watershed staff in order to sufficiently disconnect the road drainage system from entering nearby stream channels. Please refer to appendix C for a list of roads where reconstruction will occur.

The road improvements proposed in Alternatives A, D, and E would provide access needed for project units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of catastrophic fire through intensive vegetation manipulation at a lower cost because of the improved access. The aforementioned action alternatives would generate traffic from log trucks, chip vans, and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements. Refer to the Recreation section for information about project effects on recreation, including OHV use.

Indirect Effects

Three temporary license agreements are required for access to treatment units.

Cumulative Effects

A net reduction of approximately 1 mile of system and nonsystem roads in the action alternatives would occur after proposed road decommissioning. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

No Action Alternative – Alternative B and Action Alternative C

Direct Effects

Reconstruction of classified roads would not occur, and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity, and there would be no increase in hazards to driver safety from logging traffic. No roads would be decommissioned and these roads would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels.

Roads would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed.

Indirect Effects

No temporary license agreements would be needed for the normal road maintenance completed in this area.

Cumulative Effects

No reduction in system or nonsystem roads would occur during normal road maintenance completed in this area.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Action alternatives would implement mechanical thinning, mastication, hand thinning, and prescribed burning treatments which would remove trees through harvesting or result in tree mortality in the short-term. However, these treatments are designed to retain the largest, most desirable trees in sufficient amounts to meet desired stocking levels and maintain appropriate forest cover as specified by NFMA.

Long-term productivity would far exceed short-term harvest levels and treatments would enhance long-term productivity in terms of forest health, by promoting forest resilience to disturbances such as fire, drought, and insect and disease occurrences.

Action alternatives, primarily through the removal of vegetation and treatment of fire fuels, would directly impact terrestrial habitat for Region 5 Forest Service sensitive wildlife species. Potential short-term effects of entry, use, and alteration of suitable wildlife habitat to achieve project objectives is disclosed in Chapter 3 of this DEIS. Treatments would enhance long-term productivity in terms of forest health, by promoting forest resilience to disturbances such as fire, drought, and insect and disease occurrence. As a result, these treatments over the long-term are expected to increase both the quality and quantity of existing and potential suitable habitat for wildlife species.

Short-term negative impacts to fine organic matter, soil permeability, large woody debris, and channel shading are expected as a result of the proposed activities. Long-term productivity would far exceed these short-term impacts through promoting forest resilience to disturbances such as catastrophic wildfire capable of much greater impacts to the previously mentioned soil and hydrology resources.

In the short-term individual rare plants may be directly impacted from the proposed activities; however over the long-term, these treatments are expected to increase both the quality and quantity of existing and potential habitat for these species.

Over the short-term, the proposed treatments would create disturbed conditions that favor noxious weed establishment and spread. Implementation of the standard management requirements (appendix H) and the weed treatment measures proposed under action alternatives A and D would greatly reduce the risk of noxious weed spread and establishment over the long-term. This risk would not be reduced under action alternatives C and E, primarily due to implementation of ground-disturbing treatment activities with no effective weed treatment measures in place.

The Keddie Ridge Project may affect mining operations in the area in the short-term due to access issues, increased heavy equipment traffic and/or smoke production. No long-term effects to productivity are expected.

Unavoidable Adverse Effects

Action alternatives would implement prescribed burning treatments which would create smoke. Smoke may affect air quality while prescribed fire activities occur; however, prescribed fire activities would be accomplished with an approved smoke management plan to minimize effects to air quality.

Some unavoidable adverse effects may result, including immediate changes in habitat conditions and disturbance/harassment of individual wildlife species, including direct mortality, during project activities. It is assumed in this analysis that all action alternatives would be implemented as proposed, in compliance with all rules and regulations governing land management activities, including the use of Limited Operating Periods. Direct disturbance, including mortality to individual threatened and endangered species addressed in this document, would be highly unlikely due to results of survey efforts for selected species, incorporation of Limited Operating Periods, where appropriate, and implementation of Forest Plan standards and guidelines.

Direct effects on wildlife species could occur as a result of tree removal, mastication, and prescribed burning. These activities have the potential to kill young of the year birds in the nest that cannot fly and species confined to den sites, such as gray squirrels. Increased road use resulting from of project implementation could result in increased road kills of various animals. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. This would affect individual birds. Conservation measures for landbirds, such as snag/down woody retention, use of LOP’s for TES species, avoidance of riparian vegetation, retention of trees greater than thirty inches diameter, which are incorporated into project design, as well as large tracts of forested land not treated with proposed management actions, would alleviate the overall effect on Neotropical migratory bird populations within the analysis area. The Forest Service and the U.S. Fish and Wildlife Service entered into a memorandum of understanding (MOU) in 2008 to strengthen migratory bird conservation. The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities, as authorized by Congress, may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

The extent of detrimental soil compaction would increase due to mechanical harvest operations. Implementation of standard management requirements would help reduce the amount of detrimental compaction. Treatment activities may lead to increased surface runoff and sedimentation. Implementation of best management practices and standard management requirements would help reduce the amount of detrimental compaction.

There are no foreseeable unavoidable adverse impacts to mining under any of the alternatives for the Keddie Ridge project.

There are no unavoidable Adverse Effects for Heritage Resources.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road

Action alternatives would implement mechanical thinning, mastication, hand thinning, and prescribed burning treatments which would 1) remove and/or kill trees, 2) reduce surface fuels and snags and 3) include the removal of forest vegetation for the construction of landings and temporary roads – these effects would be irretrievable commitments of a resource in terms of lost timber productivity and structural attributes. However, these treatments would maintain stocking and appropriate forest cover per NFMA, and tree regeneration, snag and surface fuel recruitment, and rehabilitation of landings and temporary roads would occur over time.

Surface organic matter would be reduced by prescribed fire and underburning, which is an irretrievable effect. Soil porosity would be reduced, also an irretrievable effect, resulting in detrimental compaction. Detrimental compaction is described in the “Hydrology and Soils” section of this chapter under the “Affected Environment—Soils” heading.

Surface fuels, including coarse woody debris, may be removed directly by prescribed underburning and pile burning, an irretrievable effect. Coarse woody debris would be recruited over time via recruitment from existing snags and future tree mortality.

Snags, particularly “soft” or rotten snags, may be removed due to underburning; snags that pose a hazard to firefighters may be felled prior to conducting underburning or pile burning, an irretrievable effect. Snags would be recruited over time from future tree mortality.

Adverse impacts to rare plants will be minimized under all action alternatives through implementation of the design criteria described in appendix H.

If allowed to spread, noxious weed species can have significant adverse impacts to native plants, wildlife species, soil structure, nutrient and fire cycles, and the recreational or aesthetic value of native habitats. While the weed control measures proposed under alternatives A and D would minimize the likelihood of adverse impacts, the lack of effective weed control measures in alternatives C and E would increase the probability of adverse impacts.

There are no irreversible or irretrievable commitments of mineral resources expected under any of the alternatives for the Keddie Ridge project.

There are no irreversible and Irretrievable Commitments of Resources for Heritage Resources.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders.” The proposed action and alternatives must comply with following:

Principle Environmental Laws

The following laws contain requirements for protection of the environment that apply to the proposed action and alternatives:

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies consult with the United States Fish and Wildlife Service and National Marine Fisheries Service, as appropriate, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under ESA, or destroy or adversely modify their critical habitat.

A biological assessment was prepared for Federally Proposed, Threatened, or Endangered wildlife and botany species and their critical habitat. Implementation of the project would have no effect on valley elderberry longhorn beetle and California red-legged frog. No Federally Proposed, Threatened, or Endangered wildlife or botany species were located within the Keddie Ridge Project area during past or current surveys.

Clean Water Act

The Forest Service is complying with the provisions of the Clean Water Act as it pertains to the Keddie Ridge Project. Section 208 of the Clean Water Act requires States to prepare nonpoint source pollution plans that are to be certified by the State and approved by the United States Environmental Protection

Agency (EPA). In response to this law, and in coordination with the State of California Water Quality Resources Control Board and EPA, the Forest Service, Region 5, began developing best management practices (BMPs) in 1975 for water quality management planning on National Forest System lands in California. This process identified the need to develop a BMP for addressing the cumulative off-site watershed effects of forest management activities on the benecial use of water.

The Keddie Ridge Project meets this through the incorporation of project design features (DEIS, chapter 2), Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (RHCAs)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; appendix E of this DEIS), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in appendix H of the DEIS. Refer to the Hydrology and Soils Environmental Consequences section of this chapter for a discussion of environmental consequences.

Clean Air Act

The Forest Service is complying with provisions of the Clean Air Act as it pertains to the Keddie Ridge Project. All burning implemented under the Keddie Ridge Project would be completed under approved burn and smoke management plans. Burning permits would be acquired from the Northern Sierra Air Quality Management District. The Air Quality Management District would determine dats when burning is allowed. The California Air Resources Board provides daily information on burning conditions. Burning would be implemented in a way to minimize particulate emissions.

National Historic Preservation Act of 1966 as Amended

The Forest Service is complying with the provisions of the National Historic Preservations Act of 1966 as amended as it pertains to the Keddie Ridge Project. Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. The Advisory Council on Historic Preservation has defined a Federal undertaking in 36 CFR 800.16(y) as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency.

Coastal Zone Management Act

There are no coastal management zones within the Keddie Ridge Project area or on the Plumas National Forest. The Coastal Zone Management Act does not apply to the Keddie Ridge Project.

National Forest Management Act

The Forest Service is in compliance with the National Forest Management Act as it pertains to the Keddie Ridge Project. Projects occurring on National Forest System lands must meet minimum specific management requirements under 16 U.S.C. 1604 (g)(3). The Keddie Ridge Project meets all applicable guidelines for land management plans according to 16 U.S.C. 1604 (g)(3).

Executive Orders

The following executive orders provide direction to federal agencies that apply to the proposed action and alternatives:

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Section 1. *Accomodation of Sacred Sites*. (a) In managing Federal lands, each executive branch agency with statutory or administrative responsibility for the management of Federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accomodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites.

Invasive Species, Executive Order 13112 of February 3, 1999

This document provides an analysis of the effects of the proposed project on noxious weed introduction and spread. The standard management requirements and proposed weed treatment measures were developed to prevent the introduction of invasive species, control the spread of existing infestations, and minimize adverse impacts to National Forest Sysytem lands.

Recreational Fisheries, Executive Order 12962 of June 6, 1995

The effects to fish habitat from the project are expected to be so small that direct effects on fish productivity and the quality of the recreational fishery would be negligible.

Migratory Birds, Executive Order 13186 of January 10, 2001

The environmental analyses of deferral actions are to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. There is no interagency determination to be made for migratory birds with Federally listed species. Proposed activities and alternatives are not expected to effect migratory birds.

Floodplain Management, Executive Order 11988 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project riparian management objectives; adhering to the Scientific Analysis Team guidelines, as set forth in the HFQLG FEIS and Record of Decision; and implementing best management practices, standard management requirements, and project design criteria.

Protection of Wetlands, Executive Order 11990 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project riparian management objectives; adhering to the SAT guidelines, as set forth in the HFQLG FEIS and ROD; and implementation BMPs, standard management requirements, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994

Although low-income and minority populations live in the vicinity, activities proposed for the Keddie Ridge Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects to human health and safety or environmental effects to minorities, low income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Use of Off-Road Vehicles, Executive Order 11644, February 8, 1972

The Keddie Ridge Project is in compliance with the Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD) (September 2010).

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Research Natural Areas

There are no Research Natural Areas within the Keddie Ridge Project area.

Inventoried Roadless Areas

There is a very small portion of PNF LRMP Semi-Primitive land allocation within the Keddie Ridge Project area; however no treatment units overlap with this land allocation. Therefore there will be no impacts to the Semi-Primitive land allocation. There are no Inventoried Roadless Areas within the Keddie Ridge Project area.

Wilderness Areas

There are no Wilderness Areas within the Keddie Ridge Project area.

Wild and Scenic Rivers

A portion of Indian Creek was identified as “eligible” in the PNF LRMP. This portion of Indian Creek is within the Keddie Ridge Project area; however no treatment units overlap with this segment of creek. Therefore, there will be no impacts to the eligible portion of Indian Creek.

Municipal Watersheds (FSM 2540)

Round Valley Reservoir is a municple water supply for Greenville. The activities proposed in the Keddie Ridge Project are expected to be beneficial to Round valey Reservoir. The Keddie Ridge Project meets this through the incorporation of project design features (DEIS, chapter 2), Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (RHCAs)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; appendix E of this DEIS), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in appendix H of the DEIS. Refer to the Hydrology and Soils Environmental Consequences section of this chapter for a discussion of environmental consequences.

Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

ID Team Members:

Katherine Carpenter – IDT Leader, 4 years, B.S. Wildlife Management
Ryan Tompkins – Silviculturist, 14 years, B.S. Forest Management, M.S. Forestry
Ryan Bauer – Fuels Specialist, 14 years, certificate in Biological Sciences for Federal Land Managers
Chris Collins – Wildlife Biologist, 15 years, B.S. Wildlife Management
Michelle Coppoletta – Botanist, 9 years, B.S. Plant Biology, M.S. Ecology
Liz Long – Planner, 2 years, B.S. Forestry and Natural Resources, B.S. Society and Environment
Kelby Gardiner – Hydrologist, 3 years, B.S. Geosciences (Hydrology)
Cristina Weinberg – Archaeologist, 24 years, B.A. Cultural Anthropology
Elaine Vercruysse – Logging System Specialist, 22 years, B.A. Environmental Sciences
Luke Floch – GIS Specialist, 3 years, B.S. Forestry and Resource Management, M.S. Forestry, certificate in Geographic Information Systems.
Scott Lusk – Range Manager, 20 years, B.S. Wildlife Management, SRM Certified Professional in Rangeland Management #CP00-62, CA PFC Creeks and Communities Riparian Ecologist
Leslie Edlund – Minerals Specialist, 18 years, B.A. Geography, Cal Poly Career Development Program in Forestry
Soai Talbot – Recreation Specialist
Judy Schaber – Recreation Specialist, 26 years, B.S. Environmental Resource Sciences, emphasis on Forestry and Wildlife

Federal, State, and Local Agencies:

U.S. Environmental Protection Agency
Northern Sierra Air Quality Management District
U.S. Fish and Wildlife Service
California Department of Fish and Game
USDA Natural Resource Conservation Service
California Department of Forestry and Fire Protection
Plumas County Road Department
Plumas County Environmental Health Department
Plumas County Board of Supervisors
Plumas-Sierra Counties Department of Agriculture

Central Valley Regional Water Quality Control Board
U.S. Department of Interior

Tribes:

Estom Yumeka Tribe of Enterprise Rancheria
Mechoopda Indian Tribe of Chico Rancheria
Greenville Rancheria
Susanville Indian Rancheria
Concow Maidu Tribe of Mooretown
Tyme Maidu Tribe of Berry Creek Rancheria
Washoe Tribe of California and Nevada

Others:

Plumas County Fire Safe Council
Plumas County Horseman's Association
Sierra Access Coalition
Sierra Forest Legacy
Quincy Library Group
Sierra Pacific Industries
American Forest Resource Council
California Forestry Association
Californians for Alternatives to Toxics
The John Muir Project of Earth Island Institute
Maidu Cultural Development Group
Hank Alrich
Dixie Dursteler-Harrington
Rex Fisher
Frank Stewart
Sierra Pacific Industries
Plumas County Economic Recovery Committee
Plumas Corporation

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to federally recognized tribes, State and local governments, and organizations listed above and the following Federal agencies:

- Advisory Council of Historic Preservation, Planning and Review
- USDA Animal and Plant Health Inspection Service PPD/EAD
- Natural Resources Conservation Service

- USDA, National Agricultural Library, Acquisitions and Serials Branch
- National Marine Fisheries Service Habitat Conservationists Division, Southwest Region
- US Army Engineer Division, South Pacific CESPD-CMP
- US Environmental Protection Agency, Office of Federal Activities
- Environmental Protection Agency, Region 9
- US Department of Interior, Office of Environmental Policy and Compliance
- Federal Aviation Administration, Western-Pacific Region
- Federal Highway Administration, California HAD-CA
- US Department of Energy, Office of NEPA Policy and Compliance
- US Coast Guard Environmental Management
- All individuals listed in the public involvement section of chapter 1 of this EIS.

In addition to this list, numerous interested parties will receive notification of the EIS's availability and location on the World Wide Web through written correspondence.

Acronyms

AOC	Area of Concern
APE	Area of Potential Effect
ARCO	*Arabis constancei* (Constance's rock cress)
AT	Area Thinning
ATV	All Terrain Vehicle
BA	Biological Assessment
BAER	Burned Area Emergency Response
BE	Biological Evaluation
BEMA	Bald Eagle Management Area
BMP	Best Management Practice
CASPO	California Spotted Owl Interim Guidelines
CC	Canopy Cover/ Canopy Closure
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWHR	California Wildlife Habitat Relationships
CYFA	*Cypripedium fasciculatum* (clustered lady's slipper)
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DFPZ	Defensible Fuel Profile Zone
EHR	Erosion Hazard Rating
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency

ERA	Equivalent Roaded Area
FEIS	Final Environmental Impact Statement
FFE	Fire and Fuels Extension of the Forest Vegetation Simulator
FSEIS	Final Supplemental Environmental Impact Statement
FSSC	Forest Survey Site Class
FMA	Fire Management Analyst
FOFEM	First Order Fire Effects Model
FSH	Forest Service Handbook
FSSC	Forest Survey Site Class
FVS	Forest Vegetation Simulator
GIS	Geographic Information Systems
GS	Group Selection
GTR	General Technical Review
HFQLG	Herger-Feinstein Quincy Library Group
HFRA	Healthy Forest Restoration Act
HRM	Heritage Resource Manager
IDT	Interdisciplinary Team
MIS	Management Indicator Species
mbf	Thousand Board Feet
mmbf	Million Board Feet
MVUM	Motor Vehicle Use Map
MYLF	Mountain Yellow-legged Frog
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating Systems
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NSAQMD	Northern Sierra Air Quality Management District
OHV	Off Highway Vehicle
PAC	Protected Activity Center
PLAS	Plumas Lassen Administrative Study
PM	Particulate Matter
PNF	Plumas National Forest
PNF LRMP	Plumas National Forest Land and Resources Management Plan
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objective
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum

RPA	First Amended Regional Programmatic Agreement
SAT	Scientific Analysis Team
SMC	Sierra Mixed Conifer
SMZ	Streamside Management Zone
SNFPA	Sierra Nevada Forest Plan Amendment
SOHA	Spotted Owl Habitat Area
SRPM	Standard Resource Protection Measure
TOC	Threshold of Concern
TU	Treatment Unit
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VQO	Visual Quality Objective
WUI	Wildland Urban Interface

Glossary

90th percentile weather conditions — high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically that are met or exceeded on 10 percent of days during the fire season. It defines potential fire behavior as a result of these conditions: a 90th percentile weather day has the potential for severe wildfire behavior.

Adjuvant — a vegetable oil and silicone-based surfactant used to facilitate and enhance the spreading and penetrating properties of herbicides.

Age class — a distinct aggregation of trees originating from a single natural event or regeneration activity.

Annosum root rot — a conifer disease caused by the fungus *Heterobasidion annosum.* The fungus usually enters through freshly cut stump surfaces. Annosum can cause mortality and butt rot of conifers.

Basal area — the total cross-sectional area of all stems, including the bark, in a given area, measured at breast height (4.5 feet above the ground). Usually given in units of square feet per acre.

Biomass —trees less than 10 inches DBH not used as sawlogs. This material is usually chipped and/or removed from the project area and hauled to the mill to be used for cogeneration of energy or as fiber for wood products.

Board feet — a unit of measure of sawlog volume, equivalent to 12 inches by 12 inches by 1 inch. One thousand board feet is denoted as mbf.

California Wildlife Habitat Relationships (CWHR) — a system developed jointly by Region 5 of the Forest Service and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities, and which rates the resulting classes in regard to habitat value for various wildlife species or guilds. The CWHR system has three elements: (1) major tree dominated vegetation associations, (2) tree size, and (3) canopy cover. The major tree dominated CWHR habitats in the Empire Project include red fir, Sierra mixed conifer, ponderosa pine, white fir, montane hardwood, and montane riparian.

Tree size and canopy cover classes are as follows:

Tree Size Classes in CWHR:

1 = Seedling (less than 1 inch DBH)
2 = Sapling (1-6 inches DBH)
3 = Pole (6-11 inches DBH)
4 = Small (11-24 inches DBH)
5 = Medium/Large (greater than 24 inches DBH)
6 = Multilayered (size class 5 over a distinct layer of size class 3 or 4, total canopy greater than 60- percent closure). In this EIS, class 6 is included in class 5.

Canopy Cover Classes in CWHR:

S = Sparse Cover (10-24 percent canopy closure)
P = Poor Cover (25-39 percent canopy closure)
M = Moderate Cover (40-59 percent canopy closure)
D = Dense Cover (greater than 60 percent canopy cover)

Canopy cover — Also referred to as canopy closure. The ground area covered by tree crowns. Canopy cover is expressed as a percent of the area. Values for percent canopy cover can be derived in many ways (From the glossary in the 2004 SNFPA ROD, USFS PSW 2004b).

Cumulative effects — According the Council on Environmental Quality (CEQ) NEPA regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).

Decommission (roads) — closing a road to mechanical use and returning the road to a natural or semi-natural condition. This could include removing stream crossing fills and structures (e.g., culverts or bridges), recontouring to natural topography obliteration (e.g., replacing fill slope material against cut slopes), surface shaping (e.g., constructing in-road water bars), and/or surface scarification.

Defensible Fuel Profile Zones (DFPZ) — a zone approximately 0.25 mile wide accessible to firefighters (usually along roads) in which fuel loads are light enough to cause approaching crown fires to drop to the ground where it may successfully be attacked by ground forces during 90^{th} percentile weather conditions.

Desired conditions — desirable resource conditions for various land allocations or resources, as prescribed in forest plans.

Diameter at breast height (DBH) — the diameter of a tree trunk measured at 4.5 feet above the ground.

Disturbance — a natural event such as fire, flood, or earthquake.

Dripline — the perimeter of the vertical projection of a tree canopy upon the ground.

Duff/duff layer — decaying leaves and branches on the forest floor.

Endemic — in the context of this environmental impact statement, refers to localized pockets within a small area, such as a pocket within a stand or a small stand.

Ephemeral — a watercourse that contains sporadic running water only sporadically, such as during or following storm events. Ephemeral streams have a definable channel and evidence that scour and deposition occur with less-than-annual frequency. Activity buffers are measured from edges of stream channels.

Equivalent Roaded Area — a conceptual unit of measure used to assess ground-disturbing activities. All landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent 100 percent hydrologic disturbance, with maximum rainfall-runoff potential. Other ground-disturbing activities are assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same roaded area. Disturbance coefficients are assigned based on local coniditons. In a given watershed, disturbances are added together to determine a cumulative equivalent roaded area and compared to the Threshold of Concern.

Erosion Hazard Rating — predicts the potential for sheet, rill, and gully erosion under existing conditions if vegetation and litter are moved.

Fire frequency — the average number of years between fires.

Fireline — a corridor, which has been cleared of organic material to expose mineral soil. Firelines may be constructed by hand or by mechanical equipment (e.g., dozers).

Fire Regime Condition Class — a classification of the amount of departure from the natural fire regime. Assessing Fire Regime and Condition Class can help guide management objectives and set priorities for treatments.

> **Condition Class 1** — fire regimes are within historical range. Risk of losing key ecosystem components to wildfire is low. Species composition and structure are functioning within historical range. Potential wildfire intensities and severity are low to moderate.
>
> **Condition Class 2** — fire regimes are slightly altered from historical range. Risk of losing key ecosystem components to wildfire is moderate. This results in moderate changes in one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is moderate encroachment of shade tolerant tree species. Potential wildfire intensities and severity are moderate to high.
>
> **Condition Class 3** — fire regimes are significantly altered from historical range. Risk of losing key ecosystem components to wildfire is high. This redults in dramatic changes to one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is high encroachment and establishment of shade tolerant tree species. Potential wildfire intensities and severity are moderate to extreme.

Fire type — a description of how a fire burns, such as on the forest floor (surface) or in the tree crowns.

Flame length — the length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

Forest Survey Site Class (FSSC) — an index of the productive potential of well-stocked stands. FSSC reflects the mean annual increment of a stand at the point of culmination, and is based on normal yield tables as follows: FSSC 5: 50-84 cubic feet per acre per year; FSSC 6: 20-49 cubic feet per acre per year; FSSC 7: less than 20 cubic feet per acre per year.

Fragmentation/ stand fragmentation — occurs when a large patch of habitat is broken down into many smaller patches of open habitat, resulting in a loss in the amount of quality forested habitat.

Fuel arrangement — how fuels are distributed in the fuel bed.

Fuel bed — the fuels both living and dead that are available to burn.

Fuel loading — the weight of fuel (vegetative matter both living and dead) present at a given site; usually expressed in tons per acre. This value generally refers to the fuel that would be available for consumption by fire.

Group selection — a silvicultural system that involves harvest of small areas of trees (generally less than 2 acres). Implementation results in unven-aged (all-aged) forests consisting of small even-aged (same-aged) groups. Harvest openings must be large enough to allow for sufficient sunlight for regeneration tree seedlings to establish and grow.

Grubbing — removal of vegetation at or below the ground level with hand tools.

Hand line — fire lines created by forest workers using shovels and hand tools to remove organic materials and expose mineral soil. The line width generally ranges between 2 and 3 feet.

Hand piling — piling by hand branches and limbs from tree harvests or thinnings by hand, for burning at a later time.

Hazard Quotient — the ratio of the estimated level of exposure to the reference does or some other index of acceptable exposure.

***Heterobasidion* root disease** — see Annosum root rot.

Home Range Core Areas — these areas are designed to encompass the best available spotted owl habitat, where the most concentrated owl foraging activity is likely to occur, and is in the closest proximity to owl protected activity centers where the most concentrated owl foraging activity is likely to occur. On the Plumas National Forest, each protected activity center is 300 acres and the home range core area is an additional 700 acres, totaling 1,000 acres.

Interdisciplinary Team (ID Team) — the team of Forest Service resource specialists involved in project planning and analysis. The ID Team members for the Keddie Ridge Project are listed in the beginning of chapter 4.

Intermittent — a watercourse with non-permanent flow but having a definable channel and evidence of annual scour and deposition. Activity buffers are measured from edge of stream channel.

Jackpot burn — A burning technique that targets isolated concentrations of heavy fuels.

Ladder (fuel) — shrubs or trees that connect fuels at the forest floor to the tree crowns.

Landings — forested openings, cleared of vegetation, leveled and graded, and used to stockpile sawlogs for eventual loading of load log trucks for haul to a sawmill.

Leave trees — the trees that are purposefully left in a stand that is thinned or harvested.

Mainline — the line used in cable yarding to bring logs to the landing.

Mastication — mechanical grinding of harvest residue or thinning; masticated material is usually left scattered on the harvest site.

Mechanical thinning — the use of tractors, cable systems, or helicopters to remove trees that have been cut by chainsaws; also refers to the use of feller-bunchers (wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site).

Multilayer — stand with three or more distinct foliage layers (canopies). Trees in the different layers may or may not be in the same age class.

Mycorrhiza/mycorrhizae (pl.) — the mutually beneficial association of a fungus and the roots of a plant, such as a conifer or an orchid, in which the plant's mineral absorption is enhanced and the fungus obtains nutrients.

Natural fire regime — a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it also includes the influence of aboriginal burning (Agee 1993; Brown 1995).

Operability — the ability to conduct vegetation management operations, which include construction of access roads and log landings, use of cable logging systems, clearing of central skid trails for tractor logging, and removal of trees that pose hazards to forest workers. Trees to be removed for operability would be designated by a Forest Service representative.

Passive crown fire — the movement of fire though groups of trees; it usually does not continue for long periods of time.

Perennial streams — streams that flows continuously. The groundwater table lies above the bed of the stream at all times. Activity buffers are measured from edge of stream channel.

Piling and burning — piling harvest or thinning residues (branches and limbs) and burning them when moisture content has been reduced through evaporation, wildfire hazard is low, and atmospheric conditions are favorable for dispersal of smoke.

Prescribed burning — fire purposefully ignited to achieve a beneficial purpose, such as reducing fuels on the forest floor or fuels generated by logging or thinning forest trees.

Protected Activity Centers (PAC) — areas delineated around nesting sites of nesting pairs of particular wildlife species. Habitat disturbance is minimized or excluded within the delineated area.

Quadratic mean diameter — the upper story diameter of a tree of mean basal area within dominant or codominant positions in the stand. In other words, instead of being an arithmetic average of tree diameters, it is a weighted average based on the basal area of each tree in the upper story within the stand.

Rate of spread — the relative activity of a fire in extending its horizontal dimensions. Expressed as rate of increase of the total perimeter of the fire.

Reconstructed (roads) — reconstruction of an existing road in or adjacent to its current location to improve capacity and/or correct drainage problems. Reconstruction consists of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed.

Regeneration — tree seedlings and saplings that have the potential to develop into mature forest trees.

Release — in the context of this environmental impact statement, giving preferred trees (i.e. old, large pines) more space to grow – to "release" them from crowded conditions.

Residual trees — trees that are left to grow in a stand following treatment or fire.

Riparian Habitat Conservation Area (RHCA) — activity buffers of specified widths along streams and watercourses and around lakes and wetlands that vary according to stream or feature type, as described by the Scientific Analysis Team (SAT) guidelines.

Sanitation — tree removal or modification operations designed to reduce damage caused by forest pests and to prevent their spread.

Seral — relating to a series of ecological communities formed in ecological succession.

Shade intolerant — species (such as ponderosa pine) that require full, open sunlight on the forest floor to establish and grow.

Silviculture — a branch of forestry dealing with the development and care of forests.

Size class — a classification of forest stands based on the average diameter of trees in the stand.

Skidding — dragging a log with a tractor to a landing for loading onto a logging truck.

Skyline — a harvesting system in which a cableway is stretched taut between two points, such as a yarding tower and stump anchor, and used as a track for a block or skyline carriage.

Slash — tree tops and branches left on the ground after logging or accumulating as a result of natural processes.

Snags — a dead standing tree; for wildlife purposes, one that is at least 15 inches in diameter at breast height (DBH) and 20 feet high.

Spotted Owl Habitat Area (SOHA) — areas delineated in land and resource management plans for the purpose of providing nesting and foraging habitat for spotted owls.

Stocking levels — the number of trees per acre in a regeneration site.

Subsoiling — performed after vegetation treatments, wherein mechanized equipment is used to till compacted soil to reduce soil compaction and consequent soil erosion.

Surface fire — a fire that burns surface litter, debris, and small vegetation.

Surfactant — an agent, such as a detergent, that reduces the surface tension of liquids to that the liquid spreads out, rather than collecting in droplets.

Thinning from below — the process of thinning a conifer stand by removing the smallest diameter trees and successively removing larger diameter trees until a canopy cover or basal area retention standard is met for the stand.

Threshold of Concern — the level of watershed disturbance which, if exceeded, could create adverse watershed or water quality effects, in spite of application of best management practices and project design criteria.

Torching — (1) the envelopment in flame of live or dead branches on a standing tree or group of trees; (2) fire burning a single or very small group of trees.

Underburning — a prescribed fire in fuels on the forest floor that is intended to generally remain on the forest floor without consuming significant portions of the forest canopy.

Uneven-aged — a stand of trees of three or more distinct age classes, either inter-mixed or in small groups. Uneven-aged silvicultural systems are a planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

White pine blister rust — a disease caused by a fungus that commonly infects sugar pines and causes branch dieback and bole cankers leading to tree mortality if infection is severe enough.

Whole-tree removal — a harvest method where trees are felled at the stump and skidded to the landing for de-limbing, bucking, and processing. Large trees may be bucked in the treatment unit to facilitate removal to the landing and reduce skidding damage to residual trees. Most activity slash would be removed to the landing.

Wildland Urban Interface — the area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends out for 1.5 miles from the edge of developed private land into the wildland.

Yarding — bringing sawlogs or biomass to a central location for removal from a treatment area.

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Appendices

A. **Alternative Development by Unit, Stand Exam Data and Post Treatment Outputs by Unit, and Silvicultural and Noxious Weed Maps with Unit Numbers**

B. **Alternative Maps**

C. **National Forest System Roads Proposed for Reconstruction**

D. **Economic Analysis**

E. **Riparian Management Objectives**

F. **Past, Present, and Reasonably Foreseeable Future Projects**

G. **Public Comments, Response to Public Comments, and Issue Identification**

H. **Standard Management Requirements and Monitoring**

I. **Human Health Risk Assessment**

J. **Project Specific Land Allocation Maps**

Appendix A

Alternative Development by Unit, Stand Exam Data and Post Treatment Outputs by Unit, and Silvicultural and Noxious Weed Maps with Unit Numbers

Introduction

This appendix includes eight tables (Table 1 through Table 8) which display unit specific information for each action alternative. Tables 1, 3, 5, and 7 illustrate tabular data created after developing unit specific information for each alternative. These tables include: unit numbers for each silvicultural treatment unit; unit numbers for those noxious weed treatment units that occur outside of silvicultural unit boundaries; acres; an indicator for units within (“DFPZ”) and outside of (“Non”) DFPZs; prescription; treatment; logging system; purpose and need statement(s) that correspond to each unit; dominant land allocations; dominant California Wildlife Habitat Relationship (CWHR) system size and density classes; presence or absence of noxious weed treatments; visual quality objectives; inclusion of noxious weed treatments; wildlife land allocation(s); presence or absence of threatened, endangered, and Region 5 Forest Service sensitive (TES) plant species; and presence or absence of group selections. This information is then repeated for each unit for each action alternative. Colum headings are not applicable to specific units when the table cells are empty.

Tables 2, 4, 6, and 8 disclose stand exam data and post treatment outputs. These tables include: an indicator for units within (“DFPZ”) and outside of (“Non”) DFPZs; prescriptions; unit numbers, **existing** trees per acre, canopy cover, basal area per acre, quadratic mean diameter, relative density; **residual** quadratic mean diameter; **existing and residual** snags per acres (>15 inches DBH); **average** residual trees per acre, residual basal area per acre, and residual relative density; and **range in** residual trees per acre, residual canopy cover, residual basal area per acre, and relative density. This information is then repeated for each unit for each action alternative.

Figure 1, at the end of this appendix, includes silvicultural treatment units with unit numbers, and Figure 2 displays noxious weed units with unit numbers. These are the only figures that contain unit numbers.

Appendix B, the following appendix, includes alternative specific silvicultural and noxious weed treatment maps, and silvicultural and noxious weed prescription code tables. Appendices A and B should be used together to relate tabular (appendix A) and spatial data (appendix B) for each unit.

Specific Methodology

Plumas National Forest Geographic Information System (GIS) corporate data was used to create Tables 1, 3, 5, and 7 below. The Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) Interdisciplinary Team (IDT) worked synergistically to review the GIS data, scoping comments submitted by interested parties, and Forest Plan information, as amended, and created these unit specific tables.

Common stand exam data and Forest Vegetation Simulator (FVS) modeling were used to create Tables 2, 4, 6, and 8 below. Proposed treatments and corresponding prescriptions for each alternative were modeled to characterize existing conditions and average ranges in post-treatment stand conditions.

Table 1. Alternative A Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			Yes
3	109	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			Yes
4	19	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
5	15	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			Yes
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	No
7	64	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
10	135	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
14	96	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
17	113	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			Yes
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
22	33	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	General Forest		Yes	Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Noxious Weed Reduction	HRCA		Yes	Partial Retention	HRCA		No
25	91	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA			Modification and Partial Retention	HRCA		Yes
26	6	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
27	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
28	5	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
29	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
34	11	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		Yes
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No
42	195	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			Yes
43	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			Yes
44	13	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
45	40	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
46	4	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
49	84	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Rreduction	Defense Zone and Threat Zone		Yes	Partial Retention			Yes
50	14	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			Yes
51	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
52	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	Yes
53	15	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
54	19	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
55	55	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	Yes
56	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
59	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
62	20	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
63	28	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
66	71	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
67	24	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	Yes
68	179	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
69	93	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			Yes
71	89	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	Yes
72	47	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			Yes
74	45	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
75	34	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		Yes
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone. HRCA.		Yes	Modification and Partial Retention	HRCA		No
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Mt. Jura LSOG. HRCA.	5M	Yes	Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
93	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
94	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
95	25	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA.	5M/D		Partial Retention	50% HRCA		Yes
96	12	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Partial Retention	HRCA		Yes
97	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
98	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
99	94	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
99a	21	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
101	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		Yes
105	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		Yes
106	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		Yes
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No
NW 1						Noxious Weed Reduction			Yes	Modification			No
NW 5						Noxious Weed Reduction			Yes	Partial Retention			No
NW 11						Noxious Weed Reduction			Yes	Partial Retention			No
NW 16						Noxious Weed Reduction			Yes	Modification			No
NW 17						Noxious Weed Reduction			Yes	Modification			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
NW 19						Noxious Weed Reduction			Yes	Partial Retention			No
NW 20						Noxious Weed Reduction		5M	Yes	Modification and Partial Retention			No
NW 21						Noxious Weed Reduction		5M	Yes	Partial Retention	HRCA		No
NW 24						Noxious Weed Reduction		5M	Yes	Modification	PAC		No
NW 26						Noxious Weed Reduction			Yes	Modification	PAC/ HRCA		No
NW 27						Noxious Weed Reduction			Yes	Partial Retention			No
NW 28						Noxious Weed Reduction			Yes	Modification			No

Table 2. Alternative A Stand Exam Data and Post Treatment Outputs by Unit

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx2	93, 94, 95, 96, 97	583	60	1.6	225	13.7	74	149	112 - 191	30 - 50	127	82 - 172	17.6	37	25 - 48
			98, 99, 99a, 101	408	47	3.4	172	14.0	54	195	65 - 408	30 - 47	141	112 - 172	16.9	39	28 - 54
			92	414	55	4.5	215	15.5	62	71	35 - 113	30 - 50	145	101 - 187	20.4	32	21 - 42
			104, 105, 106	384	66	6.3	291	16.4	80	48	35 - 68	36 - 50	141	111 - 184	23.3	30	23 - 39
			68	482	63	2.8	250	14.5	78	79	55 - 112	33 - 50	144	108 - 184	20.9	37	28 - 47
			73	1136	73	5.1	276	11.5	85	150	144 - 162	43 - 50	102	89 - 129	15.6	26	23 - 31
			34	214	39	2.9	138	14.6	43	162	57 - 214	30 - 39	131	115 - 138	16.2	38	28 - 43
			2, 3, 4, 5	359	47	0.0	202	15.5	61	161	37 - 359	30 - 47	165	130 - 202	19.8	43	28 - 61
		Rx3	29	415	43	6.8	175	13.1	46	216	85 - 415	30 - 43	151	122 - 175	14.4	35	26 - 46
			28	559	61	0.3	238	11.8	66	107	57 - 167	31 - 50	146	105 - 187	16.4	34	25 - 44
			27	741	59	12.1	272	14.4	80	70	28 - 119	30 - 50	174	131 - 218	23.4	37	26 - 48
			26	231	35	4.1	154	20.6	39	168	42 - 231	30 - 35	147	133 - 154	21.7	35	25 - 39

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			7, 9	925	44	7.4	220	15.5	67	362	55 - 925	30 - 44	176	134 - 220	18.0	43	26 - 67
			81	1475	71	0.0	313	10.5	85	145	128 - 179	41 - 50	135	127 - 153	13.1	27	25 - 31
			71	244	59	10.8	266	18.1	74	68	43 - 99	30 - 50	164	117 - 211	24.9	41	29 - 54
			44	345	39	0.9	142	14.2	45	252	64 - 345	30 - 39	129	104 - 142	15.2	39	26 - 45
		Rx4	16, 17, 21	415	43	6.8	175	13.1	46	216	85 - 415	30 - 43	151	122 - 175	14.4	35	26 - 46
			22	559	61	0.3	238	11.8	66	107	57 - 167	31 - 50	146	105 - 187	16.4	34	25 - 44
			25	284	36	2.8	160	19.4	43	203	42 - 284	30 - 36	150	129 - 160	20.8	37	25 - 43
			69	571	46	0.7	165	12.9	56	343	207 - 571	30 - 46	131	97 - 165	15.0	44	34 - 56
			69	482	63	2.8	250	14.5	78	79	55 - 112	33 - 50	144	108 - 184	20.9	37	28 - 47
			66, 67	1097	41	1.3	191	10.9	67	478	129 - 1097	30 - 41	149	115 - 191	11.6	45	30 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	165	133 - 206	30 - 49	135	101 - 168	19.8	49	38 - 61
			36	417	48	1.6	201	14.1	60	192	47 - 417	30 - 48	158	118 - 201	17.2	42	26 - 60
			42, 43	345	39	0.9	142	14.2	45	252	64 - 345	30 - 39	129	104 - 142	15.2	39	26 - 45
		Rx5	65	327	45	0.6	191	15.3	52	210	93 - 327	40 - 45	175	160 - 191	16.5	44	36 - 52
		Rx8	10, 14	568	51	0.0	152	12.4	56	214	78 - 568	30 - 51	124	99 - 152	14.2	38	26 - 56
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx3	74	400	45	1.5	160	12.6	51	199	75 - 400	30 - 45	127	94 - 160	13.8	37	26 - 51
			75	264	55	5.1	258	19.3	75	128	33 - 264	40 - 55	219	168 - 258	24.0	57	40 - 75
			53, 55, 59, 62	560	65	3.4	255	12.2	75	94	61 - 137	35 - 50	159	139 - 184	18.2	38	31 - 46
			54, 56, 58	610	44	1.0	171	12.1	52	276	74 - 610	30 - 44	141	115 - 171	14.0	37	25 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	112	66 - 135	30 - 36	145	131 - 152	17.1	31	26 - 33

Table 3. Alternative C Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D	Partial Retention				No
2	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5D	Partial Retention				No
3	109	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5D	Modification and Partial Retention				No
4	19	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Modification and Partial Retention				No
5	15	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Modification				No
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5D	Modification and Partial Retention			Yes	No
7	64	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification				No
9	23	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
10	135	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	22 acres Threat Zone, General Forest		Modification and Partial Retention				No
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No
14	96	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone		Partial Retention				No
16	16	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
17	113	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5D	Modification and Partial Retention				No
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification				No
21	14	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
22	33	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Partial Retention				No
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest		Modification and Partial Retention				No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
25	91	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA		Modification and Partial Retention	HRCA			No
26	6	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
27	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification				No
28	5	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
29	9	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest		Partial Retention				No
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	General Forest		Partial Retention				No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Modification and Partial Retention	HRCA			No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Modification	HRCA			No
34	11	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone		Partial Retention				No
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Partial Retention				No
36	167	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Norther 1/4 unit = HRCA. General Forest	5M	Modification and Partial Retention	Northern 1/4 unit HRCA.			No
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA		Partial Retention	HRCA			No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.		Partial Retention	SOHA			No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone	5M	Partial Retention		Yes		No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention				No
42	195	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention		Yes		No
43	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
44	13	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
45	40	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
46	4	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Threat Zone		Partial Retention				No
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone		Partial Retention				No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
49	84	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
50	14	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Defense Zone		Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
51	14	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
52	14	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Modification			Yes	No
53	15	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
54	19	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification			Yes	No
55	55	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention			Yes	No
56	26	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Partial Retention				No
58	12	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Partial Retention				No
59	26	Non	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Partial Retention				No
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Partial Retention				No
61	27	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
62	20	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification				No
63	28	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M	Modification and Partial Retention			Yes	No
65	180	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA	5M	Modification and Partial Retention	HRCA			No
66	71	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention			Yes	No
67	24	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone		Partial Retention			Yes	No
68	179	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone		Partial Retention			Yes	No
69	93	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone	5D	Partial Retention				No
71	89	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M	Partial Retention and Retention	HRCA		Yes	No
72	47	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation. HRCA.	5M	Retention	HRCA			No
73	221	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
74	45	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. Recreation.		Partial Retention and Retention				No
75	34	Non	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.	5M/D	Partial Retention and Retention				No
78	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M/D	Partial Retention				No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M/D	Partial Retention			Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M/D	Partial Retention			Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D	Partial Retention and Modification	HRCA			No
81	19	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone. HRCA.		Partial Retention	HRCA			No
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone		Partial Retention		Yes		No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.		Modification and Partial Retention	HRCA			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M	Partial Retention	HRCA			No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M	Partial Retention	HRCA			No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone		Partial Retention			Yes	No
92	42	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Partial Retention				No
93	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
94	19	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Threat Zone	5M	Partial Retention				No
95	25	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	Threat Zone. 50% HRCA.	5M/D	Partial Retention	50% HRCA			No
96	12	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	HRCA	5M	Partial Retention	HRCA			No
97	21	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
98	25	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification and Partial Retention				No
99	94	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
99a	21	DFPZ	Rx8	Mechanical Thin	Skyline	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	VQO	Wildlife	Weed Treatments	TES plants	GS
101	3	DFPZ	Rx6	Mechanical Thin	Ground-based	Fuel Reduction	General Forest		Modification				No
102	67	DFPZ	Rx1	Mastication	Ground-based	Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
103	61	DFPZ	Rx8	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M	Modification and Partial Retention				No
104	52	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D	Modification and Partial Retention	HRCA			No
105	3	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone. Recreation. HRCA.		Partial Retention	HRCA			No
106	21	DFPZ	Rx8	Mechanical Thin	Ground-based	Fuel Reduction	Defense Zone and Threat Zone. Recreation. HRCA.	5D	Partial Retention and Retention	HRCA			No
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.		Retention				No

Table 4. Alternative C Stand Exam Data and Post Treatment Outputs by Unit

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per Acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per Acre	Range in Residual Basal Area per Acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Residual Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 32	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx8	16, 17, 21, 29	415	43	6.8	175	13.1	46	219	85 - 415	30 - 43	151	121 - 175	14.4	35	26 - 46
			22, 28	564	61	0.2	239	11.8	66	205	93 - 564	36 - 61	172	133 - 239	14.9	42	31 - 66
			27	738	58	12.1	272	14.4	80	328	107 - 738	43 - 58	227	192 - 272	17.7	57	43 - 80
			26	231	35	4.1	154	20.6	39	170	44 - 231	30 - 35	148	136 - 154	21.7	35	25 - 39
			25	284	36	2.8	160	19.4	43	247	60 - 284	32 - 36	156	138 - 160	20.0	41	29 - 43
			7, 9	925	44	7.4	220	15.5	67	523	106 - 925	34 - 44	194	156 - 220	16.8	52	34 - 67
			93, 94, 95, 96, 97	579	60	1.6	225	13.8	73	278	98 - 579	42 - 60	186	161 - 225	16.6	53	39 - 73
			98, 99, 99a, 101	408	47	3.4	172	14.0	54	251	62 - 408	30 - 47	152	118 - 172	15.9	44	28 - 54

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per Acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per Acre	Range in Residual Basal Area per Acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Residual Relative Density
			92	414	55	4.5	215	15.5	62	210	96 - 414	45 - 55	192	173 - 215	17.5	48	38 - 62
			81	1475	71	0.0	313	10.5	85	173	128 - 248	41 - 50	138	126 - 161	13.2	29	26 - 35
			104, 105, 106	384	66	6.3	291	16.4	80	244	105 - 384	52 - 66	262	232 - 291	18.8	66	52 - 80
			71	244	59	10.8	266	18.1	74	178	111 - 244	55 - 59	253	240 - 266	19.2	66	59 - 74
			69	575	47	0.6	166	12.9	57	364	82 - 575	34 - 47	142	103 - 166	14.3	45	27 - 57
			68, 69	478	63	3.0	249	14.5	77	292	101 - 478	48 - 63	218	185 - 249	16.9	62	46 - 77
			66, 67	1099	41	1.3	191	10.9	67	494	129 - 1099	30 - 41	150	115 - 191	11.5	46	30 - 67
			65	327	45	0.6	191	15.3	52	209	75 - 327	34 - 45	173	146 - 191	16.9	43	31 - 52
			73	1136	73	5.1	276	11.5	85	637	125 - 1136	43 - 73	216	150 - 276	14.3	60	34 - 85
			45, 46, 49, 50	206	49	0.6	168	16.6	61	161	70 - 206	42 - 49	159	140 - 168	17.7	55	42 - 61
			36	422	48	1.5	202	14.0	60	261	72 - 422	34 - 48	176	137 - 202	15.9	48	31 - 60
			42, 43, 44	345	39	0.9	142	14.2	45	253	62 - 345	30 - 39	130	105 - 142	15.3	39	26 - 45
			34	214	39	2.9	138	14.6	43	163	57 - 214	30 - 39	130	114 - 138	16.2	38	28 - 43
			2, 3, 4, 5	359	47	0.0	202	15.5	61	221	65 - 359	35 - 47	181	153 - 202	17.8	49	35 - 61
			10, 14	568	51	0.0	152	12.4	56	214	78 - 568	30 - 51	124	99 - 152	14.2	38	26 - 56
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx8	74	400	45	1.5	160	12.6	51	201	67 - 400	30 - 45	129	97 - 160	14.2	37	25 - 51
			75	264	55	5.1	258	19.3	75	138	73 - 264	49 - 55	237	224 - 258	22.7	61	53 - 75
			53, 55, 59, 62	556	65	3.5	254	12.2	74	104	61 - 163	35 - 50	161	142 - 187	18.1	38	31 - 47
			54, 56, 58	610	44	1.0	171	12.1	52	284	74 - 610	30 - 44	141	114 - 171	14.0	37	25 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	112	64 - 135	30 - 36	145	130 - 152	17.2	31	26 - 33

Table 5. Alternative D Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			No
3	109	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			No
4	19	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			No
5	15	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			No
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	No
7	64	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			No
10	135	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
14	96	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
17	113	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			No
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
22	33	DFPZ	Rx10	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	General Forest		Yes	Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
25	91	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction /Forest Health /Noxious Weed Reduction	HRCA		Yes	Modification and Partial Retention	HRCA		No
26	6	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
27	9	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
28	5	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
29	9	DFPZ	Rx10	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No
34	11	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		No
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
42	195	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			No
43	25	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Threat Zone	5M	Yes	Partial Retention			No
44	13	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			No
45	40	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
46	4	DFPZ	Rx9	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
49	84	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
50	14	DFPZ	Rx9	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			No
51	14	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
52	14	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	No
53	15	Non	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			No
54	19	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	No
55	55	Non	Rx1	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	No
56	26	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			No
59	26	Non	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			No
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
62	20	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
63	28	Non	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		No
66	71	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
67	24	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	No
68	179	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	No
69	93	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			No
71	89	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	No
72	47	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			No
74	45	Non	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			No
75	34	Non	Rx10	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx9	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		No
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health/Noxious Weed Reduction	Defense Zone and Threat Zone. HRCA.		Yes	Modification and Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Noxious Weed Reduction	Mt. Jura LSOG. HRCA.	5M	Yes	Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Partial Retention			No
93	25	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. OFE.	5M		Partial Retention			No
94	19	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. OFE.	5M		Partial Retention			No
95	25	DFPZ	Rx11	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA. OFE.	5M/D		Partial Retention	50% HRCA		No
96	12	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA. OFE.	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
97	21	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
98	25	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE			Modification and Partial Retention			No
99	94	DFPZ	Rx12	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
99a	21	DFPZ	Rx12	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
101	3	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	OFE			Modification			No
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	OFE	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	OFE	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx11	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		No
105	3	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
106	21	DFPZ	Rx1	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		No
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No
NW 1						Noxious Weed Reduction			Yes	Modification			
NW 5						Noxious Weed Reduction			Yes	Partial Retention			
NW 11						Noxious Weed Reduction			Yes	Partial Retention			
NW 16						Noxious Weed Reduction			Yes	Modification			
NW 17						Noxious Weed Reduction			Yes	Modification			
NW 19						Noxious Weed Reduction			Yes	Partial Retention			
NW 20						Noxious Weed Reduction		5M	Yes	Modification and Partial Retention			
NW 21						Noxious Weed Reduction		5M	Yes	Partial Retention	HRCA		
NW 24						Noxious Weed Reduction		5M	Yes	Modification	PAC		
NW 26						Noxious Weed Reduction			Yes	Modification	PAC/ HRCA		

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	Group Selection
NW 27						Noxious Weed Reduction			Yes	Partial Retention			
NW 28						Noxious Weed Reduction			Yes	Modification			

Table 6. Alternative D Stand Exam Data and Post Treatment Outputs

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx1	9	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			98, 101	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			105, 106	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			36	417	48	1.6	201	14.1	60	211	211 - 211	45 - 45	180	180 - 180	15.3	48	48 - 48
			42	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
		Rx10	21, 29	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			22, 28	559	61	0.3	238	11.8	66	260	167 - 353	50 - 61	209	187 - 230	13.1	51	44 - 59
			4, 5	359	47	0.0	202	15.5	61	271	183 - 359	47 - 47	194	186 - 202	15.5	55	50 - 61
		Rx11	17	415	43	6.8	175	13.1	46	352	224 - 415	43 - 43	172	166 - 175	13.1	44	39 - 46
			27	741	59	12.1	272	14.4	80	187	119 - 323	50 - 59	230	218 - 253	17.0	54	48 - 65
			26	231	35	4.1	154	20.6	39	187	98 - 231	35 - 35	153	151 - 154	20.6	37	33 - 39
			7	925	44	7.4	220	15.5	67	715	296 - 925	44 - 44	211	191 - 220	15.5	60	48 - 67
			93, 94, 95	583	60	1.6	225	13.7	74	233	176 - 330	50 - 60	184	171 - 209	15.6	53	47 - 62

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			104	384	66	6.3	291	16.4	80	227	68 - 384	50 - 66	252	184 - 291	18.3	63	39 - 80
			71	244	59	10.8	266	18.1	74	174	99 - 244	50 - 59	247	211 - 266	19.3	66	54 - 74
			73	1136	73	5.1	276	11.5	85	616	162 - 1136	50 - 73	217	129 - 276	13.2	61	31 - 85
			43, 44	345	39	0.9	142	14.2	45	284	162 - 345	39 - 39	138	130 - 142	14.2	42	37 - 45
			2, 3	359	47	0.0	202	15.5	61	301	183 - 359	47 - 47	196	186 - 202	15.5	57	50 - 61
		Rx12	25	284	36	2.8	160	19.4	43	200	115 - 284	36 - 36	156	153 - 160	19.4	39	35 - 43
			96, 97	583	60	1.6	225	13.7	74	253	176 - 330	50 - 60	190	171 - 209	15.4	55	47 - 62
			99, 99a	408	47	3.4	172	14.0	54	310	211 - 408	47 - 47	166	160 - 172	14.0	50	45 - 54
			92	414	55	4.5	215	15.5	62	159	113 - 206	50 - 55	196	187 - 205	16.5	47	42 - 51
			65	327	45	0.6	191	15.3	52	251	175 - 327	45 - 45	185	179 - 191	15.3	48	44 - 52
		Rx9	16	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			81	1475	71	0.0	313	10.5	85	400	179 - 622	50 - 71	207	153 - 261	11.5	47	31 - 62
			69	571	46	0.7	165	12.9	56	466	361 - 571	46 - 46	159	153 - 165	12.9	53	49 - 56
			68, 69	482	63	2.8	250	14.5	78	192	112 - 272	50 - 63	210	184 - 237	16.6	57	47 - 67
			66, 67	1097	41	1.3	191	10.9	67	746	396 - 1097	41 - 41	172	153 - 191	10.9	56	46 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	206	206 - 206	49 - 49	168	168 - 168	16.6	61	61 - 61
			34	214	39	2.9	138	14.6	43	174	135 - 214	39 - 39	137	135 - 138	14.6	41	39 - 43
			10, 14	568	51	0.0	152	12.4	56	250	212 - 288	50 - 51	139	137 - 141	12.5	44	42 - 46
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx1	53, 55	560	65	3.4	255	12.2	75	314	314 - 314	60 - 60	229	229 - 229	13.2	62	62 - 62
		Rx10	75	264	55	5.1	258	19.3	75	119	86 - 152	50 - 55	241	231 - 252	20.7	61	57 - 66
		Rx11	59, 62	560	65	3.4	255	12.2	75	210	137 - 355	50 - 65	205	184 - 247	14.5	53	46 - 67
			54, 56, 58	610	44	1.0	171	12.1	52	496	268 - 610	44 - 44	164	150 - 171	12.1	48	40 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	128	113 - 135	36 - 36	152	151 - 152	16.1	33	32 - 33
		Rx9	74	400	45	1.5	160	12.6	51	306	213 - 400	45 - 45	154	148 - 160	12.6	47	42 - 51

Table 7. Alternative E Development by Unit

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
1	2	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5D		Partial Retention			No
2	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5D		Partial Retention			Yes
3	109	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5D		Modification and Partial Retention			Yes
4	19	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
5	15	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Modification			Yes
6	20	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5D		Modification and Partial Retention		Yes	Yes
7	64	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
8	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
9	23	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
10	135	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	22 acres Threat Zone, General Forest			Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
11	78	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
12	29	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
13	70	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
14	96	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
15	83	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone			Partial Retention			No
16	16	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
17	113	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5D		Modification and Partial Retention			Yes
18	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			No
19	21	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification			No
21	14	DFPZ	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
22	33	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
23	66	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			No
24	24	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
25	91	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA			Modification and Partial Retention	HRCA		Yes
26	6	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
27	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
28	5	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
29	9	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest			Partial Retention			Yes
30	10	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
31	24	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest			Partial Retention			No
32	38	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification and Partial Retention	HRCA		No
33	5	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Modification	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
34	11	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
35	14	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone	5M		Partial Retention			No
36	167	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Norther 1/4 unit = HRCA. General Forest	5M		Modification and Partial Retention	Northern 1/4 unit = HRCA.		Yes
37	23	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA			Partial Retention	HRCA		No
38	93	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No
39	73	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Threat Zone. SOHA.			Partial Retention	SOHA		No
40	734	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone	5M	Yes	Partial Retention			No
41	8	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone			Partial Retention			No
42	195	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M	Yes	Partial Retention			Yes
43	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
44	13	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
45	40	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
46	4	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone			Partial Retention			Yes
47	3	DFPZ	Rx7	Prescribed Fire		Fuel Reduction/Forest Health	Threat Zone			Partial Retention			No
48	163	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Defense Zone and Threat Zone		Yes	Partial Retention			No
49	84	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			Yes
50	14	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Defense Zone			Partial Retention			Yes
51	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	Yes
52	14	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Threat Zone	5M		Modification		Yes	Yes
53	15	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
54	19	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification		Yes	Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
55	55	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health/TES Plants	General Forest	5M		Modification and Partial Retention		Yes	Yes
56	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
57	42	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
58	12	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
59	26	Non	Rx14	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
60	22	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Partial Retention			No
61	27	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
62	20	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification			Yes
63	28	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
64	85	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M		Modification and Partial Retention		Yes	No
65	180	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Modification and Partial Retention	HRCA		Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
66	71	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
67	24	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone			Partial Retention		Yes	Yes
68	179	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone			Partial Retention		Yes	Yes
69	93	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone	5D		Partial Retention			Yes
71	89	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Plants	Defense Zone and Threat Zone. HRCA.	5M		Partial Retention and Retention	HRCA	Yes	Yes
72	47	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5M		Retention	HRCA		No
73	221	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation.	5M/D		Partial Retention and Retention			Yes
74	45	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. Recreation.			Partial Retention and Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
75	34	Non	Rx14	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
75a	12	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Wildlife	Threat Zone. Recreation.	5M/D		Partial Retention and Retention	Bald Eagle		No
78	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M/D		Partial Retention			No
78a	55	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
78b	42	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/TES Plants	Threat Zone	5M/D		Partial Retention		Yes	No
79	35	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Defense Zone and Threat Zone. HRCA.	5M/D		Partial Retention and Modification	HRCA		No
81	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone. HRCA.			Partial Retention	HRCA		Yes
84	136	Non	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health	Defense Zone and Threat Zone		Yes	Partial Retention			No
85	175	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.			Modification and Partial Retention	HRCA		No
86	257	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
87	150	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	HRCA	5M		Partial Retention	HRCA		No

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
88	133	DFPZ	Rx7	Prescribed Fire		Fuel Reduction	Mt. Jura LSOG. HRCA.	5M		Partial Retention	HRCA		No
89	47	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction/Forest Health/TES Plants	Threat Zone			Partial Retention		Yes	No
92	42	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Partial Retention			Yes
93	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
94	19	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Threat Zone	5M		Partial Retention			Yes
95	25	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	Threat Zone. 50% HRCA.	5M/D		Partial Retention	50% HRCA		Yes
96	12	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	HRCA	5M		Partial Retention	HRCA		Yes
97	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
98	25	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification and Partial Retention			Yes
99	94	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes

Unit #	Acres	DFPZ	Rx	Treatment	Logging System	Purpose & Need	Land Allocation	CWHR	Weed Treatments	VQO	Wildlife	TES plants	GS
99a	21	DFPZ	Rx13	Mechanical Thin	Skyline	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			Yes
101	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	General Forest			Modification			Yes
102	67	DFPZ	Rx6	Mastication	Ground-based	Fuel Reduction/Forest Health	General Forest	5M		Modification and Partial Retention			No
103	61	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	General Forest	5M		Modification and Partial Retention			No
104	52	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. HRCA.	5M/D		Modification and Partial Retention	HRCA		Yes
105	3	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone. Recreation. HRCA.			Partial Retention	HRCA		Yes
106	21	DFPZ	Rx13	Mechanical Thin	Ground-based	Fuel Reduction/Forest Health	Defense Zone and Threat Zone. Recreation. HRCA.	5D		Partial Retention and Retention	HRCA		Yes
107	41	DFPZ	Rx1	Handthin, Pile, and Burn		Fuel Reduction	Threat Zone. Recreation.			Retention			No

Table 8. Alternative E Stand Exam Data and Post Treatment Outputs

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
DFPZ	Handthin, Pile, and Burn	Rx1	19	482	37	2.8	132	11.6	47	227	227 - 227	35 - 35	112	112 - 112	12.3	36	36 - 36
			32, 33	232	31	8.9	131	19.5	37	110	110 - 110	31 - 31	123	123 - 123	19.5	31	31 - 31
			37	72	31	0.2	133	21.6	29	58	58 - 58	31 - 31	133	133 - 133	21.6	27	27 - 27
			24	284	36	2.8	160	19.4	43	136	136 - 136	36 - 36	154	154 - 154	19.4	36	36 - 36
			30	166	35	2.9	190	22.6	44	73	73 - 73	34 - 34	181	181 - 181	27.6	36	36 - 36
			8	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			103	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			103	432	53	0.9	235	14.4	64	231	231 - 231	50 - 50	213	213 - 213	15.5	53	53 - 53
			79	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			64	327	45	0.6	191	15.3	52	171	171 - 171	43 - 43	174	174 - 174	16.5	43	43 - 43
			107	400	45	1.5	160	12.6	51	213	213 - 213	43 - 43	142	142 - 142	13.3	41	41 - 41
			41	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
			35	214	39	2.9	138	14.6	43	118	118 - 118	36 - 36	127	127 - 127	16.2	35	35 - 35
			1	359	47	0.0	202	15.5	61	163	163 - 163	42 - 42	175	175 - 175	17.9	46	46 - 46
			11, 12, 13	568	51	0.0	152	12.4	56	293	293 - 293	47 - 47	135	135 - 135	13.4	45	45 - 45
	Mechanical Thin	Rx1	9	925	44	7.4	220	15.5	67	355	355 - 355	42 - 42	189	189 - 189	16.5	49	49 - 49
			98, 101	408	47	3.4	172	14.0	54	212	212 - 212	43 - 43	156	156 - 156	15.0	44	44 - 44
			105, 106	384	66	6.3	291	16.4	80	249	249 - 249	66 - 66	283	283 - 283	16.4	72	72 - 72
			36	417	48	1.6	201	14.1	60	211	211 - 211	45 - 45	180	180 - 180	15.3	48	48 - 48
			42	345	39	0.9	142	14.2	45	166	166 - 166	36 - 36	127	127 - 127	15.2	36	36 - 36
		Rx10	21, 29	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			22, 28	559	61	0.3	238	11.8	66	260	167 - 353	50 - 61	209	187 - 230	13.1	51	44 - 59
			4, 5	359	47	0.0	202	15.5	61	271	183 - 359	47 - 47	194	186 - 202	15.5	55	50 - 61
		Rx11	17	415	43	6.8	175	13.1	46	352	224 - 415	43 - 43	172	166 - 175	13.1	44	39 - 46
			27	741	59	12.1	272	14.4	80	187	119 - 323	50 - 59	230	218 - 253	17.0	54	48 - 65
			26	231	35	4.1	154	20.6	39	187	98 - 231	35 - 35	153	151 - 154	20.6	37	33 - 39
			7	925	44	7.4	220	15.5	67	715	296 - 925	44 - 44	211	191 - 220	15.5	60	48 - 67
			93, 94, 95	583	60	1.6	225	13.7	74	233	176 - 330	50 - 60	184	171 - 209	15.6	53	47 - 62

DFPZ	TREATMENT	Rx	Unit #	Existing Trees Per Acre	Existing Canopy Cover	Existing and Residual Snags per acre > 15 inches dbh	Existing Basal Area per acre	Existing Quadratic Mean Diameter	Existing Relative Density	Avg. Residual Trees per Acre	Range in Residual Trees per acre	Range in Residual Canopy Cover	Avg. Residual Basal Area per acre	Range in Residual Basal Area per acre	Residual Quadratic Mean Diameter	Avg. Residual Relative Density	Range in Relative Density
			104	384	66	6.3	291	16.4	80	227	68 - 384	50 - 66	252	184 - 291	18.3	63	39 - 80
			71	244	59	10.8	266	18.1	74	174	99 - 244	50 - 59	247	211 - 266	19.3	66	54 - 74
			73	1136	73	5.1	276	11.5	85	616	162 - 1136	50 - 73	217	129 - 276	13.2	61	31 - 85
			43, 44	345	39	0.9	142	14.2	45	284	162 - 345	39 - 39	138	130 - 142	14.2	42	37 - 45
			2, 3	359	47	0.0	202	15.5	61	301	183 - 359	47 - 47	196	186 - 202	15.5	57	50 - 61
		Rx12	25	284	36	2.8	160	19.4	43	200	115 - 284	36 - 36	156	153 - 160	19.4	39	35 - 43
			96, 97	583	60	1.6	225	13.7	74	253	176 - 330	50 - 60	190	171 - 209	15.4	55	47 - 62
			99, 99a	408	47	3.4	172	14.0	54	310	211 - 408	47 - 47	166	160 - 172	14.0	50	45 - 54
			92	414	55	4.5	215	15.5	62	159	113 - 206	50 - 55	196	187 - 205	16.5	47	42 - 51
			65	327	45	0.6	191	15.3	52	251	175 - 327	45 - 45	185	179 - 191	15.3	48	44 - 52
		Rx9	16	415	43	6.8	175	13.1	46	320	224 - 415	43 - 43	170	166 - 175	13.1	43	39 - 46
			81	1475	71	0.0	313	10.5	85	400	179 - 622	50 - 71	207	153 - 261	11.5	47	31 - 62
			69	571	46	0.7	165	12.9	56	466	361 - 571	46 - 46	159	153 - 165	12.9	53	49 - 56
			68, 69	482	63	2.8	250	14.5	78	192	112 - 272	50 - 63	210	184 - 237	16.6	57	47 - 67
			66, 67	1097	41	1.3	191	10.9	67	746	396 - 1097	41 - 41	172	153 - 191	10.9	56	46 - 67
			45, 46, 49, 50	206	49	0.6	168	16.6	61	206	206 - 206	49 - 49	168	168 - 168	16.6	61	61 - 61
			34	214	39	2.9	138	14.6	43	174	135 - 214	39 - 39	137	135 - 138	14.6	41	39 - 43
			10, 14	568	51	0.0	152	12.4	56	250	212 - 288	50 - 51	139	137 - 141	12.5	44	42 - 46
Non	Handthin, Pile, and Burn	Rx1	84	201	38	0.8	93	13.3	35	140	140 - 140	37 - 37	86	86 - 86	13.4	31	31 - 31
			75a	264	55	5.1	258	19.3	75	152	152 - 152	53 - 53	249	249 - 249	20.3	66	66 - 66
			57	610	44	1.0	171	12.1	52	230	230 - 230	34 - 34	133	133 - 133	15.0	35	35 - 35
			60	135	36	1.2	152	16.1	33	106	106 - 106	35 - 35	148	148 - 148	16.7	31	31 - 31
	Mechanical Thin	Rx1	53, 55	560	65	3.4	255	12.2	75	314	314 - 314	60 - 60	229	229 - 229	13.2	62	62 - 62
		Rx10	75	264	55	5.1	258	19.3	75	119	86 - 152	50 - 55	241	231 - 252	20.7	61	57 - 66
		Rx11	59, 62	560	65	3.4	255	12.2	75	210	137 - 355	50 - 65	205	184 - 247	14.5	53	46 - 67
			54, 56, 58	610	44	1.0	171	12.1	52	496	268 - 610	44 - 44	164	150 - 171	12.1	48	40 - 52
			51, 52, 58, 61, 63	135	36	1.2	152	16.1	33	128	113 - 135	36 - 36	152	151 - 152	16.1	33	32 - 33
		Rx9	74	400	45	1.5	160	12.6	51	306	213 - 400	45 - 45	154	148 - 160	12.6	47	42 - 51

Figure 1 Silvicultural Treatment Units with Unit Numbers

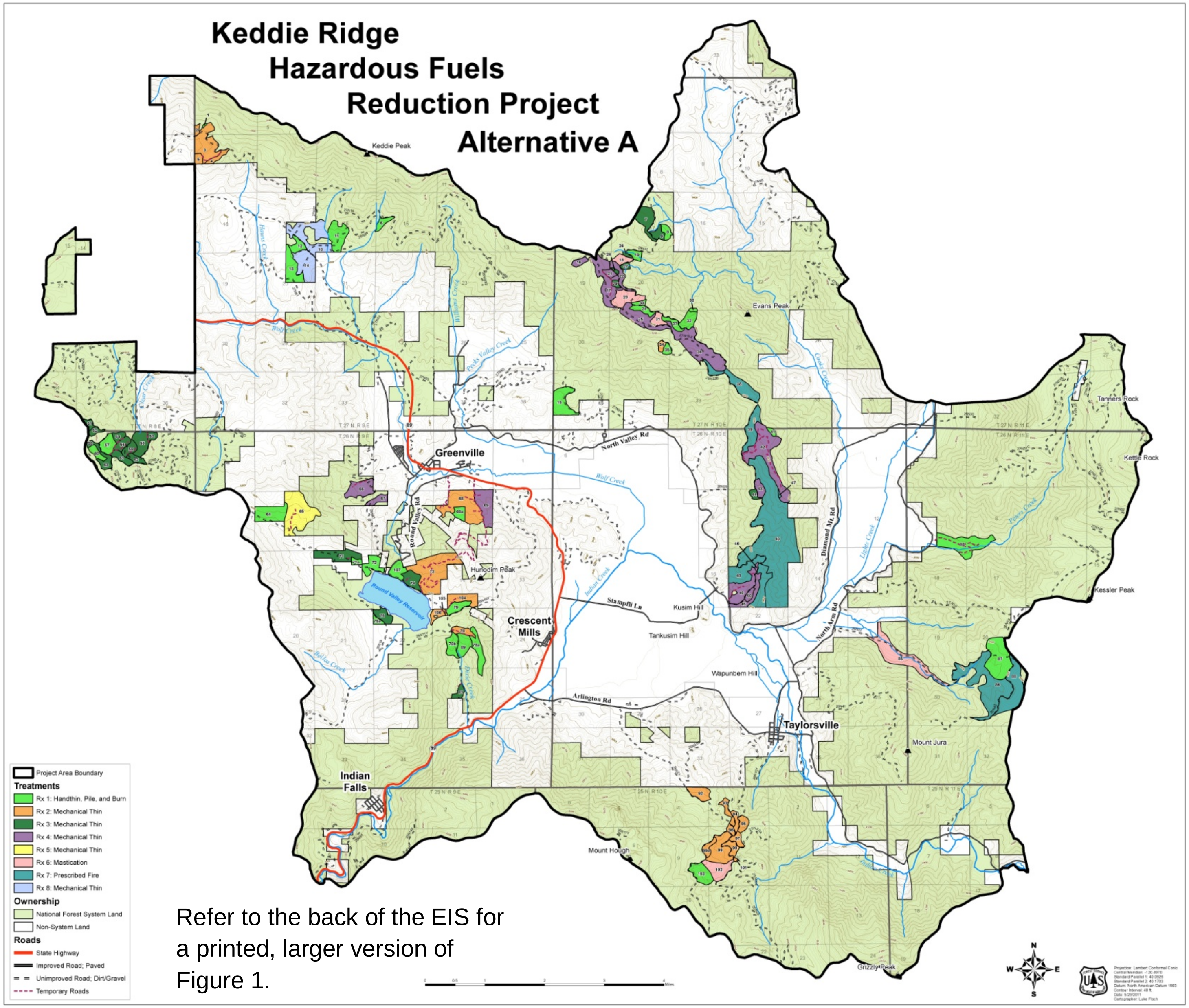
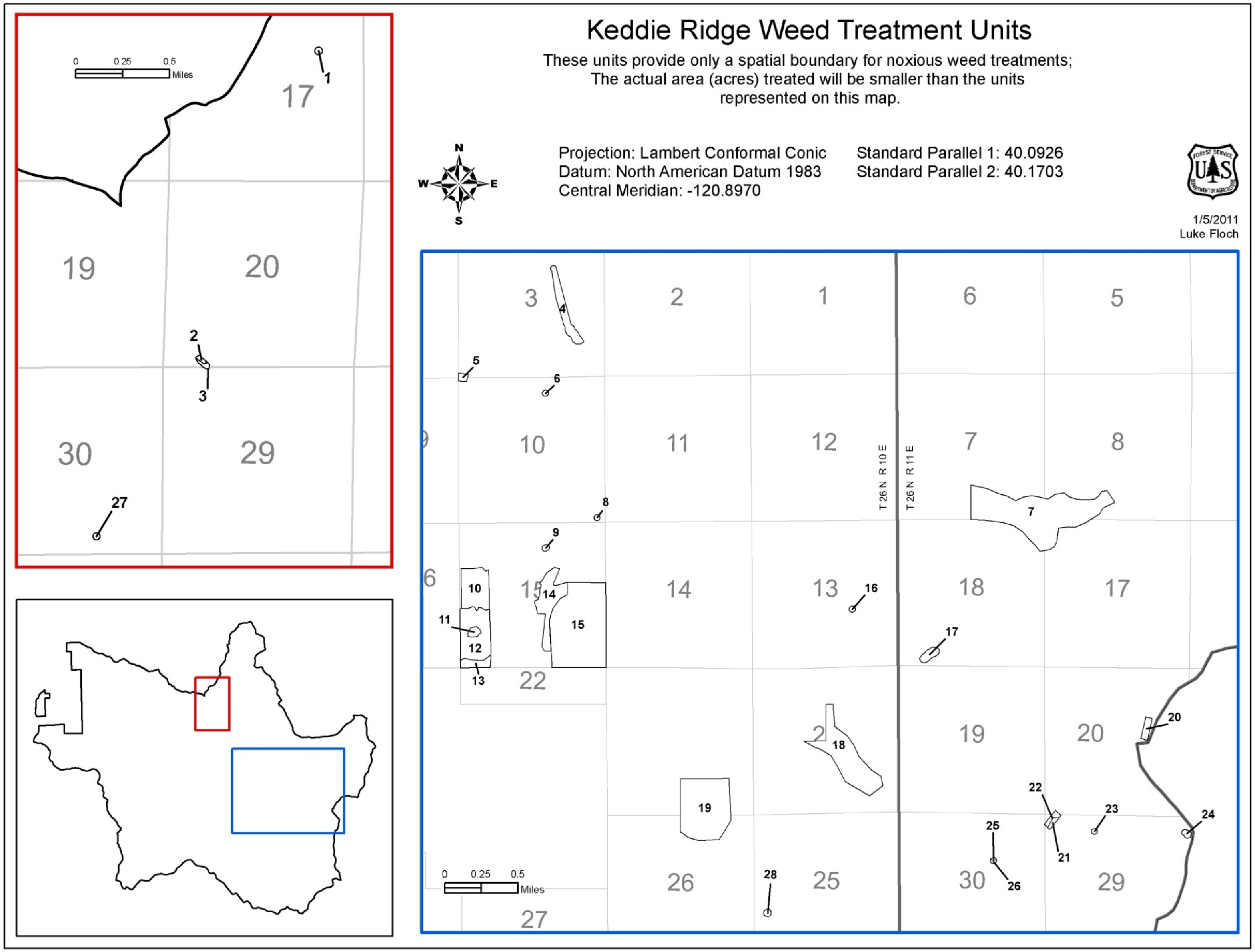


Figure 2 Noxious Weed Treatment Units with Unit Numbers



Appendix B

Alternative Maps

This appendix includes alternative specific treatment and noxious weed maps (Figure 1 through Figure 6). This appendix can be used in conjunction with appendix A to compare tabular data (appendix A) and spatial data (appendix B) for each unit within each alternative.

The first four maps (Figure 1 through Figure 4) are silvicultural treatment maps illustrating unit specific prescriptions for each alternative; township, range, and sections; ownership; and major roads, communities, bodies of water, and creeks. Some or all prescriptions change for each unit within each alternative; however, the footprint of the units does not change.

The last two maps (Figure 5 and Figure 6) focus on noxious weed treatment locations. These maps zoom into areas where there are noxious weed treatments. Most of the noxious weed treatments are less than one tenth of an acre and were difficult to see on the silvicultural maps. These weed treatment maps also include township, range, and sections; ownership; and major roads and creeks. Weed treatments are not proposed under alterative C (non-commercial funding alternative); however, implementing fuels treatments would directly benefit noxious weeds under this alternative.

Silvicultural and noxious weed prescription code tables are located at the end of all six maps (Table 1 and Table 2). The prescription code table clarifies which alternative the prescription applies to, the prescription code, and a general description explaining what the prescription is.

Figure 1 Alternative A Treatment Unit Map with Silvicultural Prescriptions

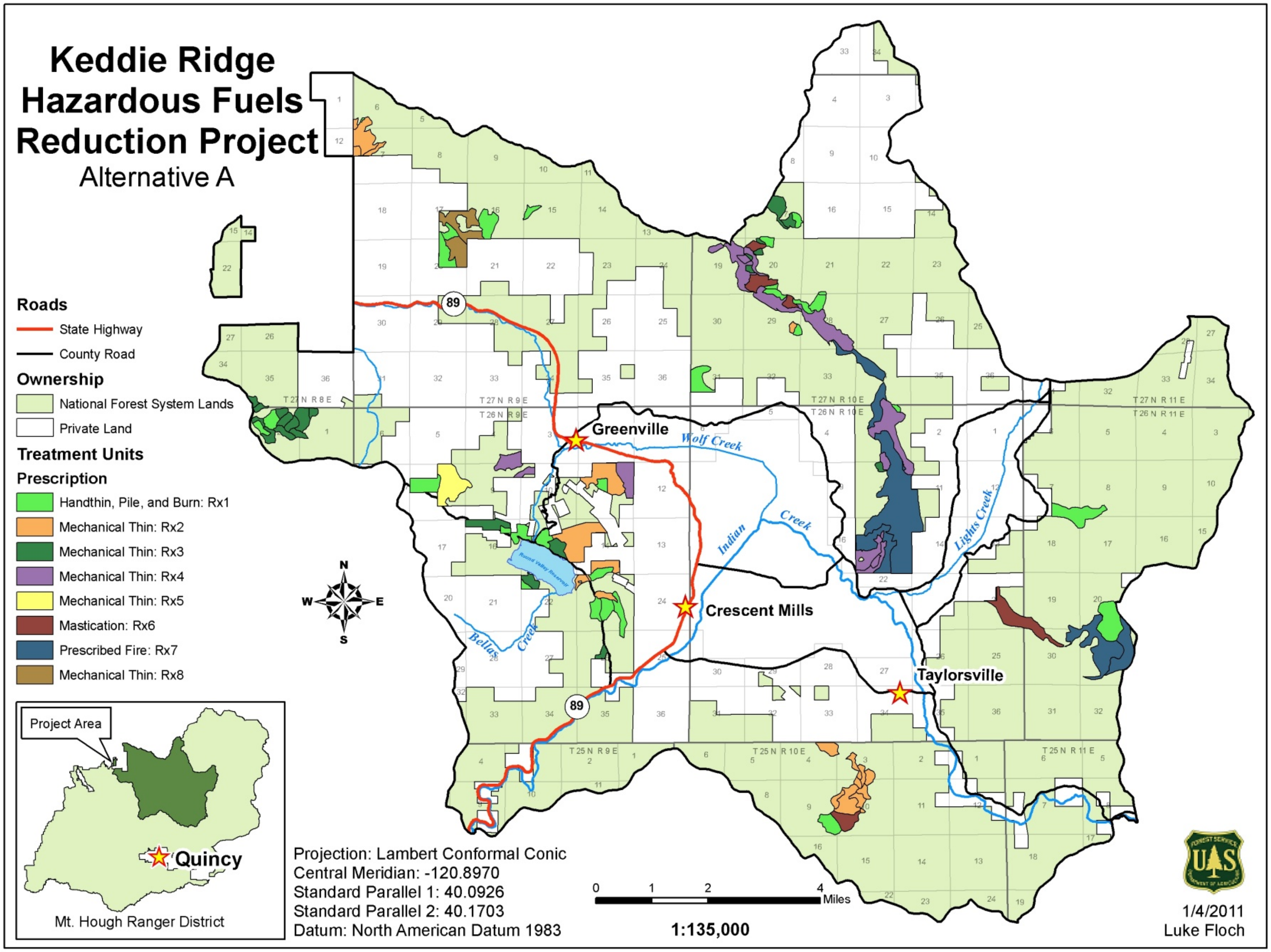


Figure 2 Alternative C Treatment Unit Map with Silvicultural Prescriptions

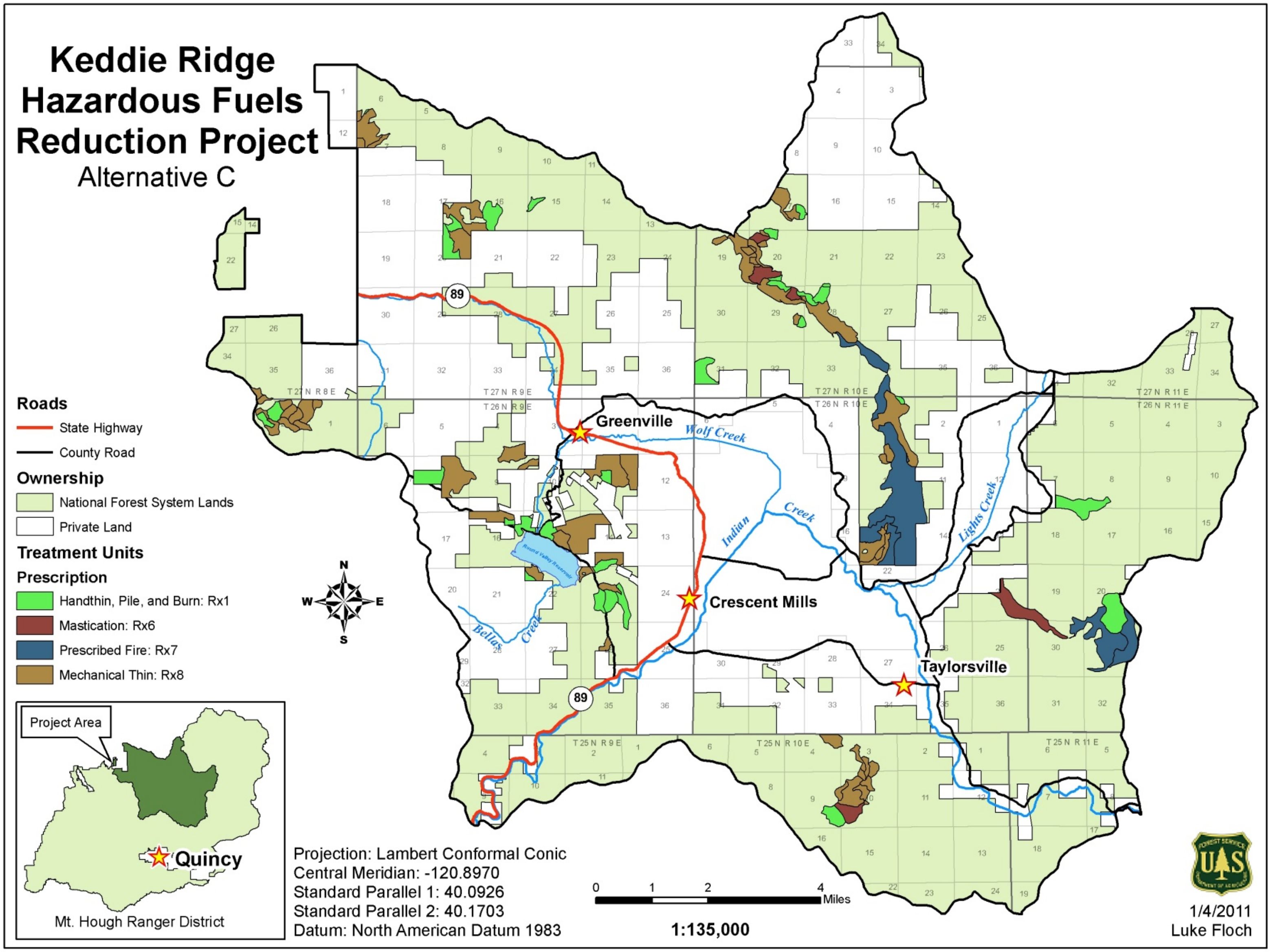


Figure 3 Alternative D Treatment Unit Map with Silvicultural Prescriptions

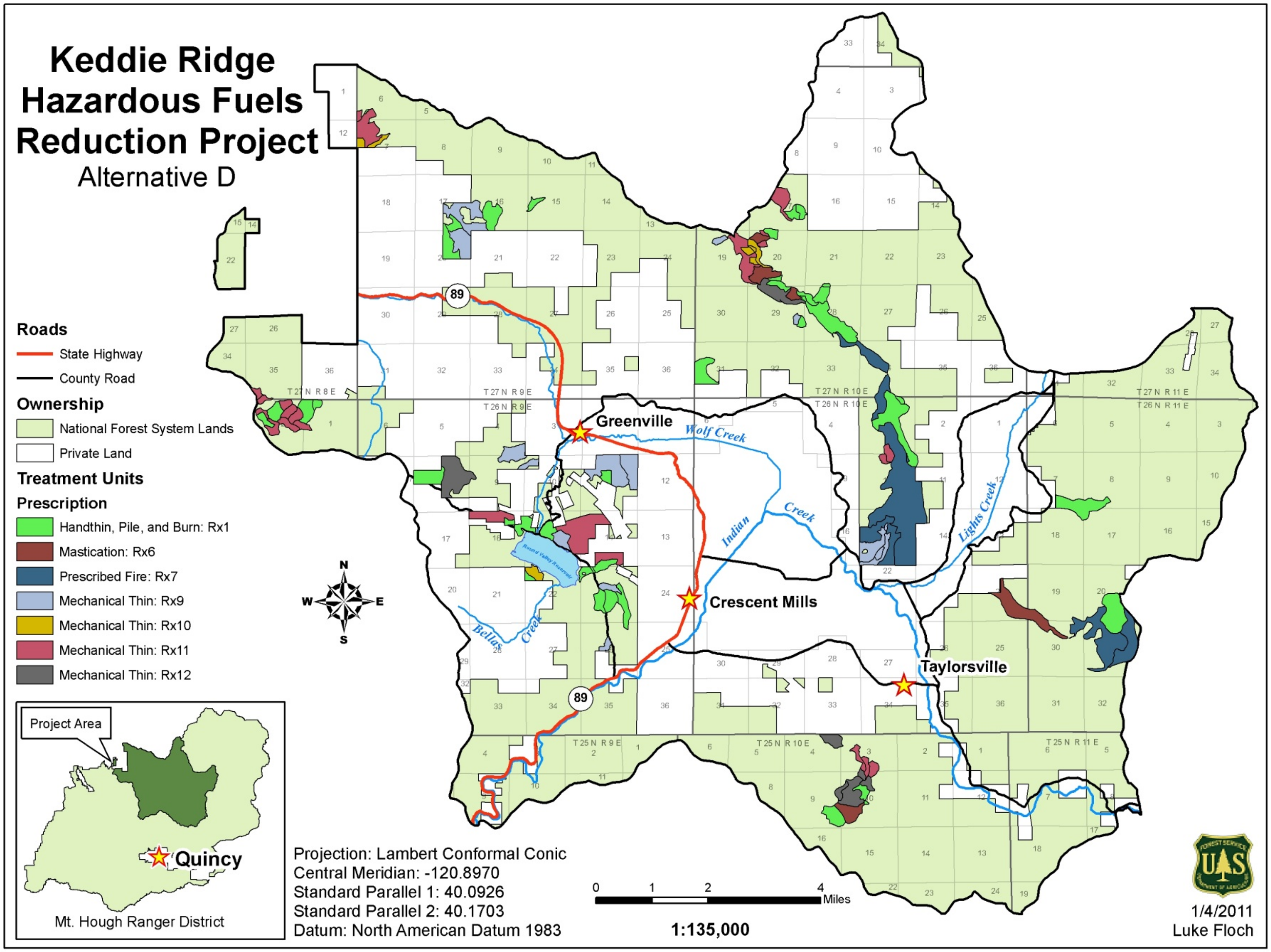


Figure 4 Alternative E Treatment Unit Map with Silvicultural Prescriptions

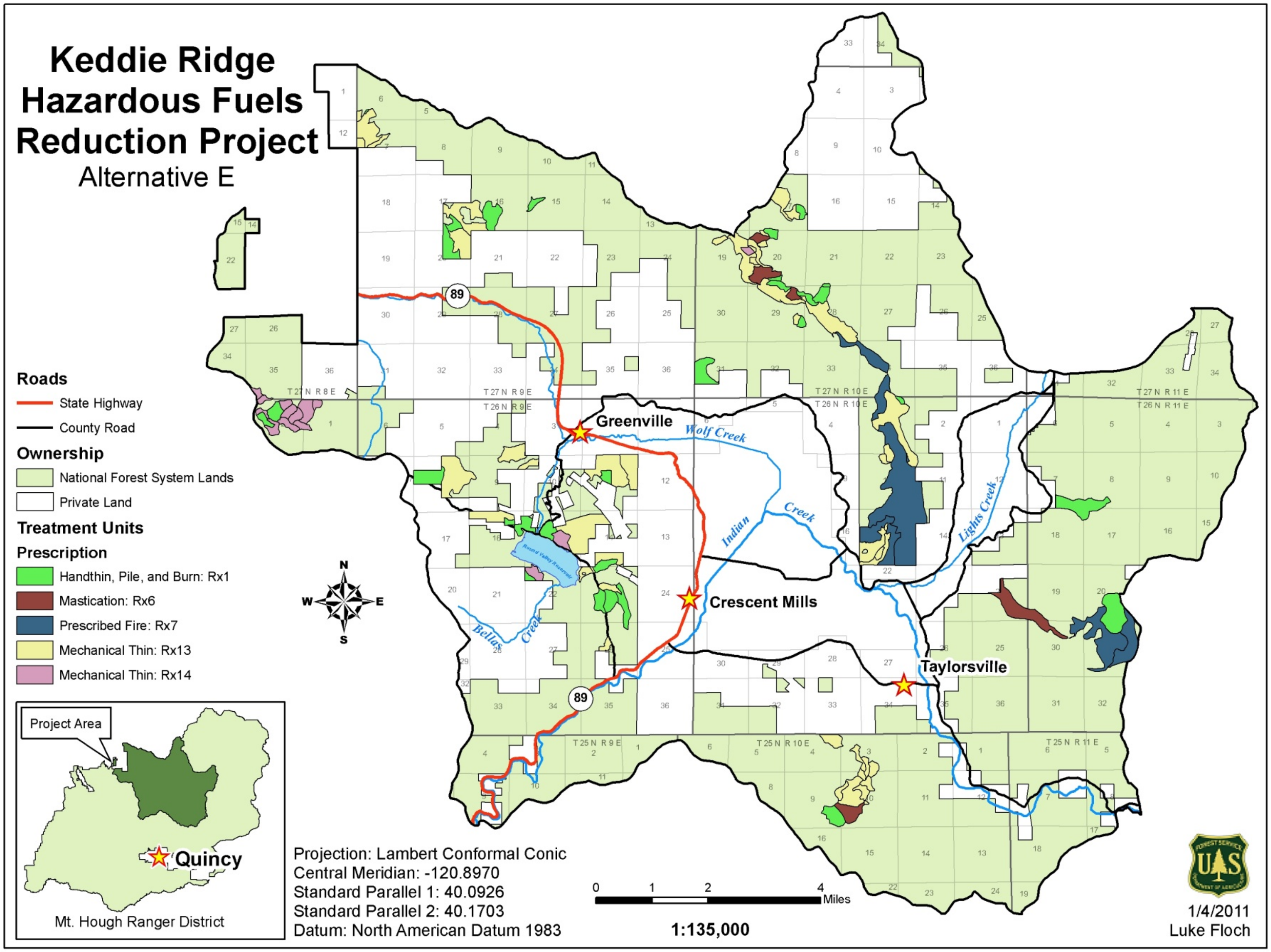


Figure 5 Alternatives A and D Treatment Unit Map with Noxious Weed Prescriptions

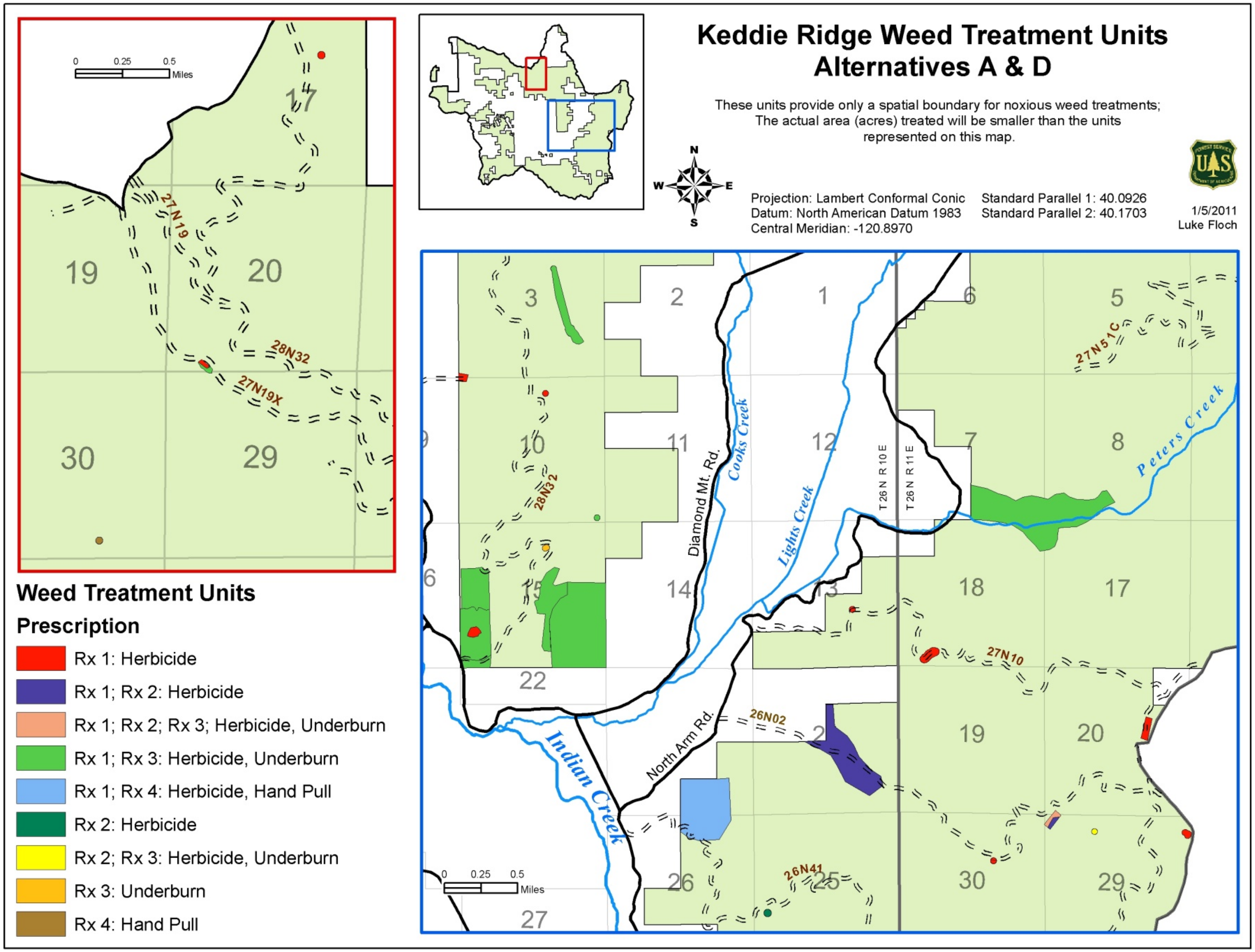


Figure 6 Alternatives C and E Treatment Unit Map with Noxious Weed Prescriptions

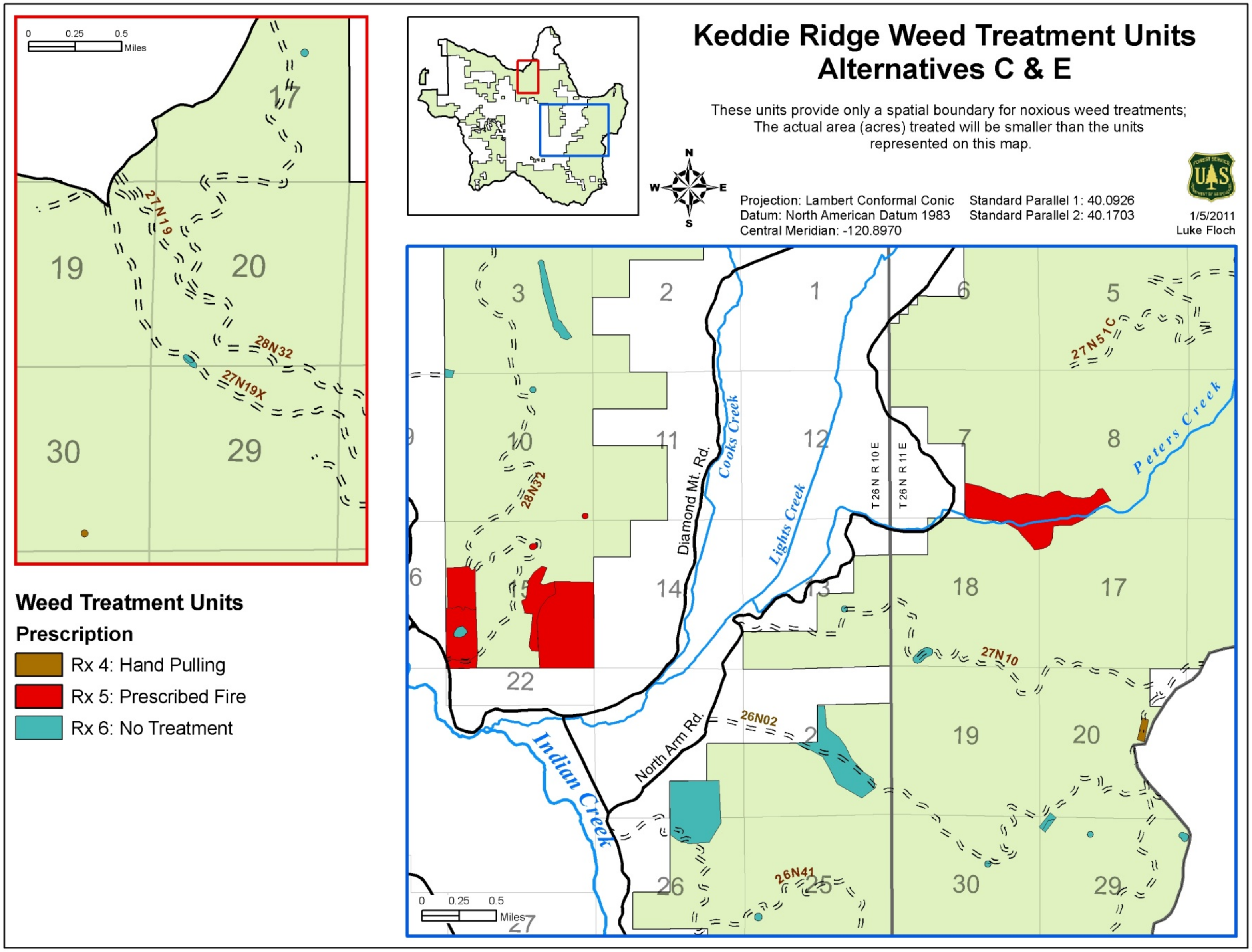


Table 1. Silvicultural Prescription Codes

Alternative	Prescription (Rx)	General Description
A, C, D, & E	**Rx 1**	Hand thin, pile, and burn trees less than 8 inches DBH and underburn.
A	**Rx 2**	Mechanical Thin to 30-40 percent canopy closure (CC), retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 3**	Mechanical Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 4**	Mechanical Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 5M/5D thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; in RHCAs thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
A	**Rx 5**	Mechanical Thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches and underburn.
A, C, D, & E	**Rx 6**	Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.
A, C, D, & E	**Rx 7**	Low to moderate intensity prescribed underburn.
A	**Rx 8**	Mechanical Thin to 30-50 percent CC, generally retain live trees greater than or equal to 12 inches DBH, and underburn.
C	**Rx 8**	Mechanical Thin to 30-50 percent CC, retain live trees greater than or equal to 12 inches DBH, in RHCAs, thin to 50 percent CC retain live trees greater than or equal to 12 inches DBH; and underburn. Spring underburn in areas infested with noxious weeds.
D	**Rx 9**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 15 percent of the stand untreated; and underburn.
D	**Rx 10**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn.
D	**Rx 11**	Mechanical Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D thin to 50 percent CC retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn.
D	**Rx 12**	Mechanical Thin to minimum 50 percent CC while only reducing the CC less than 10 percent, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn.
E	**Rx 13**	Mechanical Thin to 30-40 percent CC, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40 percent CC, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn.
E	**Rx 14**	Mechanical Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; except in RHCAs thin to 50 percent CC, generally live retain trees greater than or equal to 20 inches DBH; and underburn.

Table 2. Noxious Weed Prescription Codes

Alternative	Prescription (Rx)	General Description
A & D	**NW Rx 1**	Apply the herbicide aminopyralid to noxious weed infestations that are greater than 15 feet from the water's edge. Utilize a backpack sprayer for selective application and apply at rates between 0.05 and 0.11 acid equivalent (a.e.) pounds per acre (lbs/acre).
A & D	**NW Rx 2**	Apply the herbicide glyphosate to noxious weed infestations that are (a) between 0-15 feet from the water's edge or (b) within sites dominated by hoary cress. Utilize a wick applicator (in riparian areas) or a backpack sprayer for selective application and apply at rates between 1 and 3 acid equivalent (a.e.) pounds per acre (lbs/acre).
A, B, C, & D	**NW Rx 3**	Implement prescribed fire treatments in the spring and early summer. If necessary, utilze flaming with a propane torch to control weed infestations in areas that are a high risk for spread (i.e. on roads or landings).
A, B, C, & D	**NW Rx 4**	Implement manual control methods such as hand pulling, digging, cutting (i.e. with a weed whacker), or covering. Use manual methods to treat small infestations (i.e. less than 50 plants) and as a follow-up method to herbicide or prescribed fire treatments.

Appendix C

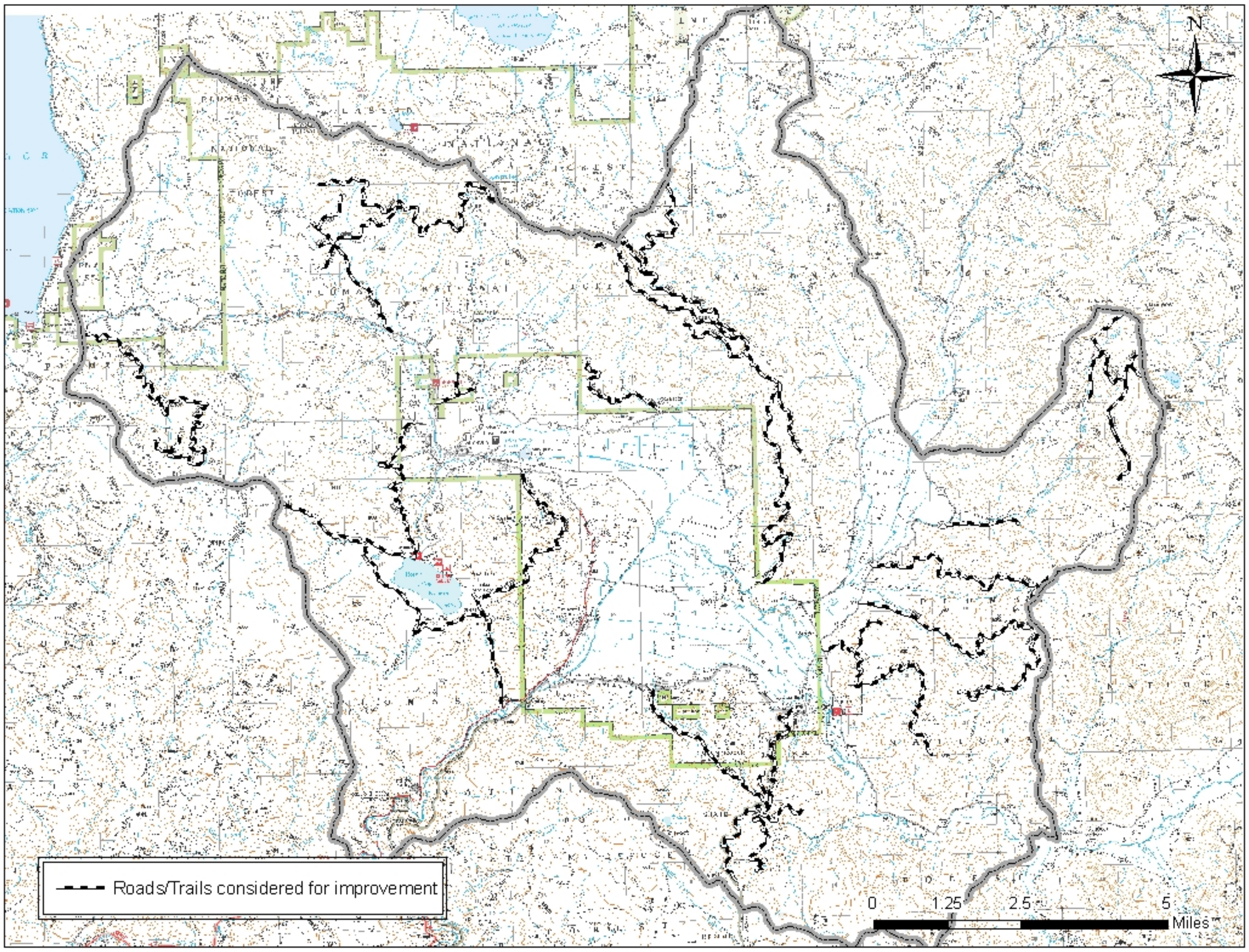
National Forest System Roads Proposed for Improvements

This appendix includes a list of National Forest System (NFS) roads and a few segments of Plumas County roads that are proposed for improvement activities under alternatives A, D, and E.

NFS roads that are to remain open but those that are improperly constructed or unmaintained will be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism will be considered for 100 miles of road within the watershed analysis area. Rolling dips, which will likely be the most commonly prescribed road improvement for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate will vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips will be determined by district watershed staff in order to sufficiently disconnect the road's drainage system from surrounding stream channels. Refer to Figure 1 for a visual display of National Forest System and Plumas County roads proposed for improvement activities.

25N29	27N16	27N92B3
25N29A	27N18	27N92B4
26N02	27N19	27N94
26N19	27N19X	28N32
26N21	27N19XA	28N32B
26N21D	27N22	28N38
26N41	27N24	PC201
26N42	27N38	PC204
26N49Y	27N43	PC208
26N55	27N43B	9M56
26N71Y	27N51A	9M56A
26N81	27N80	10M32
27N08	27N92	10M36
27N10	27N92B	

Figure 1 National Forest System and Plumas County roads proposed for improvement activities.



Appendix D

Economic Analysis

This appendix includes an economic analysis for each action alternative (A, C, D, and E). Each table breaks across two pages. This appendix relates to the information, data, effects, and conclusions presented in the Economic and Social Environment section of the Keddie Ridge Hazardous Fuels Reduction Project Environmental Impact Statement.

Table 1. Alternative A Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative A						15:25:07
NET VALUE			Total Acres =	2882	acres			
VALUE - Prescription			Total Acres =	1016				
PP/SP >24" sawtimber *	0.0%	125	mbf X	$255	/mbf			$31,875
WF >24" sawtimber *	0.0%	288	mbf X	$130	/mbf			$37,440
DF >24"sawtimber *	0.0%	109	mbf X	$215	/mbf			$23,435
IC >24" sawtimber *	0.0%	16	mbf X	$340	/mbf			$5,440
ALL 10"-23.9" sawtimber **	0.0%	2877	mbf X	$157	/mbf			$451,689
		3415		3.4				
VALUE - Low Volume			Total Acres =	1582	acres			
PP/SP >24" sawtimber *	0.0%	7	mbf X	$255	/mbf			$1,785
WF >24" sawtimber *	0.0%	554	mbf X	$130	/mbf			$72,020
DF >24"sawtimber *	0.0%	6	mbf X	$215	/mbf			$1,290
IC >24" sawtimber *	0.0%	1	mbf X	$340	/mbf			$292
ALL 10"-23.9" sawtimber **	0.0%	2413	mbf X	$157	/mbf			$378,841
		2981		1.9				
VALUE - GROUPS			Total Acres =	284	acres			
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	284	mbf X	$130	/mbf			$36,920
DF >24"sawtimber *	0.0%	483	mbf X	$215	/mbf			$103,802
IC >24" sawtimber *	0.0%	85	mbf X	$340	/mbf			$28,968
ALL 10"-23.9" sawtimber **	0.0%	3124	mbf X	$157	/mbf			$490,468
	0%	3976	mbf	14.0				
Sawlog Total Value		**10372**	**mbf**					**$1,664,265**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		6981	mbf X	$25	/mbf =			$174,525
Low volume Tractor cost		2653	mbf X	$50	/mbf =			$132,648
Skyline cost		410	mbf X	$70	/mbf			$28,686
		328	mbf X	$120	/mbf =			$39,347
# of sawtimber loads		10372	mbf /		4.5	mbf/truck =	2305	
Haul Cost		4	hours/trip X	$10	/hour X	2305	trips	$92,200
Surface Replacement-sawtimber		10372	mbf X			$15.00	/mbf =	$155,578
Subsoiling Costs		51	acres X	$230	/acre			$11,730
BD Costs		10372	mbf X	$0.30	/mbf			$3,112
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		10372	mbf X			$12.56	/mbf	$130,301
Yield Tax		$1,664,265	X	2.9%				$48,264
Scaling Sawtimber		2305	trips	$17	/trip			$39,185
Sawlog Total Cost								**$1,013,975**
Sawlog Net Value								**$650,290**
						PERCENT ABOVE VALUE		**39%**

Table 1 continues on page 3.

Biomass Value when Removed		2598	acres X	6.8	tons/acre X	$22.00	/ton =	$388,661
Biomass Value when Removed		284	acres X	12.0	tons/acre X	$22.00	/ton =	$74,976
Biomass Total Value								**$463,637**
	Acres		Total Biomass	21	1000 tons	7.3	AverageTons/Ac	
		Average Unit Size =		50	acres	$30	/acre	
		Contract Length =		5	years	($119)	/acre	
		Months Operation =		5	months	$30	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$298	/acre +	($60)	/acre)	$686,274
		2882	Biomass Acres					
# of biomass loads	2882	acres X	7.3	tons/acre	25	tons/truck =	843	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	843	trips	$429,930
Surface Replacement-biomass		2882	acres X	7.3	tons/acre X	2.14	/ton =	$45,159
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	7.3	tons/acre X	$0.20	/ton	$4,215
Scaling Biomass		843	trips	$8	/trip			$6,744
Biomass Total Cost								**$1,172,322**
Biomass Net Value								**($708,686)**
						PERCENT ABOVE VALUE		**-153%**
Combined (Sawlog & Biomass) Total Value								**$2,127,902**
Combined (Sawlog & Biomass) Total Cost								**$2,186,298**
Combined (Sawlog & Biomass) Net Value								**($58,396)**
						PERCENT ABOVE VALUE		**-3%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$5,555,070**
Harvest & Biomass (Employment)							159	
TOTAL FULL TIME JOBS								**189**
TOTAL EMPLOYEE-RELATED INCOME								**$6,799,620**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.
Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 2. Alternative C Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative C						15:41:33
Net Value			Total Acres =	2882	acres			
VALUE - Low Volume			Total Acres =	2882				
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	0	mbf X	$130	/mbf			$0
DF >24"sawtimber *	0.0%	0	mbf X	$215	/mbf			$0
IC >24" sawtimber *	0.0%	0	mbf X	$340	/mbf			$0
ALL 10"-23.9" sawtimber **	0.0%	231	mbf X	$157	/mbf			$36,267
		231		0.1				
Sawlog Total Value		**231**	**mbf**					**$36,267**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		0	mbf X	$0	/mbf =			$0
Low volume Tractor cost		210	mbf X	$50	/mbf =			$10,511
Skyline cost		21	mbf X	$120	/mbf =			$2,495
# of sawtimber loads		231	mbf /		4.5	mbf/truck =	51	
Haul Cost		4	hours/trip X	$10	/hour X	51	trips	$2,040
Surface Replacement-sawtimber		231	mbf X			$15.00	/mbf =	$3,465
Subsoiling Costs		38	acres X	$230	/acre			$8,740
BD Costs		231	mbf X	$0.30	/mbf			$69
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		231	mbf X			$12.00	/mbf	$2,772
Yield Tax		$36,267	X	2.9%				$1,052
Scaling Sawtimber		51	trips	$17	/trip			$867
Sawlog Total Cost								**$190,410**
Sawlog Net Value								**($154,143)**
						PERCENT ABOVE VALUE		**-425%**

Table 2 continues on page 5.

Biomass Value when Removed		2613	acres X	8.2	tons/acre X	$22.00	/ton =	$471,385
Biomass Value when Removed		269	acres X	8.2	tons/acre X	$22.00	/ton =	$48,528
Biomass Total Value								**$519,913**
	Acres		Total Biomass	24	1000 tons	8.2	AverageTons/Ac	
		Average Unit Size =		50	acres	$31	/acre	
		Contract Length =		5	years	($123)	/acre	
		Months Operation =		5	months	$31	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$307	/acre +	($61)	/acre)	$708,972
		2882	Biomass Acres					
# of biomass loads	2882	acres X	8.2	tons/acre	25	tons/truck =	945	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	945	trips	$481,950
Surface Replacement-biomass		2882	acres X	8.2	tons/acre X	2.14	/ton =	$50,641
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	8.2	tons/acre X	$0.20	/ton	$4,726
Scaling Biomass		945	trips	$8	/trip			$7,560
Biomass Total Cost								**$1,253,849**
Biomass Net Value								**($733,937)**
						PERCENT ABOVE VALUE		**-141%**
Combined (Sawlog & Biomass) Total Value								**$556,180**
Combined (Sawlog & Biomass) Total Cost								**$1,444,260**
Combined (Sawlog & Biomass) Net Value								**($888,080)**
						PERCENT ABOVE VALUE		**-160%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acres	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$6,384,754**
Harvest & Biomass (Employment)							31	
TOTAL FULL TIME JOBS								**60**
TOTAL EMPLOYEE-RELATED INCOME								**$2,161,134**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 3. Alternative D Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative D						15:41:33
NET VALUE			Total Acres =	2375	acres			
VALUE - Low Volume			Total Acres =	2375				
PP/SP >24" sawtimber *	0.0%	0	mbf X	$255	/mbf			$0
WF >24" sawtimber *	0.0%	0	mbf X	$130	/mbf			$0
DF >24"sawtimber *	0.0%	0	mbf X	$215	/mbf			$0
IC >24" sawtimber *	0.0%	0	mbf X	$340	/mbf			$0
ALL 10"-23.9" sawtimber **	0.0%	1900	mbf X	$157	/mbf			$298,300
		1900		0.8				
Sawlog Total Value		**1900**	**mbf**					**$298,300**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		0	mbf X	$0	/mbf =			$0
Low volume Tractor cost		1729	mbf X	$50	/mbf =			$86,450
Skyline cost		171	mbf X	$120	/mbf =			$20,520
# of sawtimber loads		1900	mbf /		4.5	mbf/truck =	422	
Haul Cost		4	hours/trip X	$10	/hour X	422	trips	$16,880
Surface Replacement-sawtimber		1900	mbf X			$15.00	/mbf =	$28,500
Subsoiling Costs		38	acres X	$230	/acre			$8,740
BD Costs		1900	mbf X	$0.30	/mbf			$570
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		1900	mbf X			$12.00	/mbf	$22,800
Yield Tax		$298,300	X	2.9%				$8,651
Scaling Sawtimber		422	trips	$17	/trip			$7,174
Sawlog Total Cost								**$358,685**
Sawlog Net Value								**($60,385)**
						PERCENT ABOVE VALUE		**-20%**

Table 3 continues on page 7.

Biomass Value when Removed		2375	acres X	5.4	tons/acre X	$22.00	/ton =	$282,150
Biomass Total Value								**$282,150**
	Acres		Total Biomass	13	1000 tons	5.4	AverageTons/Ac	
		Average Unit Size =		50	acres	$28	/acre	
		Contract Length =		5	years	($112)	/acre	
		Months Operation =		5	months	$28	/acre	
Acres of 3-9" biomass-tractor		2375	acres X (	$279	/acre +	($56)	/acre)	$529,625
		2375	Biomass Acres					
# of biomass loads	2375	acres X	5.4	tons/acre	25	tons/truck =	513	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	513	trips	$261,630
Surface Replacement-biomass		2375	acres X	5.4	tons/acre X	2.14	/ton =	$27,482
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2375	acres X	5.4	tons/acre X	$0.20	/ton	$2,565
Scaling Biomass		513	trips	$8	/trip			$4,104
Biomass Total Cost								**$825,406**
Biomass Net Value								**($543,256)**
						PERCENT ABOVE VALUE		**-193%**
Combined (Sawlog & Biomass) Total Value								**$580,450**
Combined (Sawlog & Biomass) Total Cost								**$1,184,091**
Combined (Sawlog & Biomass) Net Value								**($603,641)**
						PERCENT ABOVE VALUE		**-104%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1765	acres X	$800	/acre	120	15	$1,412,000
Underburn with handline		1456	acres X	$350	/acre	400	8	$509,600
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,100,100
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,060,551
TOTAL NON-HARVEST COST								**$5,334,351**
TOTAL PROJECT VALUE								**-$5,937,991**
Harvest & Biomass (Employment)							40	
TOTAL FULL TIME JOBS								**66**
TOTAL EMPLOYEE-RELATED INCOME								**$2,374,303**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10).
Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.
Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Table 4. Alternative E Economic Analysis

		ECONOMIC ANALYSIS						05/10/11
		Keddie Ridge Project Alternative E						15:44:51
NET VALUE			Total Acres =	2882	acres			
VALUE - Prescription			Total Acres =	1012				
PP/SP >24" sawtimber *	0.0%	205	mbf X	$255	/mbf			$52,275
WF >24" sawtimber *	0.0%	80	mbf X	$130	/mbf			$10,400
DF >24"sawtimber *	0.0%	158	40	$215	/mbf			$33,970
IC >24" sawtimber *	0.0%	39	mbf X	$340	/mbf			$13,260
ALL 10"-23.9" sawtimber **	0.0%	3386	mbf X	$157	/mbf			$531,602
		3868		3.8				
VALUE - Low Volume			Total Acres =	1545	acres			
PP/SP >24" sawtimber *	0.0%	267	mbf X	$255	/mbf			$68,085
WF >24" sawtimber *	0.0%	1023	mbf X	$130	/mbf			$132,990
DF >24"sawtimber *	0.0%	216	mbf X	$215	/mbf			$46,440
IC >24" sawtimber *	0.0%	56	mbf X	$340	/mbf			$19,040
ALL 10"-23.9" sawtimber **	0.0%	4805	mbf X	$157	/mbf			$754,385
		6367		4.1				
VALUE - GROUPS			Total Acres =	326	acres			
PP/SP >24" sawtimber *	0.0%	685	mbf X	$255	/mbf			$174,675
WF >24" sawtimber *	0.0%	326	mbf X	$130	/mbf			$42,380
DF >24"sawtimber *	0.0%	554	mbf X	$215	/mbf			$119,110
IC >24" sawtimber *	0.0%	98	mbf X	$340	/mbf			$33,320
ALL 10"-23.9" sawtimber **	0.0%	3586	mbf X	$157	/mbf			$563,002
	0%	5249	mbf	16.1				
Sawlog Total Value		**15484**	**mbf**					**$2,594,934**
ADDITIONAL COSTS		(Assumes Harvesting Sawtimber and Biomass in One Operation)						
Tractor cost		3513	mbf X	$25	/mbf =			$87,825
Low volume Tractor cost		5667	mbf X	$50	/mbf =			$283,350
Skyline cost		355	mbf X	$70	/mbf			$24,850
		700	mbf X	$120	/mbf =			$84,044
# of sawtimber loads		15484	mbf /		4.5	mbf/truck =	3441	
Haul Cost		4	hours/trip X	$10	/hour X	3441	trips	$137,640
Surface Replacement-sawtimber		15484	mbf X			$15.00	/mbf =	$232,260
Subsoiling Costs		51	acres X	$230	/acre			$11,730
BD Costs		15484	mbf X	$0.30	/mbf			$4,645
Temporary Road Construction		13.2	miles X	12,000	/mile			$158,400
Advertised Rate-sawtimber		15484	mbf X			$13.08	/mbf	$202,488
Yield Tax		$2,594,934	X	2.9%				$75,253
Scaling Sawtimber		3441	trips	$17	/trip			$58,497
Sawlog Total Cost								**$1,360,983**
Sawlog Net Value								**$1,233,951**
						PERCENT ABOVE VALUE		**48%**

Table 4 continues on page 9.

Biomass Value when Removed		2598	acres X	5.8	tons/acre X	$22.00	/ton =	$331,505
Biomass Value when Removed		284	acres X	12.0	tons/acre X	$22.00	/ton =	$74,976
Biomass Total Value								**$406,481**
	Acres		Total Biomass	18	1000 tons	6.4	AverageTons/Ac	
		Average Unit Size =		50	acres	$29	/acre	
		Contract Length =		5	years	($116)	/acre	
		Months Operation =		5	months	$29	/acre	
Acres of 3-9" biomass-tractor		2882	acres X (	$289	/acre +	($58)	/acre)	$666,058
		2882	Biomass Acres					
# of biomass loads	2882	acres X	6.4	tons/acre	25	tons/truck =	739	
Haul Cost Biomass		6	hours/trip X	$85	/hour X	739	trips	$376,890
Surface Replacement-biomass		2882	acres X	6.4	tons/acre X	2.14	/ton =	$39,592
Temporary Road Construction		0.0	miles X	0	/mile			$0
Advertised Rate-biomass		2882	acres X	6.4	tons/acre X	$0.20	/ton	$3,695
Scaling Biomass		739	trips	$8	/trip			$5,912
Biomass Total Cost								**$1,092,148**
Biomass Net Value								**($685,667)**
						PERCENT ABOVE VALUE		**-169%**
Combined (Sawlog & Biomass) Total Value								**$3,001,415**
Combined (Sawlog & Biomass) Total Cost								**$2,453,130**
Combined (Sawlog & Biomass) Net Value								**$548,285**
						PERCENT ABOVE VALUE		**18%**
						acre/job	**job**	
Mastication		357	acres X	$500	/acre	110	3	$178,500
Hand thin, Pile, and burn		1258	acres X	$800	/acre	120	10	$1,006,400
Underburn with handline		2800	acres X	$350	/acre	400	15	$980,000
Road Obliteration with Meadow Restore		23	acres X	$3200	/acre	70	0	$73,600
								$2,164,900
WO/RO/SO Overhead Costs	50.5%	of above costs						$1,093,275
TOTAL NON-HARVEST COST								**$5,496,675**
TOTAL PROJECT VALUE								**-$4,948,390**
Harvest & Biomass (Employment)							223	
TOTAL FULL TIME JOBS								**252**
TOTAL EMPLOYEE-RELATED INCOME								**$9,082,986**

Timber values based on average value of three class sizes (Board of Equalization, based on draft report for timber values for 7/10 thru 12/10). Assumptions: *Harvest Value Schedules, CA State Board of Equalization, Table 4, Area 7, Tractor, 23"-29.9"dbh; **Harvest Value Schedules, CA State Board of Equalization, Misc. Harvest Values, Small Sawlogs, 14"-22.9" dbh; ***Timber Values for 10"-13.9" are $25.00/mbf. Deduction if average volume per acre under 5mbf/ac -$25, under 2mbf/ac -$50. Skyline Yarding $70/mbf with biomass removal and $120/mbf with biomass removal for under 5mbf/acre. Cost/ac for unit size increases 0% for 400 ac to 20% for 5 ac. Cost/ac for contract length decreases 10% every year after one year. Cost/ac for months of operation decreases 10% for 10 months or more and increases 10% for 4 months or less.

Based on historical relationships between employment and harvest in California during the 1980's, each million board feet harvested supports 6.5 year-around jobs (1 in logging, 4 in sawmill, and 1.5 in US Forest Service employment). In regional economic models of employment for California and the Pacific Northwest, and estimate of one indirect or induced job for every direct timber job is added. Indirect jobs result from the employment created by the local purchase of materials for the sawmill, local expenditures by workers, and the demand for local government employees. Each million board feet harvested supports a total of 13 jobs that are timber related. The restoration work would support additional direct and indirect employment. There are approximately 1.4 indirect jobs for every full time field job. All jobs are equivalent to year-around employment. Total employee-related income is calculated by assuming an annual wage of $36,000 per full time job. This estimate is based on an average per capita income for Plumas County of $36,000 based on data in the California Statistical abstract. Lippke B. and L. Mason, 2005 "Implications of Working Forest Impacts on Jobs and Local Economy."

Appendix E

Riparian Management Objectives

Riparian Management Objectives (RMOs)

Riparian and aquatic ecosystems on the PNF are managed to achieve specific riparian management objectives (RMOs) as presented in the Scientific Assessment Team (SAT) Guidelines (USDA 1999a, 1999b, appendix L). Each of the 10 RMOs is listed below followed by a discussion that includes current conditions, project design features, and standard management requirements that achieve those objectives. In general, the Herger-Feinstein Quincy Library Group Forest Recovery Act Environmental Impact Statement (HFQLG EIS) guidelines prohibit activities within the riparian habitat conservation areas (RHCAs) unless they are specifically designed to improve the structure and function of the RHCA and benefit fish habitat. The RMOs that specifically relate to hydrology and apply to the construction of the DFPZ and operations within RHCAs are presented below.

Under all action alternatives, treatments are proposed within RHCAs. In the discussion that follows, most references to treatment within RHCAs are specifically limited to those treatment areas. No RHCA treatment would occur under the no-action alternative.

The objective of the RHCA treatment within fuel reduction units is to reduce the potential for adverse impacts from high intensity wildfire. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). RHCA treatments would provide a safer and more effective fire suppression environment, improve forest health, and provide for a more sustainable vegetation condition consistent with protecting and maintaining riparian habitat values.

Field surveys were conducted to verify the existence and condition of the streams and sensitive areas within units that would be mechanically treated. All RHCA treatments are designed to minimize erosion from soil disturbance, and to protect and maintain the riparian vegetation that provides bank stabilization and habitat for wildlife, fish, and other aquatic species. The ten RMOs for the Keddie Ridge Project are discussed below.

1. **Maintain or restore water quality to a degree that provides for stable and productive riparian and aquatic ecosystems. Water quality parameters that apply to these ecosystems include timing and character of temperature, sediment, and nutrients.**

In addition to reducing the risk of high-intensity fires, thinning RHCAs will allow the ecosystem within this corridor to return to a more productive historic condition. Competition between codominant and dominant trees will decrease and growth rates will increase while mortality rates decline. Over time, the crowns of larger more fire resistant trees will fill in, increasing the necessary shade for temperature regulation. Where available, canopy cover will be maintained at 50 percent on average, however this may range between 60 percent along fish bearing streams and 40 percent for non-fish bearing streams.

Proposed thinning, which will occur throughout most RHCAs within the Keddie Ridge Project area, would encourage forest growth and consequently hasten the development of larger trees and the subsequent recruitment of large woody debris to stream channels. Large woody debris is generally scarce throughout the RHCAs due to a shortage of old growth vegetation.

No change is expected in dissolved oxygen levels as they relate to treatments, since any newly created slash would be removed from stream courses within 48 hours after deposition. Thinning RHCAs adjacent to low velocity streams may actually improve oxygen levels by decreasing nutrient overloading from materials decaying in place. Most of the streams within the Keddie Ridge project are low to moderate velocity. In streams, the consumption of organic matter by bacteria requires oxygen. The amount of oxygen required for bacterial decomposition is the biochemical oxygen demand (BOD), a commonly used measure of water quality. When consumption by bacteria is high, oxygen levels in the water are reduced. Low oxygen levels can stress fish and other aquatic organisms.

Where RHCAs would be mechanically treated, ground based equipment would only be used on slopes less than or equal to 25 percent. RHCAs within sensitive areas (e.g., springs, seeps, and wetlands) could be entered with ground-based equipment 25 feet from the edge of the riparian area or wet perimeter of the soil, whichever is greatest. On slopes less than 15 percent, all mechanical equipment would be excluded from within 100 feet (horizontal) of fish bearing streams, 50 feet of perennial and intermittent streams, and 25 feet of ephemeral streams. On slopes between 15 and 25 percent, all mechanical equipment would be excluded from within 150 feet of fish bearing streams, 100 feet of perennial and intermittent streams, and 50 feet of ephemeral streams. In addition, skid trails will be located at angles to stream channels that minimize erosion into the channel, and skidders will only be allowed to back in to the outer RHCA on these skid trails. The mechanical exclusion zones would serve as effective filters and absorptive zones for potential sediment originating from upslope treatment areas. Removal of vegetation within these equipment exclusion zones would be allowed on a site-by-site basis to protect the sensitive attributes associated with the riparian area.

No ignition of prescribed fire would occur within 50 horizontal feet of all streams; however, backing fire would be allowed into these areas. Based on BMP evaluations completed on the Plumas National Forest over the last three years, short-term sediment delivery to streams after prescribed burning has not occurred (USDA 2007, 2008, 2009). Scorched conifers often drop needles following low or moderate severity fires. This needle cast provides ground cover that can help reduce rill and interrill erosion and sediment delivery (Pannkuk and Robichaud 2003). Additionally, the greater long-term benefit of treating these RHCAs is the potential protection from stand-replacing wildfire.

2. Maintain or restore the stream channel integrity, channel processes, and sediment regime under which the riparian and aquatic ecosystems developed. Elements of the sediment regime include the timing, volume, and character of sediment input and transport.

In addition to reducing the risk for high-intensity fires, thinning of the RHCA will allow the ecosystem within this corridor to return to a more stable historic condition. Historically, woody debris was a combination of large and intermediate logs. Debris jams; especially log-jams of small material will alter the natural sediment regime. Small material decays at a faster rate; entrainment of sediments is short term as decaying logs fail. During peak events small material cannot hold sediment in place. Released sediment will affect timing, volume and character of the input. End cutting and scouring within the channel caused by heavy loading of dead and downed material will influence the timing, volume, and character of sediment being transported through the system.

Equipment induced ground disturbances would be limited because only slopes less than or equal to 25 percent would be entered with ground-based equipment. Retention of large diameter snags within RHCAs would occur. The green-line characteristics would not be compromised in RHCAs and thus stream channel and sensitive area integrity would be maintained.

3. Maintain or restore instream flows to support desired riparian and aquatic habitats, the stability and effective function of stream channels, and the ability to route flood discharges.

Thinning of the RHCAs will reduce transpiration rates and interception. If transpiration rates are reduced, runoff and groundwater infiltration could increase. Interception of rain, snow and the subsequent evaporation also effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will initially reduce the interception of precipitation and possibly provide more water to meadows and wetlands. Runoff may increase in the short term. This additional water may increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

The main objective is to reduce the potential for stand-replacing wildfires and thus retain the RHCA's desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges. In-stream flows would be assessed during equipment operations, with respect to drafting requirements.

Within RHCAs, the green-line would be preserved and remain unaffected by harvest activities. Within the immediate riparian areas, physical effects derived from in-channel large woody debris (LWD) would be sustained, as no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers, and the snag retention standards for channel morphology, channel function, and bank stability. The effect of water diversion on future instream flow is beyond the scope of this project.

4. Maintain or restore the natural timing and variability of the water table in meadows and wetlands.

Transpiration is a function of the density, root mass, and size of existing vegetation. If transpiration is reduced, then runoff and groundwater infiltration could increase. Interception of rain, snow and the subsequent evaporation also effects water availability. Reduction of the canopy cover and removal of conifers throughout the RHCA will provide more water to sensitive areas. This additional water will increase baseflow to perennial streams and extend intermittent stream flow further into late spring or early summer.

Activities proposed in the project area are not expected to negatively impact the timing and variability of water tables within sensitive areas. All RHCA sensitive riparian areas (springs, seeps, and wetlands) would be protected by a 25 foot buffer from the edge of the riparian area or wet perimeter of the soil, whichever is greatest and through the implementation of applicable best management practices (BMPs).

Wet areas and green-lines would not be entered. Ground based equipment would only be allowed on stable soils and slopes less than or equal to 25 percent within RHCAs.

5. Maintain or restore the diversity and productive nature of native and desired non-native plant communities in the riparian zone.

Riparian areas are often hotspots for plant diversity. Riparian vegetation plays a vital role in the ecological functioning of the riparian system, which includes: stabilization of stream banks; delivery of large woody debris to stream habitats; filtration of sediment; and maintenance of water quality. Thinning of conifers and retention of all hardwood species within RHCAs would reduce competition and improve diversity of existing riparian plant communities.

If left untreated, noxious weeds can pose a significant threat to riparian communities due to their ability to displace native species. Implementation of standard management requirements (appendix H) and the proposed noxious weed treatment measures would reduce the risk of noxious weed spread into riparian areas and protect the diversity and productivity of riparian plant communities.

6. Maintain or restore riparian vegetation to provide an amount and distribution of large woody debris characteristic of natural aquatic and riparian ecosystems.

Large woody material adds structure to stream channels and creates fish habitat. It also provides habitat for small burrowing mammals and acts as a reservoir, retaining moisture throughout the summer months. A host of organisms, including several nonvascular plants, are supported by this moisture. Another benefit of large woody material is that it provides nutrients to the ecosystem over the long term through the process of decomposition.

Thinning of the RHCAs will return the project area to a level of stocking and health that is more closely related to its historic condition. While volume of wood per acre may be near historic levels, it is in the boles of numerous small, less fire resistant trees. Removing the ladder fuels will encourage the stand to return to its natural state and greatly enhance it by reducing competition for nutrients, water, and sunlight.

Within treatment units, the objective is to reduce overstocked fuel concentrations. Thinning within RHCAs may release the residual conifers and deciduous trees thus stimulating growth. LWD retention standards would be implemented. Potential recruitment of LWD into the stream channel would be retained and enhanced. There would be a reduction in the potential for stand-replacing wildfire, and therefore a greater potential of LWD retention. Prescribed underburns would occur during times of elevated moisture, resulting in less LWD consumption.

7. Maintain or restore habitat to support populations of well-distributed native and desired non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian plant communities.

Living plants provide shade; their root systems promote bank stability and create macro-pores that promote high infiltration rates. The decomposition of plant material contributes to soil matter and composition, provides nutrients, and water storage. During thinning of the RHCAs, measures will be applied to insure ground cover levels are maintained and vegetation providing stability to channel banks is not removed. Riparian zones (specifically the green-line) and wetted soil perimeters would be identified and protected from harvest activities. Impacts would further be reduced by the application of BMPs and standard management requirements.

Vertebrates that influence the viability of riparian plant communities include pocket gophers, moles, butterflies, bats, and ground squirrels. Thinning of RHCAs will have no detrimental effect on these species, thus their populations will continue to maintain the viability of riparian plant communities.

Invertebrates contribute to the viability of riparian plant communities in many ways. They act as decomposers, shredding dead plant materials and they burrow into woody debris. Invertebrates recycle nutrients and influence soil structure. They improve soil porosity and improve oxygen-penetrating capabilities. To maintain invertebrate populations, compaction and ground cover disturbance will be minimized through the use of low ground pressure equipment and the subsoiling of the final 200 foot approaches of skid trails to landings.

Noxious weed species have the potential to affect riparian plant species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard et al. 2000). Implementation of standard management requirements (appendix H) and the proposed noxious weed treatment measures would reduce the risk of noxious weed spread into riparian areas and protect the viability of riparian plant communities.

8. Maintain or restore riparian vegetation to provide adequate summer and winter thermal regulation within the riparian and aquatic zones.

Summer and winter thermal regulation within the riparian and aquatic zones would be maintained. Canopy cover within the RHCAs would be maintained at 50 percent on average, however this may range between 60 percent along fish bearing streams and 40 percent for non-fish bearing streams. Activities proposed in the project area are not expected to negatively impact riparian vegetation. Group selection harvest would only occur outside of RHCAs.

9. Maintain or restore riparian vegetation to help achieve rates of surface erosion, bank erosion, and channel migration characteristics of those under which the desired communities developed.

Riparian vegetation will be protected and maintained while coniferous ladder fuels are thinned. Except at designated crossings, stream banks will not be impacted by equipment and it is not expected that bank erosion will be accelerated either by equipment or by the implementation of the project. Thinning RHCAs will promote diversity and increase production of riparian communities. Burning of isolated burn piles outside of the RHCA will remove groundcover at point locations, but soil moving from these points will be trapped by ground cover immediately adjacent to the piles.

The maximum erosion hazard for soil types within the project area, ranging from moderate to very high, suggests that channel development has occurred under significant sediment loads. The riparian green-line of stream channels would not be impacted by the proposed management activities, and natural recovery processes within the streamside area would help moderate stream temperatures. Riparian vegetation may increase in vigor due to increased water yield and available sunlight. Within the immediate riparian areas, the physical effects derived from in-channel LWD would be retained, as no natural debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers.

10. Maintain and restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within that specific geo-climatic ecoregion.

Maintenance of the riparian habitat necessary to foster unique genetic fish stocks will be accomplished by prescribing treatments that will maintain bank stability, ground cover, and sufficient shade. In all the action alternatives, no mechanical treatment will occur in the first 100 feet of all fish bearing streams.

It is expected that all action alternatives would not substantially impact fish populations within or downstream of the Keddie Ridge Project area. The best opportunity to improve channel conditions and fish habitat along these streams is through the proposed road decommissioning and the improvement of road drainage systems that are adjacent to stream channels.

Appendix F

Past, Present, and Reasonably Forseeable Future Projects

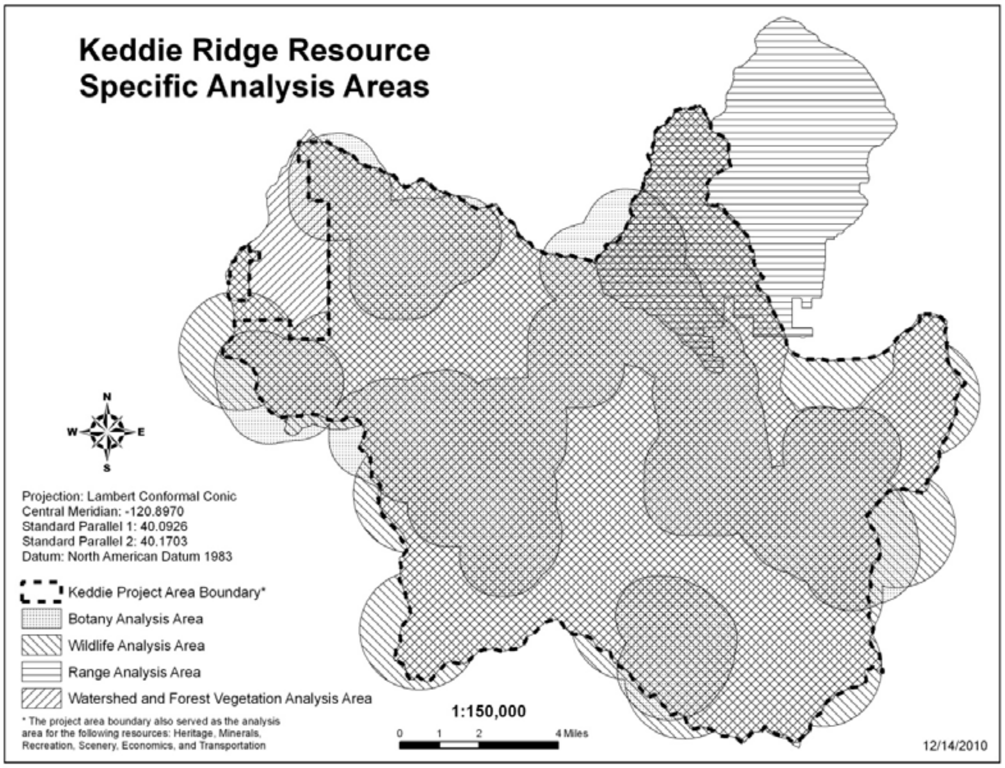
Introduction

The past, present, and reasonably foreseeable future activities described in this appendix are activities and natural events known to have already happened, are currently happening, or likely to happen within the analysis area boundaries for this project. This appendix lists projects and activities that are within one or more of the cumulative effects analysis areas for the following resources: vegetation, wildlife, botanical resources, watershed, cultural resources, range, recreation, and minerals. Analysis area boundaries are depicted in Figure 1.

This analysis relies on current environmental conditions as a proxy for the impacts of past actions—the reason is to understand the contribution of past actions to the cumulative effects of the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) proposed action and alternatives. The current conditions reflect the aggregate impact of prior human actions that have affected the environment and might contribute to cumulative effects.

This appendix is organized by past, present and ongoing, and future projects. The projects and activities associated with specific resources are listed under each category. The sections below exhibit past vegetation management projects on public and private lands; wildfires; watershed improvement projects; wildlife projects; herbicide treatments; and present, on-going, and reasonably foreseeable future projects. For each resource area, the scale and boundaries for the cumulative effects analysis vary—these are described in Chapter 3 of the Keddie Ridge Hazardous Fuels Reduction Project Environmental Impact Statement.

Figure 1 Resource Specific Analysis Areas for the Keddie Ridge Project



Past Projects

Past Forest Service Vegetation Management Projects

A total of 38,595 acres, were treated between 1980 and 2010. Table 1 lists the acres of past vegetation management actions on public lands, by activity.

Table 1. Forest Service Vegetation Management Activities Between 1980 and 2010 that Occurred in the Four Resource Analysis Areas (Combined) for the Keddie Ridge Project.

Activity	1980	1984	1989	1990	1991	1992	1993	1994	1995	1996	1997
Broadcast Burning - Covers a majority of the unit											
Burning of Piled Material	2				6						
Certification-Planted					78						
Clearcutting											
Commercial Thin				33							
Cull						60					
Mastication/Mowing											
Mechanical /Physical											
Natural Recovery											
Piling of Fuels, Hand or Machine											
Plant Trees				201	112						
Precommercial Thin				600	648						20
Sanitation (salvage)[1]				1526	6862	1612	2333	3		4390	5664
Sanitation Cut				640							
Site preparation for natural regeneration					17			51			
Site Preparation for Planting - Mechanical							16				
Site Preparation for Planting - Other					11						
Special Cut											
Stocking Survey		9		480		57	20	17			
Thinning for Hazardous Fuels Reduction											
Underburn - Low Intensity (Majority of Unit)											
Overstory Removal Cut (from advanced regeneration)			84	306	156	34	113				
Seed-tree Seed Cut (with and without leave trees)		3									
Single-tree Selection Cut			4	25	25	57	96	84	74		
Salvage Cut											
Stand Clearcut				10			6				
Total	2	13	89	3821	7914	1819	2583	154	74	4390	5683

[1] Note: Acres shown for sanitation (salvage) represent the extent of the sale area. Under sanitation harvests, dead and dying trees are removed; however trees are not harvested from every acre. In fact, the majority of acres within the sale area boundary were not subject to any harvesting.

Activity	1998	2000	2001	2003	2004	2005	2006	2007	2008	2010	Total
Broadcast Burning - Covers a majority of the unit							1072				1072
Burning of Piled Material				50							58
Certification-Planted											78
Clearcutting						4					4
Commercial Thin				1113	1729			274			3150
Cull											60
Mastication/Mowing					32	23					54
Mechanical /Physical								0	3		3
Natural Recovery										2559	2559
Piling of Fuels, Hand or Machine				540				18	25		583
Plant Trees											313
Precommercial Thin			1228	110							2606
Sanitation (salvage)[1]											22388
Sanitation Cut											640
Site preparation for natural regeneration											68
Site Preparation for Planting - Mechanical											16
Site Preparation for Planting - Other											11
Special Cut		1332									1332
Stocking Survey	276										859
Thinning for Hazardous Fuels Reduction								56			56
Underburn - Low Intensity (Majority of Unit)				64	585		610				1260
Overstory Removal Cut (from advanced regeneration)											693
Seed-tree Seed Cut (with and without leave trees)											3
Single-tree Selection Cut											366
Salvage Cut					347						347
Stand Clearcut											16
Total	276	1332	1228	1878	2694	26	1682	348	28	2559	38595

[1] Note: Acres shown for sanitation (salvage) represent the extent of the sale area for the given project. Under sanitation harvests, dead and dying trees are removed; however trees are not harvested from every acre. In fact the majority of acres within the sale area boundary were not subject to any harvesting.

Past Vegetation Management Projects on Private Lands

Timber Harvest Plans (THPs) were collected from California Department of Forestry and Fire Protection in April 2010. All THPs that overlap with the Keddie Ridge Project area and watershed analysis area were hand digitized into a Geographic Information System (GIS) shapefile with specific THP data attached in the attribute table. These THPs and attribute data (activity and year) are displayed in Table 2 below.

Table 2. Private Harvest Activities in Watershed Analysis Area.

	Acres of Activity by Treatment Year											
Activity	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2008**	**Grand Total**
All Product	110					51						161
Clearcut	119											119
Commercial Thin	85	149		150		191					558	1133
Fuel Break	37											37
Group Selection	188						13					201
Sanitation /Salvage	23					18					1614	1655
Shelterwood Removal cut	202	150		17	41			88	37			534
Shelterwood Step								15				15
Selection	243	4696	1467			4293	790	1821	1675	922		15908
Seed tree		316		10	18							344
Grand Total	1007	5310	1467	176	59	4555	803	1924	1712	922	2172	20108

Past Wildfires

Year	Acres	Cause
1979	3128	Miscellaneous
1981	17	Lightning
1986	30	Lightning
1987	17	Lightning
1990	29	Lightning
1996	1156	Equipment
2004	27	Equipment
2006	34	Lightning
2007	64960	----------------

Past Watershed Improvement Projects

Year	Project	Activity Description
1989-present	Wolf Creek (phase I, II, III, IV, Wolf Cr-Dunham, North	Bank stabilization and native revegetation.

	Canyon Creek (tributary to Wolf)) Restoration	

Past Recreation, Lands, and Minerals Projects

Year	Project	Activity Description
1977-1993	Calgom Mine	Exploratory drilling began in 1977. The first commercial scale Plan of Operations was approved in 1984. The mine operated continuously from November 1984 to November 1989. Active operations terminated in early 1990. Calgom Mining did some of the reclamation, but not all. The Forest Service secured their bond in 1992. The mine restoration plan was signed in May of 1993 and restoration work was completed in the summer of 1993.
2000	Ephesian Mine	Approved mining plan of operation for a lode mine.
1874-1999	Soda Rock Mine	Placer mining and removal of travertine for building stone took place in the area intermittently for over 100 years. In 1999, the Soda Rock Special Interest Area was withdrawn from mineral entry.
2005	Iron Dyke AML	Abandoned mine closure in Taylorsville area.

Past Wildlife Projects

Year	Project	Activity Description
1979-1995	Wildlife Guzzlers	Approximately 18 guzzlers installed in analysis area to improve water distribution/availability to wildlife.
1980-2007	Wood Duck Nest Boxes	Numerous wood duck boxes installed along shore of Round Valley Reservoir by USFS, boy scouts, California Waterfowl Association.
1984	Will Fire Road Closure	Closed 6 acres of road within the Will Fire burn.
1985	Keddie Ridge Road Closure	Closed 2.3 miles (5.5 acres) of road on Keddie Ridge.
1986	Beardsley Grade Broadcast Burn	Broadcast burned 110 acres of brush/oak using helitorch to improve deer winter range.
1988	Road Seeding	Seeded 1 acre of closed skid trail on Beardsley Grade for deer winter range improvement.
1989	Jura Burn	Broadcast burned 125 acres of brush/oak using helitorch to improve deer winter range.
2008	Genesee Oak	12 acres of black oak was thinned and over-mature silktassel brush was cut to improve deer winter range.

Past Herbicide Treatments

The California Department of Pesticide Regulation (DPR) requires farmers and other users of agricultural pesticides to submit site-specific documentation of all pesticide applications; these include applications to parks, golf courses, cemeteries, rangelands, forest lands, pastures, and along roadsides and railroad rights-of-way. The primary exceptions to these reporting requirements are home-and-garden use and most industrial and institutional uses (California DPR 2009). The total amount of reported glyphosate use within Keddie Ridge Project analysis areas is listed in Table 3 and Table 4 below. There was no reported use of aminopyralid or borax within any of the analysis areas.

Table 3. Total Pounds of Glyphosate (Isopropylamine Salt) Recorded within the Four Keddie Analysis Areas Between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Sub-watershed	Reported Use				
	2004	2005	2006	2007	2008
Crescent Mills			42		
Mountain Meadows					135
Upper Cooks Creek					1202
Upper Wolf Creek	34				
Total	34	0	42	0	1336

Table 4. Total Acres Treated with Glyphosate (Isopropylamine Salt) within the Four Keddie Analysis Areas between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Sub-watershed	Reported Use				
	2004	2005	2006	2007	2008
Crescent Mills			22		
Mountain Meadows					11
Upper Cooks Creek					245
Upper Wolf Creek	78				
Total	78		22		256

Present and Ongoing Projects

Present and Ongoing Vegetation Management Projects within the Keddie Ridge Project Analysis Area

Maidu Stewardship Project	Project treatments include approximately 550 acres of commercial and non-commercial thinning to improve oak habitat; 405 acres of commercial and non-commercial thinning to reduce hazardous fuels, approximately 325 acres of habitat enhancement for culturally important plants. Treatments were initiated in 2006 and are expected to continue through 2016.
Canyon Dam Fuel Reduction and Forest Health Project	Approximately 147 acres of hand thinning, piling, and burning was initiated in fall of 2010 and will be completed over 3-5 years. In addition, 488 acres of mechanical thinning will be initiated in 2011 and completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.
Empire Vegetation Management Project	Project treatments include approximately 121 acres of group selection timber harvest; 430 acres of defensible fuel profile

	zones (DFPZs) mechanical thinning; 133 acres of individual tree selection mechanical thinning; and 144 acres of mastication. These treatments will be initiated in fall 2010 and would be completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.
Moonlight Fire Recovery and Restoration Project	Project treatments include approximately 330 acres of post-fire roadside hazard tree removal and 70 acres of post-fire salvage harvest. These treatments are ongoing and anticipated to be complete by the end of 2011.
Plumas Fire Safe Council Projects	These projects are located on private lands surrounding homes and are currently being implemented by the Plumas Fire Safe Council. Project treatments include approximately 294 acres of a combination of handthinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.
Natural Resource Conservations Service (NRCS) Projects	These projects are located on private lands and are currently being implemented by the Natural Resource Conservation Service (NRCS). Project treatments include approximately 1,960 acres of a combination of handthinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Present and Ongoing Recreation, Lands, and Minerals Projects

Recreation activities	Recreation activities include camping, hiking, horseback riding, mountain biking, road biking, off-highway vehicle riding, boating, swimming, fishing, snowmobiling, cross country skiing, hunting and rock hounding, picnicking, and driving for pleasure.
Recreation site maintenance	There are 2 developed recreation sites within the project area, Greenville Campground and Round Valley Picnic Area. There are also 2 dispersed recreation sites, Indian Falls and Sandy Beach, which are commonly used for swimming. Greenville Campground is operated under a special use permit with Indian Valley Community Services District. Developed and dispersed recreation site maintenance requires hazard tree removal, graffiti removal, pile burning, replacing signs, fire rings, tables and older

	buildings.
Trail maintenance	There are approximately 7 miles of non-motorized system trails within the Keddie Ridge Project area. These trails include Peters Creek Trail, Round Valley Interpretive Trail, and Indian Falls Interpretive Trail. Annual trail maintenance work consists of clearing hazard trees, maintaining water bars or other erosion control devices, and maintaining or replacing signs. Work is typically accomplished by force account crews and volunteers.
Personal use woodcutting permits	Woodcutting for personal use is permitted throughout the Plumas National Forest. The following is a list of the number of personal use permits sold on the Mt. Hough Ranger District for the past nine years. It is estimated that 20 percent of the District's permit sales are within the Keddie Ridge Project area. 2001 – 2,577 permits for an estimated 5,154 cords 2002 – 2,461 permits for an estimated 4,922cords 2003 – 2,154 permits for an estimated 4,308 cords 2004 – 1,940 permits for an estimated 3,880 cords 2005 – 2,475 permits for an estimated 4,950 cords 2006 – 2,651 permits for an estimated 5,302 cords 2007 – 2,499 permits for an estimated 4,988 cords 2008 – 3,096 permits for an estimated 6,192 cords 2009 - 2,871 permits for an estimated 5,742 cords
Commercial use woodcutting permits	The following is a list of the number of commercial permits sold on the Mt. Hough Ranger District for the past 9 years. It is estimated that 20 percent of the District's commercial permit sales are within the Keddie Ridge Project area. 2001 – 160 permits for an estimated 2,400 cords 2002 – 135 permits for an estimated 2,025 cords 2003 – 92 permits for an estimated 1,380 cords 2004 – 83 permits for an estimated 1,245 cords 2005 – 255 permits for an estimated 3,825 cords 2006 – 329 permits for an estimated 4,935 cords 2007 – 372 permits for an estimated 5,580 cords 2008 – 774 permits for an estimated 9,000 cords 2009 – 1,609 permits for an estimated 16,000 cords
Christmas tree permits	The following is a list of the number of Christmas tree permits sold on the Mt. Hough Ranger District for the past 9 years. It is estimated that 25

percent of the Mt. Hough Ranger District's permit sales are within the Keddie Ridge Project area.

2001 – 2,062 permits
2002 – 2,348 permits
2003 – 2,499 permits
2004 – 2,282 permits
2005 – 2,320 permits
2006 – 2,047 permits
2007 – 2,364 permits
2008 – 2,136 permits
2009 – 1,736 permits

Abandoned mines — Two identified abandoned mineshafts exist within the project area. Open shafts may pose a direct hazard to forest users, Forest Service personnel, and Forest Service contractors.

Active mining claims — There are approximately 168 active mining claims in the project area. The Mt. Hough Ranger district currently administers 3 active plans of operation and 4 notices of intent for those active claims.

Special uses — There are 39 special uses that occur in the project area. These permitted uses include 3 road easements, 4 power lines, 1 railroad right-of-way, 11 waterlines, 1 telephone line, 1 barn, 1 private residence, 2 irrigation ditch permits, 1 transfer station permit, 2 livestock areas, 1 natural resource monitoring permit, 1 weather station, 1 weather modification device, 1 storage yard, 2 industrial microwaves, 1 reservoir, 1 stream gauge station, 1 private mobile radio service, 1 commercial radio service, 1 campground concession permit, 1 group use permit, and 2 recreation events. These forest uses require maintenance of the permitted area by permitees which may include activities such as hazard tree removal, brush removal, road maintenance, and replacement of improvements.

Present and Ongoing Grazing Activities

Allotment	Number of Acres	Acres within Analysis Area	Status		
			Status/Kind	Number	Season
Lights Creek	29,929	611	Active	24 Pair 'On' 16 pair 'Off'	6/1-9/1
Taylor Lake	26,920	235	Vacant		

Present and Ongoing Botany Projects

Webber's Milkvetch (*Astragalus webberi*) Habitat Improvement Project	This project is located approximately 0.3 miles south of Taylorsville and is adjacent to National Forest System (NFS) road 23N59. It includes treatment of 7.5 acres of NFS land using a combination of hand thinning, piling, pile burning, and prescribed fire to enhance habitat for Webber's milkvetch, a Region 5 Sensitive plant species.
Noxious Weed Mechanical Treatment Project	As a part of this project, 10 yellow starthistle infestations, covering approximately 1.8 acres, are treated on an ongoing basis within the Keddie Ridge Project analysis area. Treatments consist of hand pulling and cutting with a string trimmer (i.e. weed whacker).

Present and Ongoing Herbicide Treatments

No herbicide treatments are currently being conducted on NFS lands within the Keddie Ridge Project area. For an estimate of use on private lands, refer to Table 3 and Table 4, which describe past pesticide application within the Keddie Ridge Project analysis areas.

Future Projects

Future Fuels and Vegetation Management Projects within the Keddie Ridge Analysis Area

Year	Project	Activity Description
2013	Belden HFQLG Project	Project Treatments include: Approximately 605 acres of DFPZ treatments, 105 acres of area thinning treatments, and potentially 81 acres of group selection.
2011	Keddie Ridge Roadside and Deck Salvage Sale	This project proposes to remove three decks on NFS roads 27N19 and 27N19X created during the Moonlight Fire of 2007. Additionally, this project would remove roadside hazards along nine miles of NFS roads 28N32, 27N19, and 27N19X.

Fuel Treatment Maintenance within the Keddie Ridge Project Area

Defensible fuel profile zone (DFPZ) maintenance would be a reasonable and foreseeable future activity occurring within the Keddie Ridge Project area. These activities would be designed to maintain low surface fuel loadings, low fire intensities, and low rates of spread. This discussion incorporates, by reference, the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement and Final Supplemental EIS (HFQLG FSEIS) (USDA 2003a). Surface fuel reduction activities would include, but not be limited to, prescribed fire, mastication, and piling and burning of residual slash.

The Forest Service would assess the need for DFPZ maintenance treatments approximately five to ten years after the completion of the initial mechanical and fire activities proposed in the Keddie Ridge Project. It is expected that maintenance activities would take place as described in the HFQLG FSEIS, and further refined by on-site information available at the time that maintenance would be proposed. Specific decisions about maintenance for a particular DFPZ (timing of entry and treatment method) would be made at the time DFPZ maintenance is deemed necessary (HFQLG FSEIS, page 3).

Future Watershed Treatments

Year	Future Activities	Activity Description
2010	Wolf Creek Restoration	Bank stabilization and native revegetation.

Future Grazing Activities

A Plumas National Forest Range NEPA (National Environmental Policy Act) Strategy and Implementation Plan was signed by the Forest Supervisor on December 16, 2005. Through plan implementation, the Forest will analyze and document range NEPA projects on all active allotments. The Lights Creek Allotment is currently scheduled for analysis in 2016. No range improvements are anticipated in the meantime. End of season use monitoring (meadow use, riparian shrub use, and stream bank alteration) is done each year.

Future Recreation, Lands, and Minerals Projects

Year	Future Activities	Activity Description
2010	OHV Route Designation	The Plumas National Forest Motorized Travel Management Project Final Environmental Impact Statement and Record of Decision was completed and signed in fall of 2010. This decision added 234 miles of trails to the existing National Forest Transportation System, creating a total of 4,482 total miles of road and trail access on the Forest. Of that total, 4,118 are available for passenger car use; 4,383 are available for 4-Wheel Drive use; 3,802 are available for unlicensed All Terrain Vehicles (ATV) use; 3,855 are available for unlicensed motorcycle use; and, 4,482 are available for licensed motorcycle use. A subset (165 miles) of the 234 miles will be available immediately while the remainder will need maintenance before they can be used. Implementation of the Plumas National Forest Motorized Travel Management Project will occur when appeals have been resolved and a Motor Vehicle Use Map (MVUM) is published. The MVUM will show which routes are available for use by what types of vehicles and any seasonal restrictions that may apply. Pending any appeal resolution, the MVUM is expected in the spring of 2011. Until then, the current Forest Order regulating use remains in place.
2011	Recreation	The Mt. Hough Ranger District has plans to complete a Cycle 10 Resource Advisory Committee (RAC) Project in Greenville Campground by replacing a restroom with a sweet smelling vault toilet.
2011	Lands	The Plumas National Forest is seeking a permittee to operate and maintain the Greenville shooting range under a special use permit. The forest has started verbal negotiations with a potential permittee.
2011	Abandoned mine land reclamation	The Plumas National Forest will likely be reclaiming the two know abandoned mine sites within the project area during 2011.

2010	Mining Plans of Operation	There are six potential future mining operations that would be approved through a mining plan of operation.

Appendix G

Public Comments, Response to Public Comments, and Issue Identification

Introduction

The following appendix displays Forest Service responses to public comments on the Keddie Ridge Hazardous Fuels Reduction Project released January 2011. This appendix includes (1) a table listing the name and location of the commenter, the organization or entity each commenter represents, and the date of the comment; and (2) a narrative of comment statements and Forest Service responses organized by resource as presented in chapter 3. The comment statement is taken from the comment letters. A complete copy of each letter received is available at the Mt. Hough Ranger District, Quincy, CA, and are hereby incorporated by reference.

Summary of Public Comments Received

The Responsible Official received verbal or written comments from three agencies and seven organizations. The Council on Environmental Quality (CEQ) regulation 40 CFR 1503.4 states that an agency preparing a final environmental impact statement shall assess and consider comments both individually and collectively, and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses are to:

1. **Modify alternatives including the proposed action,**
2. **Develop and evaluate alternatives not previously given serious consideration by the agency,**
3. **Supplement, improve, or modify its analyses,**
4. **Make factual corrections,**
5. **Explain why comments do not warrant further agency response.**

Table 1. Commenters on the Keddie Ridge Hazardous Fuels Reduction Project Draft Environmental Impact Statement.

Comment ID Code	Commenter	Entity	Location	Date of Comment
Agencies				
EPA	Kathleen Goforth	U.S. Environmental Protection Agency	San Francisco, CA	3/18/2011
DOI	Patricia Sanderson Port	U.S. Department of the Interior	Oakland, CA	3/21/2011
Stewart	Frank Stewart	QLG Counties' Forester	Chico, CA	3/16/2011
Organizations				
SPI	Tom Downing	Sierra Pacific Industries	Quincy, CA	3/21/2011
AFRC	Bill Wickman	American Forest Resource Council	Quincy, CA	3/8/2011
SFL	Karina Silvas-Bellanca and Craig Thomas (Thomas and Silvas-Bellanca)	Sierra Forest Legacy	Sacramento, CA	3/3/2011
FL	Craig Thomas, Karina Silvas-Bellanca, Darca Morgan, and Pat Gallagher (Thomas et al.)	Forest Legacy	Sacramento, CA	3/21/2011
JMP	Chad Hanson	John Muir Project	Cedar Ridge, CA	3/21/2011
PCERC	Bill Wickman et al.	Plumas County Economic Recovery Committee	Quincy, CA	3/18/2011
PC	John Sheehan	Plumas Corporation	Quincy, CA	3/21/2011

Responses to Public Comments

Below are comments and responses on the Keddie Ridge Hazardous Fuels Reduction Project Draft Environmental Impact Statement released in January 2011. These comments are sorted by comment number in order of appearance under chapter 3 "Affected Environmental and Environmental Consequences (FVFFAQ – Forest Vegetation, Fuels, Fire, and Air Quality; WL – Wildlife: Terrestrial and Aquatic; WT – Watershed (Soils and Hydrology); B – Botanical Resources; E – Economic and Social Environment; AD/S – Alternative Development/Selection).

Forest Vegetation, Fuels, Fire, and Air Quality (FVFFAQ)

For additional information regarding responses to comments raised during the scoping period, during the DEIS comment period, and after the DEIS comment period, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendices F, G, and H, respectively.

1. **"The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #1 Breakdown of trees removed by diameter class and by species for each unit."** (Thomas and Silvas-Bellanca, SFL, pg. 1)

Response: Please refer to the Final Environmental Impact Statement (FEIS), Chapter 1, Purpose and Need for desired conditions for fuels reduction and forest health. Please refer to the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators and Environmental Consequences section including comparison of alternatives for a discussion on the measurement indicators used to analyze alternatives effects and effectiveness in meeting desired conditions in terms of forest structure and composition, landscape heterogeneity, and fuels and fire behavior. In addition please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendices A and C for existing pre-treatment and residual post-treatment conditions. Breakdown of trees and species removed are a poor indicator of whether desired conditions or concepts within the GTR are met because this focuses on what is being removed, not what conditions are left after the treatment. Post-treatment stand conditions are far more applicable to how well desired conditions are met. The FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences section provides a discussion of post-treatment stand conditions with regards to the measurement indicators. The FEIS, Appendix A, Tables 2, 4, 6, and 8 also display more unit specific post treatment stand conditions and ranges in conditions after treatment for each alternative. In addition, during the comment period, FVS outputs for each stand and prescription were provided showing number of trees per acre by diameter class both before and after treatments. Lastly the FEIS, Appendix D, Economic Analysis section provides a relative estimate of volume of harvested trees by species both greater than 24 inches in diameter and less than 24 inches in diameter by alternative.

2. **"The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #2 Breakdown of slope positions for each prescription and how that corresponds to retention on a per acre basis."** (Thomas and Silvas-Bellanca, SFL, pg. 1)

Response: Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Implementation of Within-stand Level Heterogeneity section. The tree selection guidelines describe how treatment intensity and corresponding reduction in stand density should vary with, among other variables, aspect. This section includes two tables; the first describes the varying amount of aspect for each unit that would receive a mechanical thinning treatment; the second table displays both average and a range in stand level conditions that correspond with maximum and minimum canopy cover retention guidelines in the silvicultural prescription for each unit.

3. **"The following specific information for each of the prescriptions would (be) helpful to identify if the concepts in the GTR are reflected by the post-treatment stand attributes: #3 We'd like a more specific description of the snag retention levels in each unit. The discussion of 4-6 snags/acre is contrary to natural (variable) snag production levels in nature that the GTR is striving to replicate. In Scott Stephen's work in the Sierra Martir, the average snag levels only occurred on 12 percent of the acres in his research acre. Presenting field markers with an average/ac marking requirement creates a homogenous landscape, not a restored, diverse outcome. We are looking for something that supports the notion of heterogeneity in the unit designs."** (Thomas and Silvas-Bellanca, SFL, pp. 1-2)

Response: Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail, Design Criteria common to all action Alternatives, for snag retention design criteria; the FEIS, Chapter Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Effects common to all action alternatives, Direct and Indirect effects section of timber harvest for effects to snags, and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Implementation of Within-Stand Level Heterogeneity, Tree Selection Guidelines, Item #7 (Snags) section for tree designation guidelines for snags. Proposed treatments would not designate snags for removal unless those snags pose a hazard to infrastructure or treatment operations. The treatments proposed under the Keddie Ridge Project would retain four to six snags per acre (greater than 15 inches in diameter and 20 feet in height) in accordance with the 2004 SNFPA ROD (Table 2, page 69) (USDA 2004b). Incidental removal of snags may occur for operability and safety; however guidelines set forth in the Pacific Southwest and Plumas National Forest Product Theft Detection and Investigation Plan would be used to ensure that operability, safety, and minimum snag densities would be met. Snags designated as hazards would meet guidance provided in the Plumas National Forest Hazard Tree Abatement Plan, OSHA regulations governing logging operations (29 CFR 1910.266), and the Forest Service Manual 2450 (Timber Sale Contract Administration) policy.

4. **"Basal area retention levels appear to take the approach that has 150 sq ft BA average across most of the project. Most of the early stand density literature is focused on young, fast growing even-aged stands and does not support a more ecological GTR-220 approach of variable clumping with gaps. Averaging BA and presenting "averaging" in the marking instructions will lead to simplification of stand structure and increased homogeneity…the thing we are trying to avoid. Clumped retention and variable BA retention, particularly around large tree groups (see attached photo) is one of the primary objective in the GTR Dinkey Creek project planning documents we presented to you during scoping. We need to better understand how (and if) these concepts are reflected in the Keddie project. A more specific breakdown of the levels of**

retention that will be provided in groups, pg. 43 of the Forest Vegetation, Fuels, Fire, and Air Quality report elude to various levels of retention in CWHR 4 stands and CWHR 5 stands, but no values are given of these various retention levels." (Thomas and Silvas-Bellanca, SFL, pg. 3: #4)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Effects Analysis Methodology, Measurement Indicators. Basal area is used as a measurement indicator of how well alternatives would or would not meet desired conditions associated with improving forest health. The threshold of 150 square feet per acre provides context and scale to this measurement indicator and is not a design element or design criteria of proposed treatments. The FEIS, Chapter 2 Alternatives, describes alternatives, proposed treatments, silvicultural prescriptions, and design criteria.

The threshold of 150 square feet of basal area per acre, above which density second-growth ponderosa pine stands are considered susceptible to bark beetle-induced mortality, was first suggested by Sartwell (1971) and his subsequent research (Sartwell and Steven 1975, Sartwell and Dolph 1976). Oliver (1995) found that Sartwell's threshold of 150 square feet of basal area per acre "above which density stands are susceptible to attack by bark beetles appears to be a reasonable average value for California."

Landram (2004) used basal area as a metric to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (Where the Keddie Ridge Project is primarily located) the insect risk thinning guides also suggest thinning to 150 square feet of basal area per acre. It is also worth noting that this threshold appears in line with a majority of the reference conditions described for the project area (Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Estimates of forest structure for pine dominated and mixed conifer forests in California and northern Mexico adapted to an active-fire disturbance regime.) Consequently, this metric is used in the analysis to quantify and compare the relative effectiveness of the alternatives and corresponding treatments in meeting desired conditions for forest health.

Using stand level average metrics as a threshold to compare alternatives would not result in "simplification of stand structure and increased homogeneity." As shown in the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Implementing Within-Stand Variability, Tree selection guidelines would be used to enhance heterogeneity and "key off" micro site and wildlife habitat structures. Item # 4c describes basal area guidelines and how basal area retention would vary depending on clump, gap, and matrix locations. In addition, the FEIS Appendix A, tables 2, 4, 6, and 8 display the stand level range of basal areas corresponding to the canopy cover ranges for each prescription by alternative. All proposed treatments would meet basal area retention standards as directed by the SNFPA 2004 ROD, table 2.

5. **The Appendix D-2 suggests 132 mbf of >24" PP and SP are going to be harvested in the project. How is this consistent with ecological restoration that should be targeting the retention of these tree species and sizes?** (Thomas and Silvas-Bellanca, SFL, pg. 3: #5)

Response: Please refer to the FEIS, Appendix D, Economic Analysis, Tables 1through 4. Table 1 estimates that treatments under alternative A could produce 132 mbf of sawlog volume in ponderosa pine and sugar pine trees greater than 24 inches in diameter. Table 4 estimates that treatments under alternative E could produce 1,157 mbf of sawlog volume in ponderosa pine and sugar pine trees greater than 24 inches in diameter. Tables 2 and 3 estimate that no sawlog volume in ponderosa pine and sugar pine trees would be harvested. These volume estimates are based on FVS modeling using simulated prescriptions and due to the uncertainty in modeling estimates, these results are best interpreted in a relative rather than an absolute sense. These tables indicate opportunities to harvest ponderosa pine and/or sugar pine greater than 24 inches do exist within stands in the project area under these prescriptions; however, 1) these opportunities would be much more limited under alternative A than alternative E, and 2) these opportunities would generally be discouraged given the preference to retain these trees to best meet desired conditions.

Under alternative A, these trees could account for approximately 1.3 percent of the total volume to be harvested and could equate to approximately 1 tree every 7 to 181 acres, depending on the stand, whereas under alternative E removal of these trees would increase by nearly 9 times more than alternative A. Under alternative E, these trees could account for approximately 7.5 percent of the total volume to be harvested and could equate to approximately 1 tree every 3 to 5 acres.

In addition, retention of ponderosa and sugar pine greater than 24 inches is preferred to meet desired conditions. While the FVS modeling and economic analysis indicates that given stand conditions, some opportunities to remove these trees exist, the on the ground rationale for designating these trees would follow those few instances described by North et al. (2009), Addendum, page vii.

6. **"In the analysis of Forest Vegetation, Fire, Fuels, and Air Quality our main concern is that the concepts of the GTR-220 are not fully captured by the averaging metrics used to compare Alternatives. Further, the target stand condition although weighted by species reduces BA to 150 ft2/ac on 70 percent of stands treated mechanically (p. 77 DEIS) and does not support the intentions of proposed action to use the concepts of the GTR-220. Comments from Malcolm North on the Keddie project point out that averaging is unlikely to capture heterogeneity. "However much of what historic forests were like and the conditions suggested by GTR 220 are for a high variability in density that SDI averages are unlikely to capture." Averaging SDI also seems to suggest spacing of larger trees, realigning the proposed alternative with the HFQLG alternative. SFL could better understand the intentions of the DEIS if general criteria were presented in the document on how and when larger trees will be thinned with more developed discussion of how this will enhance and improve habitat values and increase fire resiliency. Given the shortage of larger tree-dependent high quality it is hard to understand the emphasis on even spacing, particularly of larger trees."** (Thomas et al., FL, pg. 10)

Response: Please refer to response to comment FVFFAQ #4. The threshold of 150 square feet of basal area is used as a measurement indicator threshold, above which stands may be more susceptible to bark beetle induced mortality. This measurement indicator is used to compare the relative differences of the alternatives in meeting the purpose and need for forest health, it is not used as a design criteria. Desired conditions include heterogeneity and diverse forest structures at multiple scales: at the micro site or within stand variability, at the stand level, and at the landscape level. Such heterogeneity, particularly at the within stand level, may be represented by large ranges within stand conditions; however, there is considerable utility in forest management in describing and comparing average conditions, just as the mean is used in statistics to give context to ranges in variance and determine levels of significance.

Under alternative A, 70 percent of the mechanically treated stands would have average conditions which would be below the threshold of 150 square feet per acre. This indicates that these stands would meet desired conditions for forest health in terms of improving forest resiliency to insect mortality. While forest structure within these stands would be variable with large ranges in canopy cover and basal area, on average, at the stand level, these stands would have densities reduced such that susceptibility to insect mortality would be reduced.

These stand level thresholds do not "suggest spacing of larger trees, realigning the proposed alternative with the HFQLG alternative" or imply homogeneity. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Implementation of within-stand level heterogeneity section. For example, the figure from Terry and Chilingar (1955) under Appendix C, Tree Selection Guidelines, Item #2, displays how a certain canopy cover guideline or threshold may vary by a clumped or even distribution. Likewise with basal area, a quantified average guideline or threshold does not implicitly lead to homogeneity. Distributions depend on implementation of such threshold or guideline, and such conditions may be met while mutually emphasizing concepts of heterogeneity. The Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Implementation of within-stand level heterogeneity section provides direction on how such desired conditions may meet canopy cover and basal area guidelines while enhancing heterogeneity. Tree selection guidelines are provided as general criteria on "how and when larger trees will be thinned with more developed discussion of how this will enhance and improve habitat values and increase fire resiliency."

In addition, please refer to the response to comment FVFFAQ #7.

7. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: We remain concerned about information presented regarding desired stand density and basal area in Chapter 3 (p. 46-47) because while heterogeneity and diversity are mentioned in the treatments there is also a consistent message of retaining very low densities throughout the project area (also noted in comments from Brandon Collins, Appendix B, p. 109). Both these ideas seem to be in conflict throughout the analysis.** (Thomas et al., FL, pg. 10)

Response: Please refer to the response to comment FVFFAQ #6. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions. In the section on reference conditions, two important concepts are highlighted by studies on reference conditions: 1) the heterogeneity of forest structure, and 2) the low stand densities of forest structure. Clearly, the concept of low densities is not mutually exclusive from the concept of heterogeneity. While reference conditions indicate a large ranges in both trees per acre and basal area per acre, these studies also indicate that average stand level densities were low. Collins et al. (2011) serves as a good example of this; while recognizing considerable variation in forest structure, the authors also emphasize the need for creating low density structures. Collins et al. (2011), Figure 3 shows that over 60 percent of the historical lots had derived canopy covers less than 30 percent canopy cover and 96 percent of lots had canopy covers less than 40 percent canopy cover.

Large ranges in forest structure indicates a high degree of heterogeneity that may be characterized by a wide range of dense conditions and open conditions, but low average stand densities indicate that this forest structure – which is thought to be more resilient - had relatively higher proportions of open forest conditions than dense forest conditions. Therein lies the utility and necessity to analyze both the average and the ranges with regards to forest structure and heterogeneity; while the range indicates the wide ranges in conditions, the average puts the relative proportions of these conditions into context.

Particularly in terms of climate change, studies such as Hurteau and North (2009), Stephens et al. (2009), and Battles et al. (2008) all suggest that, for the Sierra Nevada mountains, maintaining lower density stands, on average, dominated by large fire-resistant trees may be better resilient to climate induced trends described for forests with active-fire disturbance regimes.

8. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: While the discussion on stand density and basal area effectively summarizes key research, the DEIS seems that it focuses entirely on stocking levels for ponderosa pine type. We believe that applying a threshold of 150 ft2/acre basal area or assigning an SDI of 270 (60 percent of maximum of 450) is inappropriate for mixed conifer stands. We also note that this approach is not consistent with that taken on other national forests. The values reported in yield tables for mixed-conifer stands are significantly greater than the numbers associated with pine stands. It is inappropriate to consider a stocking threshold of 60 percent as a level to never exceed when the Keddie project and the 2010 HFQLG Status Report monitoring show very low levels of snags and large woody material. Levels so low that the Plumas National Forest is failing to met standards and guidelines for the retention of these important resources. Mortality is a critical part of forest dynamics. It is important to a vast array of wildlife species and plays a critical role in overall forest health. Also, as pointed out in Collins comments, "…the period encompassed by these studies (referring to Appendix A of the Forest Vegetation, Fire, Fuels, and Air Quality specialist report pg. 100-101) corresponds with a fairly narrowly focused view of forest management that did not recognize the role or importance of natural disturbance in maintaining healthy forests." This is a key issue in the development of reference conditions, and it identifies the key question of how valid are these conditions without recognizing the importance of disturbance in the landscape.** (Thomas et al., FL, pg. 10)

Response: Please refer to the response to comments FVFFAQ #6 and #7. Also, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand Density. An SDI of "270 (60 percent of maximum of 450)" was not assigned to mixed conifer stands. The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, discloses that: "The combination of Long and Shaw's work, with first-hand familiarity of the forests within the project area, suggest a fairly conservative maximum SDI of 450, which is the value used for ponderosa pine in this analysis. This is based on the latest research by Long and Shaw (In review) for the pine dominated mixed conifer forests of the Sierra Nevada (Long, personal communication, Shaw, personal communication), and considers the desired low density conditions, and the relatively lower site of the project."

The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, further describes that "For the Keddie Ridge Project, a site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002) as described by Hann and Wang (1990). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. While a maximum stand density index of 450 is used for ponderosa pine in this analysis, the individual stand maximum stand densities are higher – this is driven by the presence of shade tolerant species such as Douglas fir and white fir which have higher maximum stand density indices. This approach is well accepted as a component of the Forest Vegetation Simulator (Dixon 2002) and is consistent with approaches described by the latest silviculture and ecology texts (Tappeneir et al. 2007) and the scientific literature (Hann and Wang 1990, Shaw 2006)."

Using basal area threshold (150 square feet per acre) and stand density threshold (60 percent of maximum SDI) are entirely consistent with Region 5 direction for designing thinning for fuel reduction and forest health objectives (Landram 2004, Blackwell 2004). Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Effects Analysis Methodology, Measurement indicators for Forest Vegetation section. The insect risk thinning guidelines developed specifically for the Plumas NF, Transition Zone (where the Keddie Ridge Project is primarily located) suggest thinning to 150 square feet per acre.

In addition, direction provided by the Regional Forester Jack Blackwell on Conifer Density Management for Multiple Objectives (2004) is to design thinnings to "ensure that that density does not exceed an upper limit (for example: 60 percent of maximum stand density index)" and to "ensure that this level will not be reached again for at least 20 years after thinning."

Furthermore, use of stand density concepts for forest and fuels management, particularly for Sierra Nevada Forests, is widely discussed in scientific literature. Sherlock's 2007 General Technical Report (PSW GTR-203) titled "Integrating Stand Density Management with Fuel Reduction" specifically discusses how stand density management concepts are directly applicable to fuel and forest health treatments for the Sierra Nevada forests and how this is congruent with the 2004 SNFPA ROD and FEIS (USDA 2004a, 2004b). Oliver et al. (1996) in the Sierra Nevada Ecosystem Project devotes an entire chapter to "Density Management of Sierra Forests" which describes "objectives for regulating stand density in the Sierra Nevada forests are ecological as well as managerial." The linkages between silviculture and ecology are widely discussed by Long et al. (2004) for a wide range of forest ecosystems. In addition, threshold relationships between stand density and insect mortality are also widely discussed in the scientific literature for western forests including Fettig et al. (2007), Ferrell (1996), Oliver (1995), Negron and Popp (2004), and Negron et al. (2009).

For a discussion on yield tables, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Reference Conditions section. Dr. Collins' comments points out that the yield tables, which tend to describe denser forest structure were focused on stand normality and "well-stocked stands." These yield tables did not include low density stands because, as Dr. Collin's comments point out, that "the period encompassed by these studies (referring to Appendix A of the Forest Vegetation, Fire, Fuels, and Air Quality specialist report pg. 100-101) corresponds with a fairly narrowly focused view of forest management that did not recognize the role or importance of natural disturbance in maintaining healthy forests." Consequently, his comments highlight that yield tables were biased toward denser stands, yet reference conditions indicate that many stands were, on average, of much lower density under a natural active-fire disturbance regime contrary to the commenter's assertion that yield tables indicate that stands were much denser.

The commenter discusses the concepts of managing for 60 percent of maximum stand density index, and recruitment of large woody debris. With regards to managing for 60 percent of maximum stand density index and large woody debris recruitment. The Keddie Ridge Project does not propose that a "stocking threshold of 60 percent as a level to never exceed". Please see response to comment FVFFAQ #8 and Blackwell (2004). In addition, please see the response to comment FVFFAQ #3 and please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternative A, Tree Selection Guidelines Item #7 section. Under the Keddie Ridge Project snags would not be designated for removal unless it is a hazard tree, and where large down woody desired conditions are not met, snags would be left for wildlife habitat.

Lastly, with regards to snags and snag recruitment, there are two concepts which are applicable to the project. The first is that managing stands below 60 percent of maximum stand density does not equate to zero tree mortality. Natural background levels of mortality would still be expected to occur. This is evident from reference conditions that indicate that while stands may have low average stand densities, a wide range in conditions – or heterogeneity – in combination with natural disturbance regime events such as fire, provide for natural background levels of mortality.

The second concept involves scale and intensity. The Keddie Ridge Project proposes to treat approximately 11 percent of the National Forest System (NFS) lands within the FVFFAQ analysis area. Of this, nearly half of the treatments involve hand thinning, piling, and burning or prescribed fire treatments which would not notably effect recruitment of larger snags (greater than 15 inches dbh and greater than 20 feet tall). In fact, the proposed 1,456 acres of low to moderate prescribed fire treatments would likely create new snags directly through fire-induced mortality and indirectly through delayed mortality as a result of fire-injury and predisposal to insect attack.

The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment, Figure 2 indicates that a large portion of NFS lands within the analysis area are dominated by closed canopy mid to late seral stands (represented by CWHR 4M, 4D, 5M, and 5D), which are characterized by relatively higher stand densities and higher potential for mortality and snag and large down woody debris recruitment. Furthermore, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Comparison of Cumulative Effects, Table 49 indicates that these CWHR types and corresponding conditions would be reduced by 7 to 12 percent dependent on alternative. Considering 1) the context, scale, and dispersion of treatments that reduce stand densities, 2) the expected continued background levels of mortality within these units, 3) snag creating effects of proposed prescribed fire treatments, 4) the persistence of high stand density conditions and expected and continued mortality outside of treatment areas, and 5) treatment design criteria to retain levels of snags and large down woody debris, including tree selection guidelines that address retaining green decadent trees with wildlife structures, measures have been incorporated into the project design to minimize reductions in, maintain retention, and promote recruitment of snag densities and large down woody debris.

9. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: Further complicating this issue, Long and Shaw (2005), which is cited numerous times to suggest that SDI of 450 was appropriate for ponderosa pine across western states (Appendix A of Forest Vegetation, Fire, Fuels, and Air Quality report pg. 96); however this same study also identifies that this approach should be used with caution (See page 214). We are particularly concerned because the Long and Shaw 2005 paper had very limited sampling of Ponderosa pine plots in California (See Table 1, p. 206) used to inform the paper. Relying on this paper to support the low BA outcomes in the Keddie project skews desired conditions in a direction inappropriate for mixed conifer stands in the project area. Relying on Oliver (2005) pine mortality data for the Keddie project is also inappropriate since that information is derived from even-aged Ponderosa pine stands in California. Please explain in detail why thresholds for even-aged pine stands are used as desired conditions and to drive management for mixed-conifer stands.** (Thomas et al., FL, pg. 11)

Response: Please refer to response to comment FVFFAQ #8. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators, Forest Vegetation, Relative Density; and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A. Recent research by Long and Shaw (2005) using data across the western states for ponderosa pine and the latest research by Long and Shaw (In review) for the Sierra Nevada Mixed conifer forests (Long, personal communication, Shaw, personal communication) suggest 450 as a maximum SDI for ponderosa pine and ponderosa pine dominated mixed conifer systems. Long and Shaw (In review) developed a density management diagram for even-aged mixed-conifer stands in the Sierra Nevada using 224 FIA plots in California. "The research is intended for use in even-aged stands, but may also be used for uneven-aged management where a large group selection system is used" (Long and Shaw In review). This research is directly applicable to the Keddie Ridge Project considering first-hand familiarity of the forests within the project area, the desired species composition, the desired low density conditions, and the relatively lower site of the project. This approach leans slightly toward maintaining higher stand densities than those using a maximum stand density index of 365 for ponderosa pine as described by DeMars and Barrett (1987) and Oliver (1995).

The stand-specific calculation of maximum stand density index for a mixed species stand is largely dependent on the relative abundance of species present. For mixed-species stands like those that occur within the Keddie Ridge Project, Tappenier et al. (2007) describes "several approaches have been recommended for establishing a maximum stand density. Cochran et al. (1994) recommend selecting the SDI of the species with the lowest maximum value, but Hann and Wang (1990) calculate a weighted average SDI in which the weights are the basal area of the respective species." These approaches are also described in Shaw (2006).

For the Keddie Ridge Project, a site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002) as described by Hann and Wang (1990). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. While a maximum stand density index of 450 is used for ponderosa pine in this analysis, the individual stand maximum stand densities are higher – this is driven by the presence of shade tolerant species such as Douglas fir and white fir in these stands which have higher maximum stand density indices, This approach is well accepted as a component of the Forest Vegetation Simulator (Dixon 2002) and is consistent with 1) approaches described by the latest silviculture and ecology texts (Tappeneir et al. 2007), 2) the scientific literature (Hann and Wang 1990, Shaw 2006, Long and Shaw 2005, Long and Shaw In review)and 3) in collaboration with experts in the field of stand density (Long, personal communication, Shaw, personal communication).

10. **Basal areas and stand densities are based on even-aged ponderosa pine stand data: "There's no discussion, however, of what kind of heterogeneity from reference conditions might be desired or how it might be silviculturally implemented" (North comments on Keddie). We would like to see more specific treatments that outline how and where the prescriptions for the proposed action to meet desired conditions. Currently, it is difficult to interpret from the documents how heterogeneity will be implemented silviculturally both within stand (or micro-site) and on the landscape level. A particular area to focus some additional descriptions would be in the group selections. The DEIS (p. 73) states for group selections, "Harvest trees less than 30 inches DBH. Consider retaining healthy vigorous undamaged tress of desired shade intolerant species greater than 20 inches DBH…" and in the Forest Vegetation, Fire, Fuels, and Air Quality specialist report (pg. 110, g. i., ii., and iii). Neither document illustrates to reader the criteria that will be used for creating "clumps", "gaps", or low densities of larger trees. This was also mentioned during our phone conversation with Ryan Tompkins and Michael Donald on March 10th, and we were not satisfied with the conclusion that this would be more evident in the marking guidelines, which were not provided for review.** (Thomas et al., FL, pg. 11)

Response: Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix C, Alternative A, Diversity within the Prescription Design, Implementation of Landscape level heterogeneity, and Implementation of Within-stand level heterogeneity section. Tree selection guidelines and group selection guidelines discuss how heterogeneity would be implemented at the stand and landscape scales, including criteria that would be used for creating clumps, gaps, low densities of larger trees (the matrix), and identification, location, and design of group selections. Appendix C also includes a thorough discussion of how the design of alternative A implements the conceptual framework of the PSW GTR-200 (North et al. 2009). These guidelines were developed with input and review from Dr. North, lead author of the PSW GTR-220 (North et al. 2009).

11. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: On page 3 of the DEIS under Purpose 1: Reduce Hazardous Fuel Accumulations and Purpose 2: Improve Forest Health, the desired condition states, "… is uneven-aged management, multistoried, fire resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of fire." There are areas where reduction in canopy bulk density may be appropriate, in forests adjacent to homes or in areas for key strategic fire suppression activities to reduce fire severity under all weather scenarios, however, separating crowns outside of these key areas may be limited in its effectiveness to prevent crown fire spread (Agee et al. 2000, Stephens and Moghaddas 2005 in North et al. 2009 p. 3). Stephens and Moghaddas found using modeling tools Fuels Management Analysis (FMA) and Fire Family Plus software (with data supplied by specific inventories of trees size, shape, height and crown ratio) that, " [A]ll four outputs can be controlled by changing surface and ladder fuels, giving managers an opportunity to interactively develop target fuel conditions for a desired fire behavior. Fuels can be reduced until the crowning and torching indices are higher than conditions that are likely to occur even under extreme weather conditions." (In North et al. 2009 p. 3)** (Thomas et al., FL, pg. 12)

Response: Please refer to the FEIS, Chapter 1, Purpose 1: Reduce Hazardous fuel accumulations. The desired condition is an "uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire." Also, please refer to the FEIS, Chapter 1, Purpose 2: Improve forest health. In addition to the fuels desired conditions, forest health desired conditions state that "stand densities would generally be low, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrences."

The desired condition for forest health includes the desired condition for Purpose 1, Reducing Hazardous Fuel Accumulations, but in addition, includes promoting low stand densities, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence. In addition, low density, open canopy forest conditions would promote the regeneration, growth, and development of fire-resistant shade intolerant species such as ponderosa pine and black oak, and would contribute to landscape, stand, and within stand level heterogeneity. Removal of a portion of intermediate sized trees would contribute to creating low density, open canopy stands, accelerate the development of large diameter trees, reduce inter tree competition, enhance the growth and development of shade intolerant species, and contribute to heterogeneity.

Lastly for discussion regarding the need for fuel reduction, the basic components of fuel reduction, scale and intensity of fuel reduction, and the interaction of fuels reduction and forest health objectives and goals, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B, Fuel Reduction section.

In addition, please see the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Effects Analysis Methodology section. Fire modeling software including Fire Family Plus, and the Fire and Fuels Extension of the Forest Vegetation Simulator with stand level tree field inventories were used in the analysis of effects by alternative.

12. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: There is substantial evidence indicating that it is not necessary to reduce canopy cover to 40 percent or to remove trees up to 30" dbh, as proposed in the Keddie project, to reduce the risk of uncharacteristic wildfire. Much of this evidence is cited in Legacy's appeal of the 2004 ROD, which was incorporated in our scoping comments on the Keddie project (SNFPC et al. 2004, pp. 62-71). It is generally recognized by fire scientists that fire resiliency largely is achieved by removing surface fuels and smaller diameter material and increasing crown to base height. "Most of the trees that need to be removed to reduce accumulated fuels are small in diameter and have little or no commercial value." (U.S. General Accounting Office 1999, p. 44). "When thinning is used for restoration purposes in dry forest types, removal of small diameter material is most likely to have a net remedial effect. Brush, small trees, along with fine dead fuels lying on top of the forest floor, constitutes the most rapidly ignited component of dry forest." (Christensen et al. 2002, p. 2). Thus, "surface fuels are the means by which crown fires are sustained....Without heavy surface fuels, crown fires are almost always absent, regardless of canopy cover, size class distribution, or the height to live crown." (Rice 2005, p. 2).** (Thomas et al., FL, pg. 12)

Response: Please refer to the response to comments FVFFAQ #11. In addition, please refer to the FEIS, Chapter 2, Alternatives section. The Keddie Ridge Project FEIS analyzes in detail four action alternatives which treat fuels to varying degrees. Alternative C, the non commercial funding alternative, is designed with the singular purpose of meeting the purpose and need for fuels reduction. This alternative would implement a substantially lower upper diameter limit of 12 inches dbh. Alternative D, the 2001 consistent alternative would implement lower upper diameter limits of 12 to 20 inches, would maintain higher amounts of canopy cover (50 percent), and would maintain 15 to 25 percent of the treatment area left untreated. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels Reduction section. While these alternative would meet or partially meet immediate fuels reduction goals, it would not fully meet the forest health goals which include creating open forest stands that are generally low in stand density, characteristic of an active-fire regime stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought fire, and insect and disease occurrences.

13. **Using crown spacing is not supported by current research to mitigate uncharacteristic fire: Studies of the effects of fuel treatments on fire behavior support the conclusion that fuel reduction that focuses on surface and ladder fuels and small diameter material is effective in reducing uncharacteristic fire. Stephens (1998) examined a number of fuel treatments and used the model FARSITE to evaluate their efficacy. In all cases, the most successful fuel treatments included prescribed fire. Further, prescribed fire alone was as effective in reducing fire risk as treatments with logging and prescribed fire combined. "These treatments resulted in fuel structures that will not produce extreme fire behavior at 95th percentile conditions." (Ibid. p. 32). Further, the vegetative conditions in the watershed where the fire effects were modeled included canopy cover conditions of up to 100 percent cover. The prescribed burning treatments did not reduce in any way the canopy cover of the dominant and co-dominant trees, yet these treatments were as effective as the thinning/biomass/prescribed burn treatments in which canopy cover was reduced to 50 percent in some areas of the watershed. Thus, no change in canopy cover of the dominant and co-dominant trees was necessary to meet the fuel objective under extreme weather conditions. Furthermore, reducing canopy in some areas to 50 percent did not result in any additional benefit. Similar results were reported by van Wagtendonk (1996), which again emphasized that removal of the surface and ladder fuels is effective in changing fire behavior. These studies demonstrate that it is not necessary to remove medium to large diameter trees or alter canopy cover in order to prevent crown fire and other extreme fire behaviors.** (Thomas et al., FL, pg. 12-13)

Response: Please refer to the response to comments FVFFAQ #11, #12, and #14. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels Reduction for a discussion on Scale and Intensity of fuels treatments. Research indicates that the effectiveness of fuels treatments is determined, in part, by the site specific existing stand conditions relative to the treatment prescribed. Research such as Moghaddas et al. (2010), Collins et al. (2010), Peterson et al. (2005) and Agee and Skinner (2005) all recognize prescribed fire, mechanical thinning, and mechanical thinning with prescribed fire as variable options for treating accumulations of hazardous fuels. Moghaddas et al. (2010) emphasize that "there is no one fuel treatment strategy…rather a combination of strategies is needed, especially when dealing with complex landscapes and management objectives (Stephens et al. 2010)." This is particularly important with regards to the multiple management objectives as described in the FEIS, Chapter 1, Purpose and Needs section. Treatments that may meet fuels reduction objectives, may not meet other project objectives such as forest health.

14. **Restoring fire as an ecological process need to be developed more within the specialist report: The DEIS and the Forest Vegetation, Fire, Fuels, and Air Quality specialist report both failed to identify the ecological restoration role that fire plays in this system, which furthers the underlying idea that thinning is always preferred.**

We understand that past management activities have lead to higher densities and species composition change, which is well summarized, "but the emphasis is on trying to restore ecological processes (including wildlife habitat) and those processes seem to thrive with greater structural

heterogeneity" (North comments on Keddie). The role that fire will play in the Keddie project in the now and into the future is unclear, and if the concepts from the GTR-220 are to be fully embraced we would like to see more discussion the tremendous ecological restoration value of fire (i.e., preparing the seedbed for germination, cycling nutrients and replenishing minerals, modifying conditions promoting wildlife habitat and forage, creating structural heterogeneity, minimizing disease and pathogens, and reducing or increasing fire hazard (Kilgore 1979).

"To completely restore fire as an ecological process, there is no substitute for fire. In the words of Sue Husari, fire management officer for the Pacific West Region of the National Park Service and one of the true pioneers in fire management: "You can't restore fire without fire."Sugihara et al. 2006. (Thomas et al., FL, pg. 13)

Response: Please refer to the response to comment FVFFAQ #11, #12, and #13. In addition, please refer to the FEIS, Chapter 2, Alternatives section . The Keddie Ridge Project recognizes the ecological role of fire in the project area, and consequently proposes thousands of acres of follow-up prescribed fire underburn treatments and prescribed burn only treatments,

All action alternatives include the use of prescribed fire to reduce surface fuels in the proposed treatments, including in all hand thinning and mechanical thinning treatments. In addition, all action alternatives include 1,456 acres of low to moderate intensity prescribed burn only treatments.

The commenters' "would like to see more discussion the tremendous ecological restoration value of fire (i.e., preparing the seedbed for germination, cycling nutrients and replenishing minerals, modifying conditions promoting wildlife habitat and forage, creating structural heterogeneity, minimizing disease and pathogens, and reducing or increasing fire hazard" (Kilgore 1979).

The reintroduction of fire as a process and the tremendous ecological value of fire is a fundamental component of the proposed treatments within all action alternatives as it is within guiding Forest Plan direction as amended by the 1999 HFQLG FEIS and ROD (USDA 1999) and the 2004 Sierra Nevada Forest Plan Amendment FEIS and ROD (USDA 2004a, USDA 2004b). This concept is the greatest similarity between all action alternatives, and consequently, the differences within the action alternatives lie in the amount and intensity of mechanical thinning and group selection treatments which would occur prior to the application of prescribed fire treatments. As North et al. (2009) highlights in the PSW GTR-220:

"Mechanical treatments can be effective tools to modify stand structure and influence subsequent fire severity and extent (Agee et al. 200, Agee and Skinner 2005) and are often a required treatment in forests containing excessive fuel loads. Prescribed fire is generally implemented very carefully, killing only the smaller size class trees (Kobziar et al. 2006). In some cases, it is ineffective for restoring resilience, at least in the first pass (Ritchie and Skinner 2007). For example, prescribed fire may not kill many of the larger ladder-fuel or co-dominant true fir trees that have grown in with fire suppression (Knapp and Keeley 2006, North et al. 2007). In many stands, mechanical thinning followed by prescribed fire may be necessary to achieve forest resilience much faster than with prescribed fire alone (Schwilk et al. 2009, Stephens et al. 2009)."

Consequently, the analysis in the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section focuses on how the relative differences in alternatives and how each alternative would or would not meet the desired conditions as described by the Purposes and Needs in the FEIS Chapter 1. In addition, the Forest Vegetation, Fuels, Fire, and Air Quality Report appendices include background information pertinent to the analysis. Appendix B includes a discussion on Fuel Reduction treatments including the need for fuels treatments, basic components of fuels treatments, scale and intensity of treatments, and the interaction of fuels reduction and forest health objectives and goals. Appendix C includes a thorough discussion on how alternatives would implement heterogeneity concepts as discussed in the PSW GTR-220 (North et al. 2009).

15. **Restoring fire as an ecological process need to be developed more within the specialist report: We also understand the complicated nature of air quality management, and if this were truly to be the collaborative approach alternative, then it would be very important to have the local air pollution control district at the table when discussing the Regions intentions to increase the pace and scale of ecologically based treatments (Ecological Leadership Intent) because the resilience and ecological integrity of the Sierran forests cannot be enhanced or maintained without managing fire within them.** (Thomas et al., FL, pg. 13)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section for a discussion on effects to air quality. In addition, please see the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B discussion on limitations to the use of prescribed fire. Implementation of prescribed fire treatments would occur over a range of years dependent on weather and fuels conditions being “within” prescription, air quality regulations, and available resources. Modifications to air quality regulations do not fall within the purview of the Keddie Ridge Project Collaboration with local air quality districts on air quality issues is addressed at the forest and regional level.

16. **To fully be able to call out a project that is using the GTR-220 concepts we would like to see the following revised in the DEIS and Forest Vegetation, Fire, Fuels, and Air Quality report. The following questions are for concepts that we do not see as being fully developed within the DEIS or within the specialist reports. A more fully developed section on stands and landscape level heterogeneity (see attach micro-site marking reference). How will the alternative A treatments and current prescriptions be varied across topographical and aspects differences within the stands. What criteria will you use to thin larger trees within CWHR 4 size classes, and how does this follow the concept in the GTR-220 of keying off existing structures? And how will this accelerate these stands into CWHR 4 is the larger trees are being removed? More detailed criteria on how the leave tree groups or clumps (both high and low density) and the creation of gaps will be established? The identification of these areas will help us understand more fully that the concepts of the GTR were in fact developed fully, and that this project falls in line with the Regions Ecological Restoration Intent. Furthermore, we would like to see more discussion on how fire will be returned to this project and be allowed to play it vital role in the ecosystem, both for reducing fuel loading and creating diversity.**

The above was also requested in our April, 2010 scoping letter, we requested that the district ensure stand heterogeneity be provided for in the project area in the following ways:

- **Varying stand density targets throughout the stand;**
- **Creating clumps composed of larger trees with higher density and canopy cover;**
- **Increasing stand density and canopy cover in canyons and north and northeast aspects;**
- **Retaining untreated areas ("diversity islands"); and**
- **Retaining patches of understory shrubs and advanced tree regeneration.**
- **Include specific wildlife tree microhabitat marking in the project design (Michel and Winter 2009) and procedures for identifying other micro-habitat features to be retained in project design.**

(SFL scoping letter for the Keddie Project, April 15, 2010, p. 2). The Keddie DEIS embraces a few concepts in the GTR such as heterogeneity, but only partially. The Forest Service should revise the DEIS to align the purpose and need, implementing the GTR, to include wildlife recommendations. (Thomas et al., FL, pg. 13, VI: Conclusion)

Response: Please refer to the FEIS, Chapter 2, Alternatives section, for the design of each alternative. Alternative A includes the greatest range in silvicultural prescriptions including the greatest ranges in canopy cover retention and stand density. This includes areas with higher densities, canopy cover, and retention of trees greater than 20 inches. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C for further discussion on implementing both landscape level, stand level, and within-stand level heterogeneity and how the design of Alternative A is congruent with the conceptual framework presented in the PSW GTR-220 (North et al. 2009). In addition, the Keddie Ridge Project ID team has worked with the lead author of the PSW GTR-220, Dr. Malcolm North, to incorporate the report's conceptual framework into the Keddie Ridge Project as appropriate.

17. **No rational connection between the facts found and the proposed action: The DEIS claims that the Proposed Action is necessary in order to prevent high levels of tree mortality from various causes, including fire and insects. However, the facts found in the Forest Service's own Forest Vegetation Simulator (FVS) data, pertaining to the Project area, present irreconcilable contradictions. First, there is no information in the record indicating that stands will not continue to increase in live tree basal area over the coming decades, even when beetle mortality is taken into account. Also, about 25 percent basal area mortality levels identified in the DEIS and Keddie Forest Vegetation, Fuels, Fire, and Air Quality Report (Vegetation Report) would be from the logging itself—i.e., the direct killing and removal of trees with chainsaws, with an additional 13 percent basal area mortality projected from fire under the most extreme fire weather—a total of 38 percent basal area mortality. HOWEVER, under the non-commercial thin (thinning of trees up to 12 inches in diameter removed) the combined live basal area reduction from thinning and fire (under "extreme" fire conditions) is much smaller than**

> **combined mortality under the Proposed Action—i.e., basal area mortality of only 15 percent from thinning and basal area mortality of only 13 percent from fire under extreme fire weather (a total of only 28 percent mortality). Thus, there is a fundamental disconnect in the DEIS between the facts found and the proposed decision, especially in light of the data discussed in the section below about the low levels of beetle mortality generally associated with high levels of basal area and stand density index.** (Chad Hanson, JMP, pg. 1)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence.

Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Analysis Methodology, Measurement indicators for Forest Vegetation, Fuels, and Potential Fire Behavior and Effects section. These measurement indicators focus on residual, post-treatment attributes of forest vegetation structure, density, species composition, and landscape diversity and heterogeneity as residual post-treatment conditions are the best indicator of how well desired conditions as described in Chapter 1 would be met for the project purposes and needs. Simply put, measures that display what remains after treatment best describe whether desired conditions are met; the measure of how much basal area is removed offers little context with regards to desired conditions.

Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Environmental Consequences, Comparison of Effects by Alternatives, Direct and Indirect Effects: Mechanical Thinning Treatments & Cumulative Effects section for a discussion comparing how well each alternative meets the purposes and needs of the project. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A for a discussion on the low density and open canopy nature of desired conditions, and Appendix B for discussion on scale and intensity of fuel treatments and the interaction between fuel treatments and forest health objectives. In general, proposed mechanical treatments under alternatives A and E would remove more trees, canopy cover, and basal area than alternatives C and D, and would better enhance landscape, stand level, and within-stand heterogeneity. While the commenter recognizes that alternative A would mechanically remove more trees relative to alternative C, the comment fails to account that prescribed fire treatments would create more residual mortality in the form of leaving more dead standing trees which would then contribute to future hazardous fuel loads. This effect and the subsequent management considerations are discussed in the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B, Scale and Intensity of Treatment, and Interaction of Fuels and Forest Health Objectives sections.

In addition, the commenter is inappropriately using percent basal area mortality as a measurement indicator. Predicted percent (basal area) mortality is the potential tree mortality as measured by the percent of basal area that would be killed in a fire event occurring under 90th percentile weather conditions as predicted by FFE (Reinhardt and Crookston 2003, Rebain et al. 2010); this is not the percent basal area mortality that would occur as the result of the proposed treatments.

Lastly, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality , Environmental Consequences, Alternative B section, acknowledges that stand growth would continue under the no-action alternative. In these forested systems, net stand growth would likely outpace mortality; however, this does not mean that there isn't an increased potential and susceptibility of these forests to unacceptable levels of mortality. It is well documented in the scientific literature, and the Keddie Ridge Project Forest Health Evaluation that as stand density increases the risk and susceptibility of these forests to unacceptable levels of mortality due to drought, insects, and disease, also increases. Consequently, indicator measures of stand density are used to characterize forest health risks and how this corresponds with the proposed treatments for each alternative. The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Affected Environment and Environmental Consequences, Alternative B and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, Stand density, existing condition of Forest health, and climate change sections all discuss the negative environmental consequences associated with high density stands which has been well documented in the scientific literature.

18. **No rational connection between the facts found and the proposed action: Moreover, the Keddie Forest Vegetation, Fuels, Fire, and Air Quality Report (pp. 49-50) claims that the non-commercial alternative, Alt. C, would leave basal area and stand density index levels that would "NOT" be "within desired conditions" (emphasis in original). Yet, the desired conditions described in the Purpose and Need section of the DEIS make no mention of specific thresholds for basal area or stand density index that must be met; nor does the DEIS explain in any meaningful way the supposed negative consequences that are sought to be avoided by reducing stand density and basal area to the levels in the Proposed Action. Instead, the DEIS merely makes vague references to the potential for some amount of beetle mortality—i.e., future snag recruitment above zero—but does not quantify this expected mortality relative to the mortality that would result from the logging itself.** (Chad Hanson, JMP, pp. 1-2)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. As FVFFAQ #21 and #24 discusses, these measurement indicators are used to display how well alternatives would meet forest health conditions. These measurement indicators and corresponding thresholds have been widely used in scientific literature to display susceptibility of stands to mortality from the combination of drought and bark beetles, and effectively characterizes the risk in these conditions post-treatment for each alternative.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health. The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Environmental Consequences, Alternative B for the negative consequences "that are sought to be avoided by reducing stand density and basal area to the levels in the proposed action."

19. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): First, the DEIS states that stands would be thinned such that their SDI (stand density index) would be no more than 60 percent of limiting or maximum SDI even 20 years after thinning, BUT fails to identify the scientific source or rationale for reducing stand density so severely that stands would still be less than 60 percent of LIMITING SDI at 20 years post-thinning, or provide any rationale or methodology to explain the levels of tree mortality that would likely occur, based upon the scientific data, if stands exceed 60 percent of the chosen SDI threshold/target, relative to the level of tree mortality expected due to cutting and removal of trees with chainsaws under the Project.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency.

Relative density as described in the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, is used as a measurement indicator to compare how well proposed treatments and corresponding silvicultural treatments for all action alternatives would meet desired conditions for forest health, including how well these proposed treatments meet guidance for thinning treatments developed by Region 5 (Blackwell 2004, Landram 2004). The calculation of relative density is based on the maximum stand density index and is described in the FEIS and the Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A. This is consistent with current research definition and application of stand density index (Shaw and Long 2010).

The Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A provides discussion on reference conditions and appropriate stand density levels for stands characteristic of an active-fire stand structure. In addition, Blackwell (2004) provides guidance advising forest managers to develop thinning prescriptions to ensure that stand densities do not exceed an upper limit, for example 60 percent of maximum stand density index, for at least 20 years after thinning. Blackwell (2004) based this recommendation on the increasing incidence of both tree mortality and large fire occurrence in California National Forests which have been subsequently been documented in scientific literature (Miller et al. 2009). The intent was to avoid situations where projects only treat surface and ladder fuels to meet short term fuels objectives while not addressing long term forest health risks. These recommendations are consistent with the latest research on fuels reduction and ecosystem restoration for forested systems of the Sierra Nevada mixed conifer forests (Collins et al. 2011) which suggest that treatment prescriptions that maintain higher densities, maintain high canopy covers, and implement lower diameter limits "may be too conservative with respect to residual stand structure" and "are on the upper end of or entirely exceed the values we report in distributions based on the 1911 data (Fig 3.)"(Collins et al. 2011).

Lastly, please refer to the FEIS, Chapter 2, Alternatives. Under the proposed action, proposed treatments and corresponding silvicultural prescriptions are designed and developed using canopy cover, CWHR type, and upper diameter limits to fully meet the desired conditions as described in the FEIS Chapter 1. All proposed treatments would meet standards and guidelines as directed in the 2004 SNFPA ROD, table 2 (USDA 2004b).

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #21, and #24.

20. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Second, the Vegetation Report (p. 10) cites Oliver (1995), vaguely asserts that beetle mortality occurs above a basal area of 150. However, in the ponderosa pine plots in California within natural forest stands (i.e., not plantations), the densest plots increased to basal areas well over 200 square feet per acre with almost no beetle mortality (i.e., mortality of trees from beetles) after the stands reached about 85 years of age (Oliver 2005, Fig. 1). The stands in the Project area are natural forests over 85 years of age. Oliver (2005) noted that mortality levels have "declined over the years" in the eastside ponderosa pine forests as these forests have grown older and denser. Oliver (2005 [Fig. 1]) found that basal area mortality was minor in ponderosa pine stands above 150 square feet per acre—about 5-15 percent basal area mortality every 10-30 years, while stands gently increased in live tree basal over time.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health.

Oliver (1995) concludes that "Sartwell's threshold of 34 m^2 per ha (150 ft^2 per acre) of basal area above which density stands are susceptible to attack by bark beetles appears to be a reasonable average value for California." In addition, basal area per acre has also been used by Landram (2004) to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (where the Keddie Ridge Project is located), the insect risk thinning guidelines suggest thinning to 150 square feet per acre. These recommendations are consistent with Oliver (2005) who concludes that a primary example of a satellite study of the west wide levels of Growth study in ponderosa pine has demonstrated "the efficacy of low reserve densities in maintaining stand health…Because, most tree mortality whether it is caused by biotic or abiotic factors, is episodic, evaluations of forest health are meaningful only if reserve densities are maintained over a long period of time."

Oliver (2005, Figure 1) does not show as the commenter asserts that "the densest plots increased to basal areas well over 200 square feet per acre with almost no beetle mortality (i.e., mortality of trees from beetles) after the stands reached about 85 years of age" nor does it show that Oliver "found that basal area mortality was minor in ponderosa pine stands above 150 square feet per acre." Contrary to these assertions, Oliver (2005) acknowledges that mortality occurred primarily in plots that had higher reserve densities (p. 75).

The theme of low stand densities in maintaining forest health and improving forest resiliency to disturbances such as drought, insect and disease, and fire, is common among literature describing reference conditions of active-fire stand structure, forest health management, and climate change recommendations. Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion.

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, and #19.

21. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Third, the Vegetation Report (p. 5) acknowledges that the Project area is comprised of mixed-conifer and true fir, not pure ponderosa pine stands, and states that the maximum stand density index (SDI-Max) for mixed-conifer forests is 750 (Vegetation Report, p. 11). The Vegetation Report (pp. 10-11) implies that significant beetle mortality occurs at stand density index (SDI) levels above 55-60 percent of the maximum SDI. However, the Vegetation Report utterly fails to describe the actual level of basal area mortality that can be expected above 60 percent of SDI-Max, and the cited studies on pp. 10-11 of the Vegetation Report do not indicate that basal area mortality from insects when stands exceed 60 percent of the SDI-Max of 750 (i.e., when they exceed an SDI of 450) will exceed the mortality levels from logging itself projected under the Proposed Action.** (Chad Hanson, JMP, pg. 2)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of stand density use, relevant thresholds, and desired conditions. The FEIS states that "Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California." However, goes on to explain that the calculation of this maximum stand density is largely dependent on the mix of species. The Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density further explains that for mixed-species stands like those that occur within the Keddie Ridge Project, Tappenier et al. (2007) describes "several approaches have been recommended for establishing a maximum stand density. Cochran et al. (1994) recommend selecting the SDI of the species with the lowest maximum value, but Hann and Wang (1990) calculate a weighted average SDI in which the weights are the basal area of the respective species." These approaches are also described in Shaw (2006).

A more site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS) which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For, the purpose of this analysis, relative density based on the maximum stand density index as calculated by FVS is used for each individual stand.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, risk for beetle induced mortality, and scientific literature on basal area and stand density and their relation to improving forest health. "Actual levels of basal area mortality that can be expected above 60%" relative density is difficult to quantify due to the limitations of forest growth and yield model (FVS) in simulating insect outbreaks and predicting periods of drought. However, FVS does provide meaningful estimates of stand density and basal area, measures which have been widely used in forest management and scientific literature as indicators of or thresholds of elevated risk for these forest health issues (Powell 1999, Ferrell 1993, Sartwell 1971, Sartwell and Stevens 1975, Oliver 1995, Oliver et al. 1996, Landram 2004, Negron and Popp 2004, Negron et al. 2009). Consequently, the FEIS displays how well each alternative meets these indicators or thresholds which describe elevated risk of bark beetle mortality and display how susceptible forested stands may be to these forest health concerns.

Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Under the proposed action, proposed treatments and corresponding silvicultural prescriptions are designed and developed using canopy cover, CWHR type, and upper diameter limits to fully meet the desired conditions as described in the FEIS Chapter 1. Relative density as described in the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, is used as a measurement indicator to compare how well proposed treatments and corresponding silvicultural treatments for all action alternatives would meet desired conditions for forest health, including how well these proposed treatments meet guidance developed by Region 5 (Blackwell 2004, Landram 2004).

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, and #24.

22. **Failure to divulge methodology, and inaccuracies, regarding stand density and stand density index (SDI): Fourth, the Vegetation Report (p. 11) states that the maximum SDI—i.e., the SDI level used to determine the target SDI percentages—is 750 for mixed-conifer forests like those in the Project Area, as discussed above. However, the FVS outputs for the Keddie Project show that the Forest Service is actually using a much lower SDI-Max value that is has neither**

disclosed nor supported with any scientific data. For example, under Prescription 1 in the FVS Outputs, 40 percent of maximum SDI is listed as 231 in one case, and 39 percent of maximum is listed as 251 in another. In other cases, 46 percent of maximum is listed as 264 and 44 percent of maximum is listed as 297. Whatever methodology was used to derive the maximum and the percentages of maximum, they were not adequately discussed, divulged, or supported with evidence in the DEIS or Vegetation Report. Moreover, as discussed above, the Vegetation Report (p. 11) makes false statements, implying that, because SDI-Max is 750, far higher SDI levels (i.e., far more trees) would be retained than would actually result under the Proposed Action. (Chad Hanson, JMP, pg. 3)

Response: Please refer to response to comment #21. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators, and the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for a discussion of background information, scientific literature, methodology for calculating site-specific maximum stand density.

A site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS) which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding detailed background information, methodology and consistency with scientific literature, and management guidelines on stand density and its relation to reference conditions, climate change, existing conditions, and improving forest health.

For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, and #21.

23. **Scientific Accuracy and Integrity, Generally: The DEIS implies that stands in the Project Area exceed some desired percentage of the maximum stand density index for ponderosa pine-dominated stands. The DEIS fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the DEIS's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future.** (Chad Hanson, JMP, pg. 3)

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Effects Analysis Methodology, Measurement Indicators for a discussion of basal area and stand density use, relevant thresholds, and desired conditions. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A: Stand Density, Reference Conditions, Existing Conditions of Forest Health, Climate Change, and Desired Conditions for further discussion regarding background information, management guidelines, and scientific literature on basal area and stand density and their relation to improving forest health. For responses to related stand density topics, please refer to response to comments FVFFAQ #4, #6, #7, #8, #9, #19, #20, #21, and #22.

For responses related to stand density and its relation to snags and large down woody debris retention and recruitment, please refer to response to comments #3 and #8. Please refer to the FEIS, Chapter 2, Alternatives, Tables 5, 6, and 7 for design criteria for snag retention and residual surface fuels (including large down woody debris). In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Implementation of heterogeneity and Tree Selection guidelines items #5 "Damaged, "Defect" and Wildlife Retention Trees, and #7 Snag Retention guidelines. These guidelines provide further direction on 1) retaining trees that serve as suitable wildlife habitat structures, 2) snag retention and recruitment, and 3) large down woody debris retention and recruitment.

24. **Scientific Accuracy and Integrity, Generally: The DEIS fails to provide information about the number, or basal area, of trees that would be removed through mechanical thinning relative to the number/basal-area that would be expected to die due to competition mortality as SDI increases, e.g., as predicted by Oliver (1995); and the DEIS fails to explain why mortality of trees through chainsaws and removal to timber mills is "restoration" and "forest health" enhancement, while natural mortality of a similar (or lower) number of trees through competition, and resulting creation/recruitment of ecologically-important snags for cavity-nesting wildlife, would somehow be ecologically harmful.** (Chad Hanson, JMP, pg. 3)

Response: Please refer to the FEIS, Appendix A, tables 2, 4, 6, and 8 for number of trees, basal area, and canopy cover before and after treatments. In addition, during the comment period, FVS outputs for each stand and prescription were provided showing number of trees per acre by diameter class and basal area per acre, both before and after treatments. Lastly the FEIS, Appendix D, Economic Analysis provides a relative estimate of volume of harvested trees by species both greater than 24 inches in diameter and less than 24 inches in diameter by alternative. These data display the existing condition and stand attributes and post-treatment condition and stand attributes and also show, by default, umber and basal area of trees to be harvested and removed. However, breakdown of number of trees or basal area of trees removed are a poor indicator of whether a) desired conditions, b) concepts within the GTR are met, or c) environmental effects to forest vegetation, fuels, and fire behavior, because this focuses on what is being *removed*, not what conditions *remain* after the treatment. Comparisons of Pre-treatment and Post-treatment stand conditions are far more applicable to how well desired conditions are met.

Please refer to the FEIS, Chapter 1, Purpose and Need for desired conditions for fuels reduction and forest health. This section describes the need for action to reduce hazardous fuel accumulations, improve forest health, protect and enhance habitat for Region 5 Forest Service sensitive plant and wildlife species, improve watershed health, and reduce noxious weed infestations. Under the Proposed Action, proposed treatments were designed to fully meet these purpose and needs. Please refer to the FEIS Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Measurement Indicators and Environmental Consequences including comparison of alternatives for a discussion on the measurement indicators used to analyze alternatives effects and effectiveness in meeting desired conditions in terms of forest structure and composition, landscape heterogeneity, and fuels and fire behavior. In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendices A and C for existing pre-treatment and residual post-treatment conditions with regards to the measurement indicators. The FEIS Appendix A, tables 2, 4, 6, and 8 also displays more unit specific post treatment stand conditions and ranges in conditions after treatment for each alternative.

The FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment and Environmental Consequences, Alternative B discusses the environmental effects of allowing " natural mortality through competition". Furthermore, this The FEIS discusses that by maintaining high stand densities and allowing natural mortality through competition, stands are at higher risk to large scale mortality from insect and disease outbreaks which may be exacerbated by periods of drought. This is well documented in past the scientific literature (Guarin and Taylor 2005, Macomber and Woodcock 1994, Fettig et al. 2007, Ferrell 1993,Ferrell 1996, Powell 1999, Egan et al 2010). In addition, the Forest Vegetation, Fuels, Fire, and Air Quality report Appendix A further discusses how these trends have the potential to intensify with climate change and affect valuable landscape attributes such as large diameter trees (Battles 2008, Lutz et al. 2009). The Keddie Ridge Project specific Forest Health evaluation (Cluck and Woodruff 2010) recognizes that stands within the project "are at a high risk to bark beetle caused tree mortality due to overstocked conditions and could experience unacceptable levels of tree mortality in the future." Once these beetle and/or disease outbreaks begin, management options to control such outbreaks are limited, especially when exacerbated by periods of drought. It is also well documented in the scientific literature (Ferrell 1996, Fettig et al 2007, Egan et al. 2010) that the most effective methods to reduce risk of unacceptable levels of tree mortality is through preventative silvicultural techniques, particularly thinning to reduce stand density.

Consequently allowing natural mortality through competition would not meet the project purposes and needs for action and would leave the landscape susceptible to mortality caused by drought, insects, disease, and fire.

In addition, please refer to response to comments FVFFAQ #3, #8, and #24 for additional discussion on snag and large down woody debris retention and recruitment.

25. **Effect of stand density reduction on future large snag levels and Wildlife, B. Effects and cumulative effects of targeting dense mature stands: Further, the HFGLG Final EIS (QLG FEIS) states on page 3-58 that the eastside forests of the QLG project area are seriously deficient in dense, mature and old growth forest habitat, and have too many openings relative to historic times. As such, the QLG FEIS states for eastside forests:**

"Due to the existing condition, it is probable that stands having mid-seral size class and density attributes (seral stages…H-3B/C, H-4A) would be adversely impacted by group selection because

these areas would be targeted for treatment and not protected by interim direction for California spotted owl. In addition to changes to the tree size class attribute of mid-seral to late-seral stands is the effect of openings. In contrast to the west slope of the planning areas, mid-seral and uneven-aged eastside mixed conifer and pine stands have far more and larger anthropogenic openings (wildfire burns, regeneration cuts, roads, skid trails, landings) today than those cause by adaphic [sic] and stochastic factors (rock outcrops, insect patches, patch burns, windthrow) in the past. As eastside fir and mixed conifer mid-seral stands increase their late-seral values the creation of more openings and removal of the larger trees would increase earlier seral attributes creating a further imbalance in the quantity of land now occupied by the various seral stages. As for eastside pine, thinning would promote later seral values, but group selection would reverse the trend for mid-seral stands."

Seral stage H-3B/C is defined as having trees 12-23.9 inches in diameter and canopy cover of more than 40 percent (with H-3C being the highest canopy cover). Plumas Forest Plan, Appendix E, pp. 1-2. Seral stage H-3B/C is equivalent to CWHR 4M and 4D. In other words, there are now more openings and more open forests on the eastside of the northern Sierra Nevada than there were historically, and fewer dense, old forests. This is a special concern, given the fact that the Project appears to target dense, old stands. These dense, mature forest areas are the areas that are capable of producing (recruiting) large snags through competition between trees. If such habitat areas are already in deficit on the eastside, as the QLG FEIS states, then the Project would have significant adverse cumulative effects—i.e., cumulative effects on native wildlife species dependent upon high densities of large snags within green forests. (Chad Hanson, JMP, , pg. 4)

Response: Please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Introduction. The Keddie Ridge Project is not located in the "eastside forests of the QLG project area". The Keddie Ridge Project is located primarily in the transition zone – an ecological zone used to describe the transition between the wet productive westside forests of the Sierra Nevada and the relatively dry, less productive eastside forests of the Sierra Nevada as described by the HFQLG FEIS (USDA 1999).

Furthermore, the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Affected Environment displays that the majority of NFS lands within the analysis area for Forest Vegetation, Fuels, Fire, and Air Quality are mid-seral closed canopy stands characterized by CWHR 4M and 4D. The affected environment described the high density and homogenous nature of these stands. Because such stand structure has increased vulnerability to high-severity fires, insect outbreak, and landscape level drought-induced mortality, a homogenous occurrence of this seral stage across the landscape is unstable (McKelvey and Johnston 1992, Millar et al. 2007). A more diverse distribution of seral stages, characterized by heterogeneous stand structures, may be more resilient to disturbance events such as fire, drought, and insect and disease infestations and more characteristic of desired conditions (Stephens and Fule 2005, Millar et al. 2007, Collins and Stephens 2010).

Please refer to the FEIS, Chapter 3, Environmental Consequences, Cumulative Effects and Comparison of Alternatives, for a discussion on how proposed alternatives and corresponding treatments may affect landscape level heterogeneity with regards to seral stages as represented by CWHR size class and density. Proposed treatments under alternatives A and E would convert mid-seral canopy stands (CWHR 4M and 4D) stands into open canopy stands (CWHR 4P) and create conditions that reduce inter tree competition and accelerate the growth and development of large diameter trees. This would enhance heterogeneity at the landscape and stand levels and promote the development of later seral open canopy stands as described in the desired conditions for forest health.

In addition, please refer to response to comments FVFFAQ #3, #8, and #24 for additional discussion on snag and large down woody debris retention and recruitment.

26. **Misrepresentation of fire effects and failure to discuss the ecological importance of mixed-intensity fire: The DEIS fails to adequately discuss the fact that, historically, there was always some mix in fire intensities in the forests of the northern Sierra Nevada and eastside Cascades, and high-intensity fire patches were both common and natural (Beaty and Taylor 2001, Bekker and Taylor 2001, Hessburg et al. 2007, Bekker and Taylor 2010). Bekker and Taylor (2010) found that, in an unmanaged area of the Lassen National Forest within mixed-conifer forests, the fires burned mostly at high-intensity historically, with some high-intensity fire patches being thousands of acres in size. Bekker and Taylor (2010) concluded that "high-severity fire was important in shaping stand structure" historically. Further, the Project documents fail to discuss the fact that patches of high-intensity fire support very high levels of native biodiversity and many wildlife species depend upon such habitat (Hutto 1995, Hutto 2006, Noss et al. 2006, Hanson 2010, Swanson et al. 2010). The DEIS describes fire intensities other than low intensity as being wholly negative for the forest ecosystem and the wildlife species that inhabit it, and this is inaccurate.** (Chad Hanson, JMP, pp. 4-5)

Response: Please refer to the FEIS, Chapter 1, Purpose and Need, Purpose 1 Reducing Hazardous Fuel Accumulation. The objective is to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources. The FEIS, Chapter 1, Purpose and Need, Background provides a recent and local example of how high severity wildfire has impacted biological resources, and the Purpose and Need 1 discuss the need for action. The desired condition is an uneven-aged multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire.

In addition please refer to the FEIS, Chapter 2, Alternatives considered but eliminated from detailed study, Alternative F. The 2004 SNFPA ROD does not include the incorporation of high severity effects within prescribed fire treatments.

In addition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report Appendix B, Fuels Reduction, Need for Fuels Reduction. Many studies such as Bekker and Taylor (2001), Beaty and Taylor (2001), and Hessburg et al. (2007), Miller et al. (2009), and Collins and Stephens (2010) have discussed the occurrence of moderate, high, and mixed severity occurrences within dry mixed conifer forests of the Cascades and Sierra Nevada ranges. However, Fire Regime data for the Keddie Ridge Project area indicates that over 96 percent of stands proposed for treatment within the Keddie Ridge Project fall within Fire Regime I, a fire regime characterized by frequent primarily low to mixed severity fire.

Concerning high severity patch sizes, recent large wildfires are very different from presettlement fires with respect to the average sizes of patches of high severity fire within the fire perimeter. High severity patches more than a few acres in size were unusual in fires in the Sierra Nevada before Euroamerican settlement (Show and Kotok 1924, Kilgore 1973, Stephenson et al 1991, Weatherspoon et al. 1992, Skinner 1995, Skinner and Chang 1996, Weatherspoon and Skinner 1996, Safford 2007, Safford pers. comm. 2008a, Safford 2008b). Miller et al. (2008) have also shown trends indicating that the average size of high severity patches in Sierra Nevada wildfires has increased (by about 100 percent) over the last 25 years (Safford pers. comm.. 2008a, Safford 2008b).

While the occurrence of fire (including low, moderate, and high severity fire) on the landscape is a natural disturbance that is essential to ecosystem function, the large scale of these fires, particularly the vast proportion that burned under high severity, are well outside the natural range of variability in fire size and severity experienced on the Plumas National Forest in the past and are uncharacteristic of the "natural" fire regimes typically described for the dry Sierra Nevada forests (Peterson et al 2009, Miller 2008, Safford 2007, Safford et al. 2007, Safford 2008b, Stephens et al 2007, Beaty and Taylor 2007, Moody and Stephens 2002, , Gruell 2001, McKelvey et al. 1996, Weatherspoon 1996, Weatherspoon and Skinner 1996, Skinner and Chang 1996, McKelvey and Johnston 1992, Leiberg 1902,).

As stated above, for the purposes of the Keddie Ridge Project, fuels treatments are designed to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources and to create open forest conditions where fire severity is reduced. The FEIS, Chapter 3 Forest Vegetation, Fuels, Fire, and Air Quality Section, Affected Environment shows that within the Keddie Ridge Project, forested stands are highly vulnerable to the effects of uncharacteristically severe wildfire – over 70 percent of NFS lands within the analysis area have a high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components.

27. The DEIS fails to explain why, for fire and fuels purposes, it proposes to remove many mature fire-resistant trees up to 20 or 30 inches in diameter. Contrary to the implication of the DEIS, removal of intermediate-sized trees is unnecessary where the purpose is to effectively reduce the potential for severe fire. Recent scientific studies have found that precommercial thinning of sapling and pole-sized trees only (up to 8-10 inches in diameter) effectively reduces fire severity. See, for example:

   a. Omi, P.N., and E.J. Martinson. 2002. Effects of fuels treatment on wildfire severity. Final report. Joint Fire Science Program Governing Board, Western Forest Fire Research Center, Colorado State University, Fort Collins, CO. Available from http://www.cnr.colostate.edu/frws/research/westfire/finalreport.pdf (found that precommercial thinning of trees under 8 to 10 inches in diameter reduced potential for severe fire (email communication with the authors confirmed that trees removed were of this small size class)). More specifically, the Omi and Martinson (2002) study, found that

precommercial thinning reduced stand damage (a measure of fire severity generally related to stand mortality) in both of the two thinned study sites, Cerro Grande and Hi Meadow (the authors reported that the Hi Meadow site was marginally significant, p<.1, perhaps due to small sample size), each with several plots.

b. **Martinson, E.J., and P.N. Omi. 2003. Performance of fuel treatments subjected to wildfires. USDA Forest Service Proceedings RMRS-P-29 (found that non-commercial thinning of submerchantable-sized trees, generally followed by slash burning or removal, in several areas across the western U.S. greatly reduced fire severity, and that this result held true regardless of post-thinning basal area density).**

c. **Strom, B.A., and P.Z. Fule. 2007. Pre-wildfire fuel treatments affect long-term ponderosa pine forest dynamics. International Journal of Wildland Fire 16: 128-138 (non-commercial thinning of very small trees under 20 cm dbh (8 inches dbh) in seven different sites dramatically reduced fire severity, resulting in post-fire basal area mortality of only about 28 percent (low severity) in non-commercially thinned areas versus post-fire basal area mortality of about 86 percent in untreated areas).** (Chad Hanson, JMP, , pp. 6-7, Thinning and Fire Severity)

Response: Please refer to the response to comments FVFFAQ #11 and #12. In addition, please refer to the FEIS, Chapter 2, Alternatives. The Keddie Ridge Project FEIS analyzes in detail four action alternatives which treat fuels to varying degrees. Alternative C, the non commercial funding alternative, is designed with the singular purpose of meeting the purpose and need for fuels reduction. This alternative would implement a substantially lower upper diameter limit of 12 inches dbh and consequently would implement treatments similar to those described by literature and cited by the commenter. Alternative D, the 2001 compliant alternative, would implement lower upper diameter limits of 12 to 20 inches, would maintain higher amounts of canopy cover (50 percent), and would maintain 15 to 25 percent of the treatment area left untreated. In addition, nearly half of the acres proposed for treatment in all action alternatives include prescribed fire only or hand thinning treatments described by literature and cited by the commenter; However, alternatives A and E also propose a wider range and diversity of treatment intensities.

Please refer to the Forest Vegetation, Fuels, Fire, and Air Quality report, Appendix B, Fuels reduction. While these alternatives would meet or partially meet immediate fuels reduction goals, alternatives C and D would only and uniformly implement low intensity thinning treatments that would not fully meet the forest health goals. Forest health desired conditions include creating open forest stands that are generally low in stand density, characteristic of an active-fire regime stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought fire, and insect and disease occurrences. Please refer to the FEIS, Chapter 2, Comparison of alternatives, and the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality Section, Environmental Consequences, Comparison of Alternatives. The lower intensity treatments proposed under alternatives C and D do not meet desired conditions described for forest health.

Moghaddas et al. (2010) emphasize that “there is no one fuel treatment strategy…rather a combination of strategies is needed, especially when dealing with complex landscapes and management objectives (Stephens et al. 2010).” This is particularly important with regards to the multiple management objectives as described in the FEIS, Chapter 1, Purpose and Needs. Treatments that may meet fuels reduction objectives, may not meet other project objectives such as forest health.

28. **The proposed action for alternatives A and E do not have the appropriate number of acres of group selection as directed by the HFQLG Act. Group Selection units are to be located primarily in CWHR 4M Stands. The NFS lands within the project area contain approximately 16,230 acres of CWHR 4M Stands. The total acres of CWHR stands proposed for treatment in both alternative A and E is 3,998. Using the total acres proposed for treatment multiplying the yearly harvest level percentage of 0.57 and on a 20-year re-entry cycle results in 456 acres. Alternative A and E have identified 284 and 326 acres of group selection respectively. As of 2009, the HFQLG Pilot Project has accomplished 7,600 acres of group selection, which represents 18 percent of the total 43,000 acres originally identified in the HFQLG ROD. We have experienced this shortfall on a project level throughout the HFQLG Pilot Project Area. The agency, by not meeting this target has failed to promote stand restructuring and has severely impaired the economic viability of these projects. We request that both alternatives have the maximum number of acres allowed under the act be placed on the landscape within the project area.** (Tom Downing, Sierra Pacific Industries, pg. 1)

Response: Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail. Alternatives A and E proposed 2,882 acres of mechanical thinning or group selection treatments in DFPZ and Area Thinning units where commercial forest products would be harvested. Alternative E proposes 326 acres of group selection which is 11.3 percent of the area to be treated. The 11.3 percent based on a 20 year re-entry cycle is approximately equivalent to 5.7 percent based on a 10 year re-entry cycle as specified by the HFQLG FEIS and ROD. Under Alternative A, proposed acreage of group selection treatments was reduced to based on resource concerns raised during scoping, existing conditions and desired conditions, and the conceptual framework discussed in the PSW-GTR-220 (North et al. 2009). Alternative A proposes 284 acres of group selection treatments which is 9.9 percent of the area to be treated based on a 20 year re-entry cycle. For additional information regarding alternative development and design, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C, Alternatives A and E.

29. **Unit 84 in 2006 was to be mechanically thinned. In 2011, the treatment is hand pile and burn trees less than 8 inches DBH and underburn. Mechanically treating this unit as a DFPZ or area thin is being consistent with the purpose and heed of the project. Treating this unit by hand thinning will not result in significant fuels reduction, improve stand health, or contribute to the protection or enhancement of habitat for sensitive species.** (Tom Downing, Sierra Pacific Industries, pg. 2).

Response: Please refer to the FEIS Chapter 1, Purpose and Needs, Purpose 2: Improve Forest Health for a discussion of objectives, the need for action, desired conditions, and measures of modifying forest structure and species composition. Forest health desired conditions include creating open canopy stands of large fire resistant trees that are generally low in stand density, characteristic of an active-fire stand structure, to promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrence. Between 2006 and the proposed action, concerns regarding occurrences of noxious weeds within proximity of the unit were identified. Please refer to the FEIS, Appendix A table 2. The Forest Vegetation ,Fuels, Fire, and Air Quality analysis indicates that for this unit, hand thinning treatments would create an open canopy stand (approximately 37 percent canopy cover) of low density (approximately 31 percent relative density) and would effectively reduce ladder fuels and potential fire behavior and effects. Therefore, the proposed treatment would still meet desired conditions as described in the FEIS, Chapter 1, Purpose and Need for Reducing hazardous fuel accumulations and Improving forest health.

30. **EPA acknowledges the importance of the project's goals to improve forest and watershed health, reduce fuel loading, and protect and enhance habitat for sensitive plant and wildlife species. The preferred alternative (Alternative A) proposes to construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs) and to decommission on mile of roads. We recognize the long term benefits of decreasing wildfire risk, and we support the inclusion of the resource protection measures and best management practices described in the DEIS. We have rated the DEIS as Lack of Objections.** (Kathleen Goforth, Environmental Protection Agency, pg. 1).

Response: Noted.

31. **We recommend the FEIS include a more detailed description of climate change and the implications for successful reforestation. The DEIS notes climate change trends, such as summer drought, may increase the frequency and severity of wildfires (p. 229). We encourage the Forest Service to elaborate on aspects of the project's monitoring related to climate change, including temperature and precipitation, and how they can be incorporated into the goals of successful fuel management and watershed restoration. For example, describe and evaluate projected climate change impacts on the severity and frequency of insect outbreaks, droughts, and fire seasons in the Plumas National Forest and how these anticipated effects will impact the Keddie Ridge project's objectives of forest and watershed health. WE encourage such discussion in NEPA documents since it contributes to improved federal decision-making and public understanding of the effects of climate change on forest ecosystems and forest management, particularly the effects of hotter and drier conditions in stressing trees and contributing to the increasing frequency of bark beetle outbreaks.** (Kathleen Goforth, Environmental Protection Agency, pg. 1).

Response: Please refer to the FEIS, Chapter 1, Purpose and Needs, Purpose 2, Improving forest health. The desired condition for forest health includes improving forest resiliency to drought, fire, and insect and disease occurrences. In addition, please refer to the FEIS, Chapter 3, Forest Vegetation, Fuels, Fire, and Air Quality section, Environmental Consequences, Comparison of Effects by Alternative ,Direct and Indirect Effects : Air Quality, Cumulative Effects: Air Quality, and Climate change considerations for a discussion of air quality and considerations regarding climate change. In addition, the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A includes discussion regarding climate change, likely trends in climate change, uncertainty in climate change, and a project level discussion regarding proposed alternatives and climate change. Lastly, the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B includes discussion on the need for fuel treatments, the scale and intensity of proposed treatments under the alternatives, and the interaction of fuels and forest health objectives.

32. **What is the reason for eliminating the use of Borax for control of root diseases from [Alternative E]?** (Frank Stewart, Counties' QLG Forester, pp. 1-2)

Response: Please refer to the commenter's April 26, 2010 comment letter requesting that the use of "herbicides" be pulled from the project proposal due to potential appeals and challenges. Borax is a fungicide which requires the equivalent analysis as an herbicide and has received similar comments and potential appeals on past vegetation management projects. Consequently, alternative E does not include any herbicide or fungicide treatments.

Wildlife: Terrestrial and Aquatic (WL)

1. **The DEIS fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the DEIS's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future.** (Chad Hanson, JMP, pg. 3)

Response: The proposed action is designed to treat a small percentage of the landbase in strategically located stands to reduce, protect and maintain habitat attributes at the larger scale landscape, which support key wildlife species and biodiversity. It is acknowledged that treatments at the stand level remove attributes that contribute to suitable forest dependent wildlife habitat. This occurs on 5,953 acres over a total of 66,040 acres (9 percent of the analyzed Forest System land in the wildlife analysis area). Yet at the stand scale, treatments maintain and create elements of biodiversity not found on the landscape, including open canopied stands composed of large trees, interspersed with small gaps and openings. This is actually moving biodiversity in a positive way, creating habitat not well represented from habitat considered abundant, and protecting this habitat from stand replacing fire. Please refer to response to comments WL#2, FVFFAQ #23.

2. **The DEIS shows that there are currently low levels of large (over 15 inches in diameter) snags per acre in the Project Area, relative to the needs of many cavity-nesting wildlife species. Yet the DEIS utterly fails to provide any quantitative estimate of the density of large snags within the Project area within coming decades after Project implementation (e.g., 10, 20, 30 years after logging), or any analysis of adverse impacts to cavity-nesting species due to further reductions in large snag densities in future decades from stand density reduction, reduced competition between trees, and the consequent reduction in large snag recruitment. This is a major concern because, due to proposed stand density reduction, large snag densities could remain at deficient**

levels relative to minimum wildlife needs for decades if the Project is implemented. The DEIS does not analyze the adverse impacts of stand density reduction, and perpetuating large snag deficits, on wildlife species that depend directly or indirectly upon substantial large snag densities, including California spotted owl (Sensitive Species), Northern Goshawk (Sensitive Species), Hairy Woodpecker (MIS), and Pileated Woodpecker. (Chad Hanson, JMP, pp. 3-4)

Response:. Table 12 in the FEIS (p.58) presents existing conditions of forested stands in the project area. On average, snags per acre greater than 15" dbh exist at 3/acre in CWHR 4 and CWHR 5 stands. For a discussion on how natural background levels of mortality and project treatments scale and intensity from the perspective of reducing stand density and reducing competition between trees would contribute to future snag recruitment please refer to response to comment FVFFAQ #8. Please refer to FEIS, Chapter 2, Alternatives Considered in Detail, Design Criteria common to all action Alternatives and response to comment FVFFAQ #3 for snag retention design criteria.

The wildlife analysis presented in the FEIS Chapter 3, BE, and MIS Report discusses impacts at the stand and landscape level. Many habitat factors were considered, including within stand structural changes (basal area, canopy cover, snags/acre) and the impacts these changes have on habitat suitability and habitat functionality at both the stand and landscape scales. Analysis of California spotted owl, northern goshawk, and Hairy woodpecker (MIS) are documented in the aforementioned reports. The pileated woodpecker is not specifically analyzed; it is not a TES or MIS species. Habitat provided by snags in Green Forest is analyzed at the project scale and is represented through analysis with the Hairy woodpecker. The pileated woodpecker is a species that uses snags in both green and burned forest. There is no burned forest in the Keddie Ridge Project treatments, thus the changes to habitat for the Hairy woodpecker are representative of direct impacts to snag densities for pileated woodpeckers. In addition, the green forest habitat analysis conducted for goshawks and spotted owl also represent habitat impacts to habitats used by pileated woodpeckers.

Under the Keddie Ridge Project snags would not be designated for removal unless it is a hazard tree, and where large down woody desired conditions are not met, snags would be left for wildlife habitat. Please refer to response to comment WL #13, FVFFAQ #3, and FVFFAQ #8.

3. **The Project documents fail to discuss the fact that patches of high-intensity fire support very high levels of native biodiversity and many wildlife species depend upon such habitat (Hutto 1995, Hutto 2006, Noss et al. 2006, Hanson 2010, Swanson et al. 2010). The DEIS describes fire intensities other than low intensity as being wholly negative for the forest ecosystem and the wildlife species that inhabit it, and this is inaccurate.** (Chad Hanson, JMP, pg. 5)

Response: The FEIS, Chapter 3 Forest Vegetation, Fuels, Fire, and Air Quality, Affected Environment shows that within the Keddie Ridge Project, forested stands are highly vulnerable to the effects of uncharacteristically severe wildfire – over 70 percent of NFS lands within the analysis area have a high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Please see response to comment FVFFAQ #26.

The Keddie Ridge Project proposes to treat 5,953 acres to meet desired conditions of an uneven-aged multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Reducing hazardous fuels would meet the objective of modifying fire behavior to protect communities, fire fighters, and biological resources. Approximately 60,000 acres of Forest System lands in the analysis area would remain untreated, with the majority of this acreage remaining highly vulnerable to the effects of uncharacteristically severe wildfire. Therefore, the proposed actions do not preclude high severity burns from occurring in the majority of lands being left untreated. Rather they would reduce the potential of large scale high severity wildfires from occurring in the project area. The effects from the Moonlight Fire of 2007, which burned thru similar habitat conditions which exist in the Keddie Ridge Project area, resulted in high amounts of continuous forest cover fragmentation and severe adverse effects to wildlife species which depend on forested conditions (USDA 2009c).

Early seral habitat created by high intensity wildfires such as the Moonlight Fire of 2007 is discussed in the FEIS (p.151) and BE (p.66). It is acknowledged in the FEIS/BE that such habitat created by wildfire 'are used extensively by early seral and midseral wildlife species but not used by species requiring old forest and continuous forest conifer cover.'(ibid). For a discussion of project impacts to early seral habitat please refer to pages 19-23 of the MIS Report.

4. **In December of 2006, the District sent out a scoping letter stating the proposed action with a map of units and treatments. Unit 84 in 2006 was to be mechanically thinned. In 2011, the treatment is hand thin, pile, and burn trees less than 8 inches DBH and underburn. Mechanically treating this unit as a DFPZ or are thin is being consistent with the purpose and need of the project. Treating this unit by hand thinning will not result in significant fuels reduction, improve stand health, and contribute to the protection or enhancement of habitat for sensitive species.** (Tom Downing, SPI, pg. 2)

Response: A Northern goshawk Protected Activity Center was delineated between 2006 and 2010. The logging system for unit 84 was changed to reduce the impacts to the new PAC and group selections were not permitted. Refer to the FEIS, Appendix A, Tables 1, 3, 5, and 7 for unit specific information.

California Spotted Owl

5. **The project reduces spotted owl habitat quality in the project area to unacceptable levels. Basal area is below recommended levels by owl experts. The BE and DEIS estimate 160-320 ft^2 per acre basal area provides optimal spotted owl habitat (DEIS p. 146). Verner et al. (1992) provides a similar estimate. However, the Keddie project maintains less than even the lowest basal area, 140 ft^2 per acre, in CWHR 4 habitat, and 165ft^2 in CWHR 5 (BE p.146). High quality spotted owl habitat is rare, 10 out of 13 HRCAs have less than 62 percent habitat even for foraging (BE p.64) and should be maintained to support existing owls an provide dispersal, especially in light of the declining status of owls in the Lassen demographic study area.** (, Thomas et al., FL, pg. 2)

Response: Impacts to spotted owls and spotted owl habitat resulting from the Keddie Ridge Project are discussed and displayed in the BE (pgs. 57-70) and the FEIS (pgs. 143-154). Seventy-five percent of the CHWR 4M/4D and CWHR 5M/5D habitat treated under the Keddie Ridge Project (3,282 out of 4,368 acres) would be maintained at conditions recognized by the U.S. Fish and Wildlife Service (USDI 2006) as suitable for the California spotted owl (i.e. stands of trees 12 inches in diameter or greater, with canopy cover 40 percent or greater). Basal area was recognized in the BE and DEIS as an important habitat component to the owl and the effects to basal area in treated CWHR 4 and CWHR 5 stands disclosed. These basal area effects do not necessarily reduce stand conditions to unsuitable nor do they reduce owl habitat quality to unacceptable levels, as the commenter suggests. The basal area amounts that would be maintained falls within acceptable levels for the owl and in CWHR 5 stands would remain in the optimal basal area level (above 160 ft^2 per acre).

Page 64 of the BE that the commenter references does not discuss or show the amount of suitable owl habitat in HRCAs. Rather, it summarizes the effects of project treatments to habitat in thirteen 1.5 mile radius home ranges (4,500 acres), which is a much larger area than HRCAs (approximately 700 acres). Only Forest Service system lands were summarized in this home range analysis. A significant amount of private forested land is present in many of the 13 home ranges, which is acknowledged in the BE and DEIS as likely providing additional suitable habitat to the owl than what is shown in Table 12. Table 12 summarizes existing conditions and project treatment effects to all suitable owl habitat on Forest Service system land in owl home ranges, not just foraging habitat as the commenter states.

The HRCA analysis is discussed on pages 60-61 of the BE and Table 10 (pg. 61, BE). This analysis shows that 6 of 8 HRCA affected by the Keddie Ridge Project would be maintained at 80 percent or greater suitable habitat (4 above 90 percent). The remaining two HRCAs would have 69 percent and 74 percent suitable habitat.

The Lassen Demographic study does still show declines in this study area, but the PLAS owl module reports (2008-2010) indicate that populations in the study areas on the Plumas are stable. This is considered more site specific than the Lassen Demography study

6. **Canopy cover is reduced beyond suitable levels for spotted owl. The risk assessment in the BE (p.29), indicates that closed canopy conditions in the project area will not be retained and that there is a risk to more than half of the owl sites affected by the project area. Overall, canopy cover in DFPZs in CWHR 4 would be 30-40 percent (DEIS p.10-12). This is below the threshold at which owls are normally known to occur (DEIS p.124).** (Thomas et al., FL, pg. 2)

Response: Effects to spotted owls and spotted owl habitat resulting from the Keddie Ridge Project are discussed and displayed in the BE (p. 57-70) and the FEIS (p. 143-154). These sections show that 25 percent of owl habitat after treatment (1,086 of 4,368 acres) would be reduced to an unsuitable condition, due to the maintenance of canopy cover conditions below 40 percent. This reduced amount comprises a 3 percent reduction in all suitable owl habitat in the analysis area (BE, pg.46, DEIS, pg. 139). Therefore, contrary to the commenter’s statement, the majority of existing closed canopy conditions would be retained post-project. The commenter is in error in reference to a risk assessment in the BE (p.29). There is no such risk assessment in the BE on that page or in any part of the BE that states the closed canopy condition risk the commenter is referring to.

The commenter's statement that canopy cover in DFPZs in CWHR 4 would overall be 30-40 percent is incorrect. Out of the approximate 5,175 acres of DFPZ proposed, 3,065 acres fall within CHWR 4M/4D stands. The three DFPZ treatments (out of eleven proposed) that would result in thinning CWHR 4 stands to below 40 percent canopy cover (FEIS, p. 11-12) fall within approximately 1,080 acres. This amount comprises 35 percent of the CWHR 4M/4D stands to be treated to DFPZ standards. Therefore, 65 percent of DFPZs in CWHR 4M/4D would not be reduced to below 40 percent canopy cover.

DFPZ's have never been designed to maintain owl habitat within the DFPZ treatment area; DFPZ landbase is devoted to a specific objective – alter fire behavior to allow for firefighters to suppress and keep fire from burning into larger blocks of forested habitat. Based on PLAS monitoring of the Meadow Valley Project Area, owl numbers have fluctuated during the life of the monitoring, both pre and post DFPZ/group selection implementation, but overall owl numbers have been stable in the Meadow Valley project area, which means implementation of DFPZ's between 30-50 percent canopy cover, at least in the short term, is still providing not only adult survival and persistence, but also successful reproduction.

7. **The Keddie BE identifies 16 PACs in the Keddie analysis area but only 6 nestlings have been found in the project area over a 10-year survey period.** (Thomas et al., FL, pg. 2)

Response: The commenter is referring to Table 4 of the BE (pg. 29). This table shows territorial status of 16 PACs, based on survey results from various years since 2002, a 9-year period. This table shows that only the 3 PLAS study area PACs have been surveyed each year since 2002. These three PACs account for 5 of the 6 nestlings shown in Table 4. Of the remaining PACs, 8 have been surveyed over two years, 2 have been surveyed 4 years, and 2 PACs not surveyed at all during this period. Table 4 does not, as the commenter infers, reflect ten years of surveys in each individual PAC.

8. **A primary focus for management should be to avoid "actions which further reduce the survival probabilities for adult females (which) will have disproportionately large and negative effects on population growth rate.**

As stated by leading owl scientists, *"[G]iven the current trend in California spotted owl populations, the most positive step that can be taken to reverse the apparent decline is to identify, and implement, those actions that will lead to increases in adult survival probabilities. Owl studies to date suggest that this will occur with increased retention and recruitment of large trees and retention of closed-canopy conditions throughout the Sierra Nevada landscape." (Blakesley et al. 2001, p. 675) (Emphasis added).* Recent updates to the spotted owl demography study incorporating 2005-2010 data indicate an ongoing decline in the Lassen study area (J.Keane, personal communication, February 3, 2011). This recent finding underscores the importance of implementing fuel reduction projects that protect old forest stand structure and species, and to avoid contributing to protected species population decline, as required by NFMA. (Thomas et al., FL, pp. 2-3)

Response: Actions designed to reduce stand density in strategic areas so that wildfires would burn less severe and thus destroy less acres of limited habitat is viewed as a large scale action that would protect important habitat blocks and habitat features that would "lead to increases in adult survival probabilities". Areas identified for owl management would be better protected from stand replacing events. Out of the 16 PACs in the analysis area, only 2 would be entered for a low intensity underburn treatment, which would result in no change to habitat suitability for the owl (BE, p.57). The BE (p.61) discloses that 8 of the 15 HRCAs in the Keddie Ridge Project would be entered for treatments. Four HRCAs would experience a reduction in suitable owl habitat due to canopy cover reductions and group selections (Table 10, BE, p.61). Six of the 8 treated HRCAs would maintain 80 percent or greater owl suitable habitat. The remaining two HRCAs would have post-treatment 69 percent and 74 percent suitability.

Mechanical thinning treatments would reduce canopy cover to lower limits within mid-seral CWHR 4M and 4D stands to accelerate growth of residual trees into late-seral open canopy stands characterized by CWHR 5. Thinning treatments in CWHR 5 stands and Riparian Habitat Conservation Areas would maintain more closed-canopy conditions as well as more intermediate and large-sized trees to retain later seral structure. On average, 97 percent of trees greater than 20 inches DBH would be retained in the Keddie Ridge Project area (FEIS, p.76).

9. **Research on habitat characteristics of areas similar in size to HRCAs supports the critical importance of retaining high quality habitat with large trees and high canopy cover in spotted owl territories. This correlates to higher owl occupancy and survival.** (Thomas et al., FL, pg.3,)

Response: The effects analysis for owl territories treated under the Keddie Ridge Project is based on suitable habitat availability on the PAC/HRCA level, the 500-acre nest core level, and the 4,500 acre home range scale. This analysis (BE, p.57-58, p.61-64) discloses that the majority of high quality habitat at each of these territorial scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions). The spotted owl effects determination made in the FEIS and BE is based on this multi-scale territorial analysis as well as on cumulative habitat availability on the landscape scale (BE, p.58-60) and implementation of the Keddie Ridge Project is not anticipated to result in loss of occupancy and productivity in known spotted owl territories (BE, p.68).

10. **The USFS risks expanding the Area of Concern 2 (AOC2) (Verner et al. 1992) by removal and degradation of spotted owl habitat in the Keddie project that reduces the likelihood owls will persist on the border of the AOC2.** (Thomas et al., FL, pp. 3-4)

Response: AOC2 is explained in the BE on page 30. AOC2 as defined in Table 3G of Verner (1992) is identified as a concern because of "a gap in known distribution, mainly on private lands, extends east-west in a band almost fully across the width of the owl's range". Private land in the west end of the Keddie Ridge Project is somewhat reflective of the private land situation within AOC2, but overall the majority of the landbase in Keddie is not impacted by private forest land. It is recognized that the 2007 Moonlight Fire Complex due to loss of owl suitability in severe burn areas, potentially expanded the east-west gap in distribution that defines AOC2. One of the primary objectives of the Keddie Ridge Project is to implement actions that would prevent another Moonlight Fire Complex from happening. If stand replacing fire occurs within the Keddie Ridge area, it is anticipated that this northeast section of the Plumas NF would definitely expand into the AOC's identified now. The actions proposed for implementation with the Keddie Ridge Project would not increase fragmentation or habitat continuity to a point that the AOC's may expand.

11. **The USFS should avoid serious negative impacts to spotted owls by retaining more canopy cover in the largest size classes of trees across the project area, rather than selling 137 mbf of trees >24" (DEIS Appx. D, p.2) which provide much-needed large tree stands used by owls and other federally protected species. The impacts are not adequately disclosed.** (Thomas et al., FL, pg. 4,)

Response: Commenter is inferring that the owl is a federally listed species and that there are others. This is a false inference. The California spotted owl is not federally listed. The Pacific fisher is a candidate (but not federally listed) and there are no other species classified as federally listed species on the Plumas NF requiring large tree stands.

The impacts to CWHR size and density classes as a result of implementing the Keddie Ridge Project proposed action are adequately disclosed in the FEIS (Ch.3 Forest Vegetation section, p.70-88, Ch. 3 Wildlife section, p.144-146) and the BE (p.58-60). The majority of trees >24" dbh proposed for harvest would occur in the approximate 284 acres of group selection. To meet the purpose of improving forest health and protect and enhance Forest Service sensitive wildlife (including the owl), all remaining stands to be treated in the Keddie Ridge Project (approximately 5,667 acres or 95 percent of units) would retain 73-100 percent of trees > 20" dbh (on average, 97 percent retention of trees greater than 20" dbh) (FEIS, p. 34, p.76).

Please refer to response to comments WL #4, WL #5, WL #7, WL #8

12. **Impacts to owl nest areas are not evaluated. Based on Blakesley et al. (2005), an evaluation at the 2,010-acre scale should be included in the project analysis.** (Thomas et al., FL, pg.4,)

Response: The effects analysis for owl territories treated under the Keddie Ridge Project is based on suitable habitat availability on the PAC/HRCA level, the 500-acre nest core level, and the 4,500 acre home range scale. This analysis (BE, p.57-58, p.61-64) discloses that the majority of high quality habitat at each of these territorial scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions). The spotted owl effects determination made in the FEIS and BE is based on this multi-scale territorial analysis as well as on cumulative habitat availability on the landscape scale (BE, p.58-60) and implementation of the Keddie Ridge Project is not anticipated to result in loss of occupancy and productivity in known spotted owl territories (BE, p.68). The Forest Service does not see a need for a fifth acre scale analysis to display any additional hard look at the risks to species habitat. Please also refer to response to comment WL #8.

13. **Effects to prey species are not evaluated.** (Thomas et al., FL, pg.4)

Response: The BE effects section for the spotted owl has been updated to include a discussion of the potential effects of treatments on spotted owl prey species (BE, p.61). The BE (p. 57-70) and FEIS (p. 143-154) analyzed the effects to spotted owl nesting and foraging habitat. The cumulative amount of change to suitable habitat resulting from Keddie Ridge Project implementation at four spatial scales (PAC/HRCA, nest core, home range, landscape) formed the primary basis for species effects determination. The MIS Report (p. 25- 27) discloses project effects to the northern flying squirrel, an important owl prey species.

14. **Snags and wildlife tree management intent unclear** (Thomas et al., FL, pg.4). **Alternative A does not acknowledge many concepts that are central to the GTR-220 (i.e. snag retention, old forest wildlife habitat, heterogeneity at multiple scales.** (Thomas et al., FL, pg .5)

Response: Additional clarification for snags and wildlife tree management to be followed under the Keddie Ridge Project and how this coincides with recommendations from the GTR-220 can be found in Appendix C of the Forest Vegetation Specialist Report (full title: Keddie Ridge Hazardous Fuels Reduction Project Forest Vegetation, Fire, Fuels, and Air Quality Report). The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity. Tree marking guidelines and wildlife habitat tree retention standards for the project which incorporates many concepts of the GTR-220 are presented in Appendix C of the Forest Vegetation, Fuels, Fire, and Air Quality Report. Please also refer to response to comments WL #3, FVFFAQ #8

15. **The DEIS fails to adequately divulge or analyze the fact that recent research reveals that California spotted owls preferentially select unlogged high-severity fire patches for foraging, while selecting unburned or low-severity areas for roosting (Bond et al. 2009).Unlogged high-intensity fire patches, with their rich array of montane chaparral and high abundance of large snags and downed logs (which, again, is not mimicked by logging), provide suitable foraging habitat for Spotted Owls (Bond et al. 2009), and the Project documents are obliged to acknowledge this.** (Chad Hanson, JMP, pp. 5-6)

Response: No high severity fire patches are to be logged with the project. No low-severity areas are to be logged with this project. No unburned patches within a fire perimeter are to be logged with this project. Heterogeneity provided by high severity fire will not change with this project. Since burned habitat is not treated with the Keddie Ridge Project, and any affects of treating the habitat discussed by the commenter will not occur, the project documents are not "obliged" to discuss this. The No Action Alternative effects section in the FEIS and BE discuss higher risk of stand replacing fires, but this consequence is not considered a foreseeable cumulative effect, and certainly any logging of future burned habitat is way beyond the planning horizon. Please refer to response to comment WL #3.

16. **The Wildlife BE (p. 27) inaccurately states that 20 Spotted owl PACs were lost in the Moonlight fire. All 20 of these Spotted owl territories were intensively salvage logged on both private and public lands following the Moonlight fire. To be accurate, in terms of reduced Spotted owl occupancy, the Wildlife BE and DEIS must acknowledge that the reduction in occupancy occurred after fire and intensive post-fire logging, not fire alone,**

which can have very beneficial effects for spotted owls, as discussed above. (Chad Hanson, JMP, pg. 6)

Response: The Revised Final EIS for the Moonlight and Wheeler Fires Project, as well as the BE for that project, were completed in June 2009. During the analysis period for the Moonlight Project, the Plumas Lassen Administrative Study owl crews surveyed the Moonlight- Antelope Complex Fire area for spotted owl for two years post fire (2008 and 2009). The BE for Moonlight Project used habitat based analysis as well as the results of the 2008 owl survey to conclude that PACs had been lost as a result of the Moonlight Fire. The results from 2009 surveys reinforced this conclusion. The two years of survey work suggested that the primarily high-severity Moonlight-Antelope fires do not support California spotted owls other than a single pair that was using the landscape and that owl detections were well-distributed within the non-burned buffer areas outside the fir perimeter. The results supported the PLAS hypothesis that high severity fires may result in greater negative effects on spotted owls (California Spotted Owl Module: 2010 Annual Report). The Keddie Ridge Project BE refers to the 2008 and 2009 PLAS surveys.

Within the Antelope portion of the burn complex, in late 2008 and into 2009 only roadside salvage/hazard tree removal occurred along the Indian Creek road and Antelope Lake area. No other area or units were salvage logged. In the much larger Moonlight portion of the complex, the first salvage project was the Eagle sale and it began logging the last week of August, 2009. This was immediately after the two-year PLAS owl surveys were completed. The commenter's statement infers that owl PACs were lost due to salvage logging in Moonlight; the implementation timeline of these activities show that habitat within PACs was destroyed by high severity fire and subsequent surveys for owls confirmed that owls were not present at these territory sites for two years prior to salvage logging commencing.

17. **The DEIS does not acknowledge the adverse impacts to Spotted Owls from precluding some future high-intensity fire patches, in a mosaic of mixed-severity effects, through implementation of the Proposed Action.** (Chad Hanson, JMP, pg. 6)

Response: Implementation of the Keddie Ridge Project would not preclude future high-intensity fire patches, in a mosaic of mixed-severity effects. Please refer to response to comments WL #3.

18. **The DEIS fails to adequately acknowledge the impacts of the Project on future large snag levels, Spotted Owl prey levels, and Spotted Owls. The DEIS admits that the Project would reduce future large snag densities by reducing stand density and reducing competition between trees, but does not provide estimates of the extent of this reduction on future large snag densities in 10, 20, 30, or 40 years, and the impacts this would have on Spotted Owls.** (Chad Hanson, JMP, pg. 6)

Response: Effects to spotted owls and spotted owl habitat at the project scale and trends in habitat and populations at the bioregional scale are in the BE (p. 57-70), the FEIS (p. 143-154), and the MIS Report (p. 24-27). Please refer to response to comment WL #4, WL #5, WL #7.

For response regarding spotted owl prey species, please refer to response to comment WL #12.

For response regarding snag densities, snag recruitment, and effects to snags from reducing stand density and reducing competition between trees please refer to response to comments WL #2, WL #13, and FVFFAQ #8.

19. **Cumulative effects are inadequate. The Mt. Hough Ranger District should quantify, map, and disclose all projects that reduced old forest habitat on public and private land in the past that have led to the condition the project area is in today.** (Thomas et al., FL, pg. 5)

Response: The quantification of impacts from past projects to old forest habitat is presented in the FEIS, Appendix F, tables 1 and 2. These tables list the activity name, year of implementation, and acreage affected. The impacts from these cited projects on old forest habitat are generally discussed on page 65 of the FEIS, with specific mention of past activities that have resulted in conversion of mid to late seral forests to early seral structure and to those activities that have promoted closed-canopy, higher density stands of small trees with relatively high fuel loads. Current old forest habitat conditions in the Keddie Ridge Project analysis area reflect the aggregate impact of these past actions. Opportunities for owl population movement, expansion and persistence in the Mt. Hough Ranger District and PNF is primarily based on the existing quantity and quality of suitable foraging and nesting habitat. The vegetation layer used for cumulative effects analysis for the Keddie Ridge Project reflect these current conditions.

American Marten

20. **The DEIS does not acknowledge the marten's imperiled status. The DEIS does not discuss or acknowledge the apparent gap in the marten's distribution in the northern Sierra Nevada. Based on this new information, the marten's status is more imperiled than implied in the DEIS. NEPA requires that the project be reconsidered in light of this significant new information.** (Thomas et al., FL, pg. 6)

Response: The marten is a R5 sensitive species thus meeting the definition of sensitive: "designated because of low population numbers, or highly restricted range for which National Forests make up a significant portion of the habitat, or significant detrimental impact to the population may occur from management practices" (USDA 1988). This is acknowledged in the FEIS and BE. As well, distribution of known martens and effects from management actions of the Keddie Ridge Project are discussed in the project FEIS and BE. The 'new information' which the commenter states is based on research findings (Zielinski 2004, Zielinski et al 2005) that indicates marten populations appear to be discontinuous in the northern Sierra Nevada (i.e. an apparent population gap exists in this area). These findings are discussed and acknowledged in both the FEIS (p. 130) and BE (p. 38).

21. **The DEIS does not adequately disclose the project's impacts on the marten. First, vegetation treatments such as mastication, burning, and tree removal may eliminate snags and trees for future snag recruitment, and downed woody materials – all critical habitat elements for marten. DFPZ treatments eliminate understory altogether, thereby eliminating habitat for prey species such as tree squirrels and small rodents needing cover and downed**

woody material as well. The Keddie documents fail to take a hard look at likely impacts on the viability of marten in and adjacent to the project area. (Thomas et al., FL, pg. 7)

Response: The project's impacts on suitable habitat elements for the marten are disclosed in the BE (p. 78-82) and FEIS (p. 143-154, 160-164). Tree marking guidelines and wildlife habitat tree retention standards for the project are disclosed in Appendix C of the Forest Vegetation Specialist report. The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity.

The proposed DFPZ treatments would not eliminate understory altogether. As the FEIS (p. 146) and BE (p.60) discloses, under the proposed action a percentage of stand biomass would be retained in all mechanical thin units, including DFPZs. However, a large majority of this stand attribute would be removed to meet fuel reduction standards and the effects of this removal on prey species for the marten and other forest dependent sensitive species is discussed in the BE (p. 61). The MIS Report (p. 25- 27) discloses project effects to the northern flying squirrel, a prey species for the marten.

Please refer to response to comment WL #5, WL #12.

22. **The extent of cumulative impacts to marten habitat have not been described in the DEIS. The BE simply describes cumulative impacts from past USFS salvage harvest, selection harvest and private timberland management has contributed to "an open patchwork of early seral habitat" (BE p. 79). These impacts are not quantified or discussed further. Surprisingly, the BE concludes that even though the action alternatives would create habitat fragmentation, "connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high severity fire." (BE, p. 80). This conclusion is not supported by any tangible data or quantification of past and future impacts to marten habitat. Given the marten's sensitivity to forest fragmentation and habitat degradation, the implementation of the proposed action has the potential to threaten marten's viability and restrict its distribution. The DEIS should be revised to evaluate the amount and distribution of openings and open canopy habitat existing on private and public lands and to evaluate the site specific effect of placing groups selection openings near areas that currently or proposed for support open habitat conditions (ie. 30-40 percent canopy cover).** (Thomas et al., FL, pg. 7)

Response: Please refer to the FEIS (p. 162-164) and the BE (p. 80-82) for a full discussion and quantification of cumulative impacts to the marten. The BE (p. 80) discloses that cumulative impacts 'would result in increased "patchwork" of open habitat and young age class vegetation between mature forested stands within the analysis area.' The BE then provides further discussion of these impacts and quantifies all possible suitable habitat reductions and amount of contiguous habitat blocks available to the marten. Based on a potential reduction of 7% of suitable marten habitat the BE concluded that the proposed actions would not increase any large-scale, high-contrast fragmentation above existing levels. Implementation of any of the action alternatives would result in little change to available contiguous suitable habitat (BE, p. 80). Group selections placed in areas currently existing at or proposed to exist at 30-40 percent canopy cover following treatments have been analyzed in the FEIS and BE. These areas are discussed and quantified in the analysis as nonsuitable habitat for the marten and the cumulative amount of available suitable habitat following treatments is disclosed.

Please refer to response to comments WL #3, WL #13, FVFFAQ #8

23. **The statement that marten "usually select stands with 40 percent canopy cover" (DEIS p. 131) is inaccurate and does not reflect the marten's dependence on old forests with high canopy cover. The research summarized above demonstrates marten's preference for 50-100 percent canopy cover. The project effects analysis should be redone to accurately reflect potential impacts of canopy cover reduction and snag and large tree removal on marten.** (Thomas et al., FL, pg. 7)

Response: This was a language error in the draft EIS. The FEIS (p.131) and BE (p. 38) have been corrected and now state martens 'select stands with greater than 40 percent canopy closure for both resting and foraging'. The marten analysis was correctly based on what is accepted as suitable canopy cover stands selected by martens. Potential impacts of canopy cover reductions and snag and large tree removal on marten have been analyzed and discussed in the FEIS (p. 160-164) and BE (p. 78-82) and is based on accurate analysis of suitable canopy cover percentages, therefore the effects analysis does not need to be redone.

24. **We offer several strong recommendations for improving the project. The majority of habitat in the project area is old forest. Project impacts are greatest on old forest associated species such as spotted owl, great gray owl, goshawk, fisher, marten, and protected bats. The USFS should expand the project habitat improvement objectives to include these species as well as bald eagle. Improving habitat for old forest species in the short term should be a goal of the project and is compatible with fuels objectives. Prescriptions should be revisited to leave more large trees, more basal area and canopy cover in the larger trees in the stand, especially when these trees are clumped together. Refer to our public scoping letter for a full discussion of achieving these important wildlife considerations using the GTR-220. We also urge the USFS to drop 19 acres of mechanical treatments in forest carnivore network. The carnivore movement corridor should be managed to maintain and enhance this habitat.** (Thomas et al., FL, pp. 7-8)

Response: The majority of habitat in the project area is not considered as the commenter claims 'old forest'. As a result of past management activities the existing conditions of forests in the project area resemble the age and structure of other forests across the Sierra Nevada, which is "generally younger, denser, smaller in diameter, and more homogeneous" (McKelvey et al. 1996). This condition is typical of forests in the analysis area (FEIS, p.53). There is a dominance of CWHR size class 4 stands in the project area where diameter at breast height (DBH) ranges between 11 and 24 inches, which is the WHR small size class category (BE, Figure 1).

The impacts to CWHR size and density classes suitable to old forest species as a result of implementing the Keddie Ridge Project proposed action are disclosed in the FEIS (Ch.3 Forest Vegetation section, p.70-88, Ch. 3 Wildlife section, p.144-146) and the BE (p.58-60). The majority of trees >24” dbh proposed for harvest would occur in the approximate 284 acres of group selection. To meet the purpose of improving forest health and protect and enhance Forest Service sensitive wildlife (including old forest species), all remaining stands to be treated in the Keddie Ridge Project (approximately 5,667 acres or 95 percent of units) would retain 73-100 percent of trees > 20” dbh (on average, 97 percent retention of trees greater than 20” dbh) (FEIS, p. 34, p.76). Tree marking guidelines and wildlife habitat tree retention standards for the project are further disclosed in Appendix C of the Forest Vegetation, Fuels, Fire, and Air Quality Report. The goal of the treatments designed under the proposed action is to promote, enhance, and maintain both landscape and within stand heterogeneity.

The Plumas National Forest carnivore network is not incorporated into the Forest Plan as a land allocation with standards and guidelines; rather, it is a plan to evaluate impacts of specific projects on habitat connectivity. The FEIS and BE acknowledged that, cumulatively, the Keddie Ridge Project would slightly reduce habitat connectivity in the analysis area but ‘would not increase any large-scale, high-contrast fragmentation above existing levels’ and connectivity would ‘improve over time as conifer cover is restored through natural processes and increased protection from high severity fire.’(FEIS, p.163, BE, p.80). The project’s effects on the forest carnivore network would be negligible, due to the small amount of acreage proposed for treatment and little to no change to existing suitable habitat post project (ibid).

Please refer to response to comments WL #2, WL #4, WL #5, WL #10, FVFFAQ #8.

Pacific Fisher

25. **As the habitat on private lands is limited, the potential is high for the Pacific Fisher to permanently move on to public lands. The Keddie project area contains suitable denning and foraging habitat for fisher that should be maintained in high quality condition where it presently exists (generally CWHR 4D and 5D).** (Thomas et al., FL, pg. 8)

Response: We disagree with the commenter that fisher habitat on private lands is limited. Aaron Facka, lead researcher for the Northern Sierra Nevada Fisher Translocation Project, Sterling Tract Study recently met with PNF biologists and provided the most recent monitoring information for the 28 fishers released on private timberlands between December 2009 and February 2011. Results indicate that habitat on this private land tract is supporting a fisher population, with documented denning (35 den trees) and reproduction by 4 females all occurring on private land (A. Facka, personal communication, March, 2011). Monitoring data also shows the majority of all individual fisher movements since their release have been on private lands. Detections of released fishers on public lands (both the Lassen and Plumas National Forests) have primarily been from dispersing males, all of which have been documented returning back to private land (ibid). These male movements onto public lands are not considered relevant from a population establishment standpoint and there is no evidence at this time that any re-introduced individual has permanently moved onto the Plumas National Forest (ibid). In April, 2011 a fisher den established by a released Sterling Tract female, was located on the Lassen National Forest (ibid). Due to reproduction occurring on the Sterling Tract private land, the Forest Service anticipates that additional females may likely den on the Lassen NF in the coming years. Remaining fisher releases for 2011-2012 (8 females, 4 males) will likely occur closer to the Plumas NF than previous releases. Therefore, it is likely that the PNF will also have residing fishers in the next coming years.

Impacts to fishers and fisher habitat resulting from the Keddie Ridge Project have been discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). The amount of suitable habitat remaining for the fisher would not preclude fisher occupancy and residency establishment in the project area.

26. **Fisher habitat is characterized by dense conifer forest with structures suitable for denning and resting (Zielinski et al. 2004a and 2004b, Purcell et al. 2009). Providing for fisher habitat in the short and long term is critical to its persistence in the project area as well as the persistence of the larger population. The lack of fire resiliency of the forested areas is also a concern in the project area. We recognize that the reduction of surface and ladder fuels is important to improve the fire resiliency of the habitat. The challenge for this project is to strike an appropriate balance between habitat benefits for fisher in the short term while improving the resiliency of the stands. The Keddie project will render 44 percent of the CWHR 4M and 4D unsuitable to old forest associated species (DEIS p. 138). Unfortunately, the proposed action in the DEIS falls short of an appropriate balance and unnecessarily degrades fisher habitat placing this population at greater risk of extirpation.** (Thomas et al., FL. pg. 8)

Response: Fishers are not established or known to be occupying any part of the Keddie Ridge Project analysis area, therefore persistence of fishers in the project area, as the commenter states, is a misleading statement. Impacts to fishers and fisher habitat resulting from the Keddie Ridge Project have been discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). The analysis concluded that 'post-treatment amounts of suitable mesocarnivore habitat would provide similar numbers and size blocks of contiguous habitat as the existing condition. The reduction of 4.6 percent of suitable denning habitat and the reduction of 1.3 percent of suitable foraging habitat for the fisher would not cause any significant large-scale fragmentation of suitable habitat (table 8).'(BE, p.81). A primary objective of the Keddie Ridge Project is to implement actions to better protect landscape habitats, including fisher habitat, from stand replacing fire and resulting increased habitat fragmentation. The Keddie Ridge Project would render 34 percent (not 44 percent as the commenter states) of CWHR 4M and 4D unsuitable, either by opening the canopy cover to below 40 percent or by group selection (FEIS, p.138). This is a reduction of approximately 1,052 total acres, which when compared cumulatively to suitable CWHR 4M and 4D fisher habitat available post-treatment in the analysis area, equates to a 4 percent reduction (FEIS, p. 139, table 59).

Please refer to response to comments WL #2, WL #4, WL #5, WL #10.

27. **Impacts of the Keddie project at a smaller scale are not addressed. The wildlife analysis area is 115,000 acres, however female territories are typically much smaller, ranging from**

1,200-2,700 acres in the Sierra Nevada (Mazzoni 2002; Zielinski et al. 2004b). A focus at the 100,000+ acre scale overlooks the importance of stand level impacts to habitat quality for fisher and other old forest species. The environmental analysis should be revised to distinguish changes to habitat quality and quantity at both the home range and rest site scales, rather than changes to habitat that are averaged across the entire project area. (Thomas et al., FL, pp. 8-9)

Response: The smaller scale habitat analysis conducted for the spotted owl (BE, p.57-58, p.61-64) can be used as a proxy for smaller scale habitat analysis for the fisher since the same CWHR size and density stands are considered suitable for both species. That analysis, performed basically at the 500 acre,1,000 acre, and 4,500 acres scale, can be used as a surrogate for distinguishing changes to fisher habitat quality and quantity at both the home range and rest site scales. That analysis concluded that the majority of high quality habitat at each of these scales would be retained (i.e. not treated or minimal to no change to existing canopy cover conditions).

Please refer to response to comments WL #8, WL #11.

28. **Recent efforts to apply rest site characterizations to the prediction of rest site suitability across the landscape indicate that thinning treatments can significantly reduce the quality of rest sites. Zielinski et al. (2010) used forest inventory and analysis (FIA) data from rest sites to create a model predicting rest site suitability. When thinning treatments were applied to actual landscapes on the Sierra National Forest suitability was reduced significantly for treatments that imposed 30" or greater diameter limits and reduced canopy close to 35-40 percent. Less intensive treatments (e.g., 12" dbh limit and retention of 60 percent canopy cover) resulted in only modest reductions in landscape level suitability for resting. This information and analytical tool should be used to evaluate the effects of the alternatives on fisher denning and resting sites. This tool could also be used to identify treatment units for which a less intensive treatment would benefit fishers while still meeting other project objectives.** (Thomas et al., FL, pg. 9)

Response: Potential direct, indirect, and cumulative effects to fisher denning and foraging habitat resulting from the Keddie Ridge Project's proposed four action alternatives are discussed and displayed in the BE (pgs. 77-80) and the FEIS (pgs. 160-164). This includes full analysis of the non-commercial alternative C, which proposes less intensive treatments compared to the other alternatives (e.g. a 12" dbh limit and maintaining CWHR 5 stands at 40 percent or greater canopy cover). It was concluded, based primarily on the amount of reduced habitat and remaining contiguous habitat blocks remaining after project implementation, that none of the action alternatives would likely trend the fisher towards federal listing or result in loss of viability.

29. **The Keddie BE states that there are no direct project effects to fisher (p. 77). This does not account for the possibility that fisher could occur in the project area during implementation of mechanical and prescribed burn activities. Potential direct effects include disturbance**

and vehicle collision, a major source of mortality in the Southern Sierra Nevada (SNAMP 2010). (Thomas et al., FL, pg. 9)

Response: Please refer to response to comment WL #24 which discusses recent monitoring results from the fisher translocation project occurring on private lands (Stirling Tract) to the west of the project area and Plumas National Forest. The conclusion in the BE that there would be no direct effects to the fisher was based upon the extreme likelihood that no individuals reside in the project area and would therefore not be directly impacted by project activities. For further clarification, this was based on 1) the known. distribution of fisher in California, 2) the behavior of the released fishers on the Stirling Tract, 3) that fishers are considered not within the project area based on numerous survey efforts/methodologies on the Plumas NF over time, 4) that fisher are not on the Plumas NF and that there is a 240 mile gap in fisher distribution north to south in California along the Sierra Nevada (the Plumas is not within the Southern Sierra Nevada where roadkill are a major source of mortality).

30. **The potential effects of habitat degradation and loss resulting from the Keddie project are further exacerbated by activities being undertaken on private lands. In the area immediately adjacent to the Keddie project, logging activities are proposed that would likely have a dramatic effect on fisher habitat quality (BE, p. 79). The simple conclusion that the Keddie project will contribute to an already existing "patchwork" of open, early-seral habitat (BE p. 79) suggests a perceived habitat stability on the Plumas National Forest, and an assumption that management activities have not or would not reduce suitability. These assumptions should be revised in light of the above information. Management activities are estimated to negatively influence habitat quality and such effects can have subtle and long lasting impacts to individuals. Small populations, such as this fisher population, are especially at risk to disturbance. This risk to species persistence is not adequately disclosed or mitigated in the DEIS.** (Thomas et al., FL, pg. 9)

Response: The Forest Service does not 'assume' that management activities have not or would not reduce suitability. Rather, the FEIS and BE fully disclose and acknowledge cumulative adverse effects of implementing the proposed actions, such as reductions in habitat availability, quality, and connectivity (FEIS, p. 160-164, BE, p. 77-80). Risks to fisher habitat appear to decrease with implementing fuel reduction actions described in the action alternatives when compared to implementing the no action alternative and risking another Moonlight Fire event. In regards to species persistence, please refer to response to comment WL #25.

31. Black oak has been shown to be very important for fisher den sites (Zielinski et al. 2004). We are concerned with project impacts to oak. The Keddie project objectives highlight group selection as a tool to enhance shade-intolerant species. Although not conifers, black oak seedlings are shade-intolerant. True restoration may very well include hardwood as well as conifer enhancement in project objectives. Instead of restoring oak, the project proposes to cut black oak saplings in group selection units less than 6"dbh. This would interfere with a well-distributed age class of black oak across the landscape. Westside

hardwoods are one of five management strategies outlined in the 2004 Framework ROD. Hardwood management and protection is central to the rationale for the Framework decision, and there are more management guidelines for oaks than for almost any other resource. Large and small black oaks should be retained in group selection units where operability allows, and Keddie should develop a management plan for oaks as outlined in Standard and Guide #25. (Thomas et al., FL, pp. 9-10)

Response: Zielinski et al. (2004) discusses the importance of large oak structures (greater than 27” dbh) to fisher resting habitat. The Keddie Ridge Project would not impact or remove such large hardwood structures. Please refer to the FEIS, Chapter 2, Alternatives Considered in Detail, Table 6, Design Criteria for Group Selection which states: ‘Where black oak is present, retain black oaks greater than or equal to 6 inches in diameter.’ Due to the shrubby habit, multiple stems, and sprouting nature of black oaks less than 6 inches, these are more susceptible to damage from harvesting operations such as felling and skidding. In addition, thinning smaller leaders (less than 6 inches in diameter) of multiple stemmed oaks would encourage the growth and development of a primary stem or leader. This would promote tree habit development, which in due course would provide greater beneficial hardwood habitat attributes for fisher and other carnivores.

Hardwood management and guidelines were incorporated in the development of the Keddie Ridge Project. The project’s treatments, silvicultural prescriptions and design criteria were designed to maintain important habitat characteristics and structures at the stand and landscape scale, including hardwoods. Please refer to Appendix C of the Forest Vegetation Report for additional criteria relating to hardwood retention and guidelines. Standard and Guide #25 does not apply to HFQLG projects (USDA 2004b, p.67).

Black-backed Woodpecker

32. **The DEIS fails to indicate that there would be adverse impacts of the Project on the Black-backed Woodpecker (BBWP), which is the only MIS bellwether species for all wildlife species associated with snags in heavily burned forest. This habitat type is very ecologically important, and supports high levels of native biodiversity (Swanson et al. 2010). The Project would affect Black-backed Woodpeckers for two reasons. First, recent science shows that pre-fire logging, consistent with the type of mechanical (commercial) thinning proposed in this Project, substantially reduces habitat suitability for Black-backeds even if the affected area later burns in a wildland fire, likely due to reduced potential densities of large snags upon which the birds forage (Hutto 2008, Hutto and Hanson 2009). Second, the DEIS predicts that the Proposed Action would serious reduce or totally eliminate the potential for moderate or high severity fire (passive or active crown fire) in the thinned areas. Black-backeds depend upon areas burned at higher fire severities (Hanson and North 2008, Hutto 2008). Further, the Project would threaten the viability of the Black-backed Woodpecker by further reducing potential habitat across the landscape. The MIS Report does not even**

include a section analyzing the impacts of the Project on the Black-backed Woodpecker. (Chad Hanson, JMP, pg. 5)

Response: The BBWP became an MIS species for the Plumas NF as a result of the Sierra Nevada Forests MIS Amendment Record of Decision (ROD) (USDA 2007e). Based on this ROD, “Species selected for inclusion on the MIS list must occur in and rely on the habitat they are intended to represent”. The BBWP (along with the hairy woodpecker) was selected as an MIS because it represented a “species with special habitat needs that may be influenced significantly by planned management programs”. Alternative 6 in the SNFMIS (and selected in the ROD) “will ensure that MIS are strongly associated with habitats we (USFS) are currently affecting with our management in the Sierra Nevada”. The ROD further clarifies that, “The sole MIS requirement that is applied at the project-level is the assessment of habitat for MIS”. The habitat that the BBWP was selected to represent at the bio-regional (Sierra Nevada) scale is “snags in Burned Forest”. The hairy woodpecker was selected for “Snags in Green Forest”. At the project scale, the Keddie Ridge Project is not treating any habitat classified as burned forest; thus no snags in burned forest are to be impacted. Thus at the project level, the assessment of the BBWP is that no change will occur as no habitat represented by the BBWP is affected. This results in no change in population or habitat trends across the bioregion. This is stated in the Keddie Ridge Project MIS Report (p.7). The Keddie Ridge Project is affecting green forest and thus snags in green forest is subject to an affects analysis; impacts to the MIS hairy woodpecker is articulated in the MIS Report.

Please refer to response to comments WL #2, WL #13, WL #14, FVFFAQ #8.

Watershed (Soils and Hydrology)(WT)

1. **Mechanical harvesting and 35 percent slope restriction statements in Chapters 2 and 3.** (Bill Wickman, AFRC, pp. 1-3; Tom Downing, SPI, pg. 2)

Response: Please refer to the FEIS, Chapter 2, Table 5. The FEIS has been modified to read “Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100’) within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined.”

2. **We recommend that the FEIS provide a map of the roads/trails proposed for improvement, as well as a detailed closure, restoration, and BMP plan for the proposed road decommissioning. Little information is present in the DEIS as to how the project will specifically improve watershed health. Additionally, the FEIS should explain how decommissioning those particular roads, and not others, will directly contribute to watershed improvements.** (Kathleen Goforth, EPA, pg. 2)

Response: Please refer to the “Hydrology Analysis—Direct and Indirect Effects Common to Alternatives A, C, D, and E” for a detailed description as to how the Keddie Ridge Project will specifically improve watershed health through road improvements and decommissioning. Please refer to the FEIS, Appendix H for a list of applicable project Best Management Practices and Appendix C for a map of roads/trails proposed for improvement.

3. **The soil survey information offers average numbers for various survey results but it is unclear if the reporting is accurate or appropriate to meet soil quality standards. Are the "Geographic Areas" identified in Table 68 management units, stands in an area of the project, or?** (Thomas et al., FL, pg. 14)

Response: As stated on pages 173-174 of the DEIS, standards and guidelines of the Plumas National Forest LRMP (as amended by the Record of Decision for the Sierra Nevada Forest Plan Amendment and the HFQLG FEIS and ROD) provide the relevant substantive standards to comply with the National Forest Management Act. The soil quality analysis standards presented in the Region 5 Soil Management Handbook are thresholds used for consistent project analyses across the Region, but – unlike the LRMP standards and guidelines - those thresholds are not a set of mandatory project standards or requirements, this was emphasized in a 2007 letter from the Regional Forester (USDA 2007b). Please refer to the table of soil survey results under the Soils Affected Environment section of the Hydrology and Soils report in the FEIS.

4. **The numbers of large down logs and fine organic matter reported in the DEIS on pg. 184 do not match the figures in Table 68, what is the range of large logs on a per acre basis in the Taylorsville/Peters Creek geographic area? Are down logs/ac in Table 68 the same as "large logs" at the bottom of pg. 184?** (Thomas et al., FL, pg. 14)

Response: Please refer to the table of soil survey results under the Soils Affected Environment section of the Hydrology and Soils report in the FEIS. Based on surveyed units, large down logs per acre range from 15-20 in the Taylorsville/Peters Creek geographic area. "Large logs" will be referred to as "large down logs" so as to clear up any confusion.

5. **Detrimental soil compaction is at or above the acceptable threshold as required by the SQS and the PNF forest plan. The DEIS p.181 is incorrect to suggest that detrimental soil impacts from past activities and those likely to occur from the project should not be considered in the cumulative effects analysis. Acknowledging that past actions (compaction effects) exist and when coupled with impacts from the proposed actions continue a legacy of detrimental soil conditions that are not consistent with the Plumas National Forest Plan or existing law.** (Thomas et al., FL, pg. 15)

Response: Cumulative and detrimental soil compaction was surveyed using the same protocol that has been used for the HFQLG Soil Monitoring Reports (and subsequent HFQLG Status Reports to Congress). That protocol directs that an increase in soil porosity of more than 10 percent indicates detrimental soil compaction. The Monitoring Reports then compare the areal extent of detrimental compaction with a 15 percent threshold, which is a LRMP standard and guideline for the Lassen and Tahoe National Forests but is not a standard for the Plumas National Forest. As stated on page 174, the Plumas NF LRMP contains a standard that, to avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Permanent landings and skid trails do not exist within the project area and the Keddie Ridge Project does not propose such permanent features. The revised Forest Service Manual for Soil Management states that a primary objective of Forest soil analyses is to inform managers of the effects of land management activities on soil quality and long-term productivity and to determine if adjustments to activities and practices are necessary to sustain and restore soil quality. The effects analysis for the Keddie Ridge Project states that the expected extent of detrimental soil compaction for each of the action alternatives would not be of a size or pattern that would result in significant changes to soil production potential for the activity area. Detrimental soil impacts from past activities (on private and NFS lands) and those proposed under the Keddie Ridge Project have been considered in the cumulative watershed effects analysis and are reflected in the existing condition and each alternative's ERA value.

Botanical Resources (B)

33. **What is the reason for excluding the other noxious weed treatments and eliminating the use of Borax for control of root diseases from [Alternative E]?** (Frank Stewart, Counties' QLG Forester, pp. 1and 2)

Response: Alternatives C and E propose treatment of noxious weed infestations with non-herbicide methods that include spring underburning, direct flaming with a propane torch, and limited manual removal. Additional treatments, or expansion of these proposed treatments to include all of the project's infestations, were not incorporated into these alternatives due to feasibility constraints, cost, and the lack of effective non-herbicide controls for species such as Canada thistle and hoary cress. Non-herbicide noxious weed treatments that were considered, but eliminated from detailed study, are discussed in detail under Alternative G (in Chapter 2). Please refer to response to comment FVFFQA #32 for a discussion regarding borax.

Economic and Social Environment (E)

1. **The average Plumas unemployment rate in 2010 was 16.8 percent, the highest in the last 30 years. All appropriate employment activities in the forest are welcome. Alternatives C and D do not provide adequate employment opportunities. I believe Alternative E will provide those opportunities.** (John Sheehan, PC, pg. 4)

Response: Each action alternative provides an estimate for potential employee income and direct and indirect jobs. The FEIS, Chapter 3, Social and Economic Environment section provides a discussion of employment opportunities.

2. **There appears to be a significant mathematical error in the economic analysis, appendix D, p.2, which overstates and masks the actual costs of the preferred alternative A.** (John Sheehan, PC, pg. 4)

Response: The mathematical error in appendix D has been corrected. All economic values listed in Chapters 2 and 3 have been corrected as well.

3. **A quick discussion of how the current social and economic situation that surrounded the most recent mill closures within the geographic area of consideration is worth discussing your consideration of providing a complete Social and Economic Analysis within the Keddie document.** (Bill Wickman, PCERC, pg. 1)

Response: Refer to the FEIS, Chapter 3, Social and Economic Environment section for a discussion of businesses within local communities including, but not limited to the timber industry. In order to represent all variables in the social and economic analysis more than the mill closure would need to be considered. Given the changing dynamic of businesses in rural communities, tracking open and closed businesses is not a variable of focus in this analysis. Unemployment is consistently monitored and figures within the social and economic analysis were updated to reflect the most recent unemployment rate. Unemployment reflects the impacts of the mill closure and is a better measure of our local economy. In addition, the social and economic analysis estimates the potential number of direct and indirect jobs and employee income that would be created as a result of implementing any given alternative. The estimates presented are a result of modeling and should be used as an indicator, not absolute values.

4. **Our rural counties cannot stand additional losses of volume that will translate into prolonged mill closures. The impact of the loss of the direct jobs causes the further loss of indirect and induced jobs. The mills closed nearly two years ago causing the loss of jobs. The loss of indirect and induced jobs is now starting to occur.** (Bill Wickman, PCERC, pg. 1)

Response: Refer to response to comment E #1.

5. **Within the three counties in 2009 we lost approximately 450 direct jobs. The associated jobs loss has caused dramatic loss in local community stability.** (Bill Wickman, PCERC, pg. 7)

Response: Refer to response to comment E #1.

6. **Over the last ten years, the School District's enrollment has declined from over 4,000 students to 2,344 today.. The combined loss of 25 percent receipts and loss of enrollment have devastated Plumas County schools. We are currently looking at the necessity to close schools in out four small rural communities within Plumas County.** (Bill Wickman, PCERC, pg. 6)

Response: Noted.

7. **Secure Rural Schools Act terminates at the end of this fiscal year and the current administrations' Draft 2012 Budget for the Forest Service includes a five year extension of the Act through 2016.** (Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Noted.

8. **As such, it is important that Alternative – E be selected as the preferred and action alternative in the Final EIS and subsequent Record of Decision because it provides 49 percent more total project sawlog volume, 39 percent more cable yarder sawlog volume, and 50 percent more skidder/tractor sawlog volume that Alternative – A, the "Collaboration Alternative". This will create additional revenues for the Treasury, FRR funds for Plumas County and additional**

urgently needed jobs for local contractors and associated businesses. (Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Noted.

9. **We support the management of stands located on steep ground using skyline harvesting. The project has identified 269 acres using this harvest method. A total of 131 acres will require whole tree yarding for both the sawlog and biomass components. Sawlog tops and limbs are required to be removed as product according to the design criteria. Sawlog trees will need to be limbed and bucked before yarding. Tree length yarding of the sawlogs will result undue residual tree damage. We request the requirement of yarding biomass be dropped for units 2, 4, 5, 21, 27, 28, 29, 56, and 59. We request the hand piling of slash and biomass be dropped for units 46,50,54,55,95, and 99a. The cost of treating biomass on steep ground far outweigh the benefits. In conducting the pilot project, the Forest Service shall use the most cost-effective means available to implement resource management activities.** (Tom Downing, SPI, pg. 2)

Response: Please refer to the FEIS, Chapter 2, Table 5 for design criteria specific to skyline units and DFPZs and area thinning treatments. There are six skyline units that propose trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. The remaining nine skyline units propose trees less than 10 inches DBH be removed and tops and limbs be yarded to the landing and removed as a product. It is anticipated that the remainder of the tree will be cut to length of 16 or 32 foot logs.

Refer to the FEIS, Chapter 1, Purpose and Needs section for a discussion of existing conditions, which drive proposed treatments and activities, to trend the landscape toward desired conditions. Yarding biomass and tops and limbs, as well has hand thin, pile, and burn, are proposed activities to meet the fuels reduction purpose and need. Although a cost is realized by implementing these activities, the Keddie Ridge Project IDT has identified the need to remove trees less than 12 inches DBH to meet fuels objectives. In addition, removal of tops and limbs is proposed to meet, rather than exceed, residual surface fuels objectives.

The proposed biomass (yarding and hand thin, pile, and burn) and surface fuels (removing tops and limbs) activities would contribute to full time jobs and employee related income. The cost of implementing proposed treatments is one variable among many when choosing to implement one alternative versus another.

10. Lateral yarding would require lift. Side hill set-ups would not be allowed. (Bill Wickman, AFRC, pg. 3) **Prohibiting side hill set ups is not justified. Side hill corridors can result in minimal residual stand damage if proper timber falling and yarding techniques are used. Permit the use of side hill corridors where appropriate.** (Tom Downing, SPI, pg. 2)

Response: The Forest Service Handbook Region 5 provides direction on side hill set ups. The design criteria does not prevent side hill yarding when there are short inclusions of side hill within the corridor. The treatments for these units are a thinning treatment from below. When a side hill set up is implemented, meaning the corridor is entirely side-hill yarding, the remaining stand is less protected, corridors increase in width, and the logs being yarded are more difficult to control. Thinning treatments are removing low volumes from the stand and residual stand protection is important.

Alternative Development/Selection (AD/S)

1. **The selection of Alternative A, the collaboration alternative may make you feel warm and fuzzy because of its title, it does nothing to meet the social and economic crisis that exists within Plumas County, in particular, Indian Valley. PCREC hopes that you will reconsider your alternative selection as we do not find an significant difference in environmental impacts between Alternative A and E. However, Alternative E does address the beneficial social and economical impacts that would also be offered to the other species not addressed in your EIS, the human species.** (Bill Wickman, PCERC, pg. 7)

Response: Please refer to the FEIS, Chapter 2 for a detailed description of how each alternative was developed; Tables 1-13 for design criteria specific to all action alternatives, treatments, and resource areas; and Tables, 14, 15, 15a, and 15b for a comparison of each alternative. An effects analysis for each resource is presented in Chapter 3 of the FEIS. All action alternatives contribute to the local economy through sawlog and biomass value, full time jobs, and employee related income, among other items.

Alternative A is designed to account for suggestions received from collaborators. Collaborators suggested careful consideration of prescriptions for units with regard to land allocation. For example, when treating a California spotted owl home range core area, the Mt. Hough IDT considered treating this land allocation differently than wildland urban interface land allocations. Alternative E is designed to follow Table 2 of the SNFPA ROD (USDA 2004b, pp.68-69) only, with no additional modifications from Table 2 direction. Alternative A provides a balance between resource impacts by proposing a variety of treatment intensities.

2. **The District has done a good job of outreach on this project. I believe everyone who is interested has had a chance to be informed and comment. However, I don't believe that there has been enough agreement on the project to call Alternative A the "Collaboration Alternative." There are substantive difference between Alternative A and Alternative E. There are significant revenue, US Treasury receipts, employment, and treatment methods deviation between the two and with the other alternative.** (John Sheehan, PC, p. 2; Bill Wickman, AFRC, pg. 5; and Frank Stewart, QLG Counties' Forester, pg. 2)

Response: Refer to the FEIS, Chapter 1, Public Involvement section, and Chapter 2, Alternatives Studied in Detail section for detailed information on the collaboration process and development of each action alternative. In the introductory paragraph for alternative A in chapter 2 of the FEIS, collaboration is defined as it relates to the Health Forest Restoration Act (HFRA) and the Forest Service's authority and role. The Mt. Hough Ranger District's goal during collaboration was to solicit written comments, as required by HFRA, from interested parties, such that the IDT could incorporate as much similarly grouped criteria as possible into the proposed action, to accommodate a variety of interests, while still meeting standards and guidelines from the 2004 SNFPA FEIS and ROD (USDA 2004 a, b). There was no expectation that all interested parties would reach an “agreement,” or that all interested parties’ ideas and suggestions would be fully satisfied. There was no expectation of having all interested parties present at the same time. As a result of collaboration it was clear that the interested parties involved in collaborating have opposing views, ideas, and suggestions. The Mt. Hough IDT incorporated interested parties’ comments and suggestions into the proposed action (alternative A) where appropriate.

Issue Identification from Scoping Comments

A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Keddie Ridge Project was published in the Federal Register on Thursday, April 1, 2010. The notice asked that comments on the proposed action be received by Friday, April 16, 2010. The purpose of the scoping process was to inform the public about the proposed action and purpose and need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period.

Comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. Issues are phrased as cause-effect relationships, the concept of describing a specific action and the environmental effect(s) expected to result from that action applies whether one is using an EA or an EIS. Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. Significant issues were defined as those where there may be a cause-effect relationship between a proposed action and a significant effect and the disclosure of that effect is documented in an EIS. Non- issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. Non-significant issues were identified as those not resulting in a significant effect. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, “…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…”.

One verbal and thirteen written comments on the proposed action were received during the scoping period. After receiving scoping comments, the Mt. Hough Interdisciplinary Team (IDT) separated the issues into two groups: significant and non-significant. The Mt. Hough IDT created cause-effect relationships from each letter, where appropriate, and these relationships were categorized as issues. All issues identified resulted with no significant effects; therefore only non-significant issues resulted. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. Table 1 below includes scoping comments that resulted in issues (a cause-effect relationship was created) and provides rationale for why the issue was not significant. Two alternatives, D and E, were requested by commenters who submitted scoping comments during the scoping period. A complete set of comment letters, the list of comments that resulted in categories other than issues, and how those were processed can be found in the project record at the Mt. Hough Ranger District in Quincy, CA.

Proposal: **Keddie Ridge Hazardous Fuels Reduction Project**

Interdisciplinary Team Review: **LL, KC, RB, RT, KG, CW, GR, MC** **Date:** **April-July 2010**

Responsible Official Approval: **Michael A. Donald** **Date:** **07/26/2010**

Source	Scoping Comments	Screen 1 Issue or Non-Issue? Cause-Effect Relationship?	Screen 2 Significant? Alternative Elim. From Detailed Study?	Measures of Change
Letter and Source		*List any possible issues, clarified in cause-effect relationship.*	*Significant (cause-effect relationship between a proposed action and a significant effect)? Yes or No?*	*Pertinent measures of change for each affected element.*
		If an issue statement may not be formed the comment is a non-issue.	*Provide brief rationale and reasons why issues are determined to be non-significant.*	

Steve Brink - 4/5/2010	If sufficient commercial-size trees (where appropriate and consistent with the purpose and need) are not included, then most of the costs of the service items necessary to fully implement the project will not be covered.	**ISSUE** The project will be economically unviable if you don't cut enough large trees.	**NON-SIGNIFICANT ISSUE** There are a few options for implementing non-commercial components of this project. This project will be a stewardship project. Once the analysis for the economics of the project is complete, a determination will be made to request appropriated monies to implement any remaining service items that cannot be implemented using the value of the commercial-size trees.	**Measurement Indicators:** 1. Economics a) potential direct and indirect jobs b) volume of i) sawlogs and ii) biomass removed from public lands c) total cost d) potential employee income e) potential advertised value to the Government f) forest health improvements g) value of i) sawlogs and ii) biomass
Chad Hanson - 4/13/2010	The DFPZ proposal is inconsistent with current Forest Service science about protecting homes from fire. The only effective way to protect homes is to reduce the ignitability of the homes themselves and to thin brush and small trees within at most 100-200 feet of individual homes; therefore DFPZs are ineffective in protecting homes. Because DFPZs give homeowners a false sense of security, they increase risks to homeowners and divert scarce resources away from true home protection.	**ISSUE** DFPZs will give homeowners a false sense of security, leave homeowners with an increased risk of their home burning, and divert resources away from true home protection.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge HFR Project has 5 purposes and need statements. One purpose is to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources. There is currently no research indicating what and how homeowners feel about DFPZs and their associated risk to homeowners.	N/A

Chad Hanson - 4/13/2010	The SN fails to indicate the current densities of large (over 15 inches in diameter, and especially over 30 inches in diameter) snags in the Project area. Nor does the SN provide any quantitative estimate of the density of large snags within the Project area within coming decades after Project implementation (e.g., 10, 20, 30 years after logging). This is a major concern because stand density reduction reduces competition between trees and reduces the potential for large snag recruitment in future years—meaning that large snag densities could remain at deficient levels relative to minimum wildlife needs for decades if the Project is implemented.	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** A sufficient number of snags per acre will be left within each unit, the project area, and across the landscape to maintain the viability of snag dependent wildlife species.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre. The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre.	**Effects:** 1. Wildlife 2. Forest Veg

Chad Hanson - John Muir Project - 4/13/2010	The EIS must analyze the adverse impacts of stand density reduction, and perpetuating large snag deficits, on wildlife species that depend directly or indirectly upon substantial large snag densities, including California spotted owl (Sensitive Species), Northern Goshawk (Sensitive Species), Hairy Woodpecker (MIS), and Pileated Woodpecker. This is particularly important, given that the Forest Service's own research reveals that there is a pervasive deficit of large snags, relative to minimum habitat needs of native cavity-nesting wildlife species, in all forested regions of California (Christensen et al. 2008).	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** A sufficient number of snags per acre will be left within each unit, the project area, and across the landscape to maintain the viability of snag dependent wildlife species. The wildlife effects analysis in the EIS will provide an assessment of the number of snags per acres with regard to snag dependent wildlife species. The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre.	**Effects:** 1. Wildlife 2. Forest Veg

Chad Hanson - John Muir Project - 4/13/2010	There are now more openings and more open forests on the eastside of the northern Sierra Nevada than there were historically, and fewer dense, old forests. This is a special concern, given the fact that the Project appears to target dense, old stands. These dense, mature forest areas are the areas that are capable of producing (recruiting) large snags through competition between trees. If such habitat areas are already in deficit on the eastside, as the QLG FEIS states, then the Project would have significant adverse cumulative effects—i.e., cumulative effects on native wildlife species dependent upon high densities of large snags within green forests.	**ISSUE** The project will reduce stand competition and will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is not on the eastside of the Forest as defined by the HFQLG EIS. The project area is in the transition zone. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	**N/A**
Chad Hanson - John Muir Project - 4/13/2010	The Project SN fails to indicate that there would be adverse impacts of the Project on the Black-backed Woodpecker, which is the only MIS bellwether species for all wildlife species associated with snags in heavily burned forest (p.4).	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat. The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

			Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	The Project would affect Black-backed Woodpeckers for two reasons. First, recent science shows that pre-fire logging, consistent with the type of mechanical (commercial) thinning proposed in this Project, substantially reduces habitat suitability for Black-backeds even if the affected area later burns in a wildland fire, likely due to reduced potential densities of	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat. The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

	large snags upon which the birds forage (Hutto 2008, Hutto and Hanson 2009). Second, the Project SN predicts that the Proposed Action would seriously reduce or totally eliminate the potential for moderate or high severity fire (passive or active crown fire) in the thinned areas. Black-backeds depend upon areas burned at higher fire severities (Hutto 2008).		Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape.	

Chad Hanson - John Muir Project - 4/13/2010	Further, the Project would threaten the viability of the Black-backed Woodpecker by further reducing potential habitat across the landscape, thus violating the forest plan's requirement to ensure viability.	**ISSUE** Project activities will cause adverse impacts to the BBWO.	**NON-SIGNIFICANT ISSUE** BBWO habitat consists of numerous snags within high severity burn areas. Currently the Keddie Ridge Project does not contain any suitable BBWO habitat.The Keddie Ridge HFR Project has 5 purposes and need statements. Creating BBWO habitat or areas that burn at high severity is not a purpose of the Keddie Ridge Project. Currently, there are no desired conditions in our LRMP as amended for creating BBWO habitat. The EIS will contain a discussion of the existing condition and will analyze impacts for all MIS. Only a portion of the landscape will be treated under each alternative, therefore the remaining untreated landscape will have the potential to burn at high severity. The no-action alternative will address not implementing any project related activities and the associated risk of introducing wildfire in an untreated landscape.	**Effects:** 1. Wildlife 2. Forest Veg 3. Fuels

Chad Hanson - John Muir Project - 4/13/2010	The SN fails to acknowledge potential adverse impacts to the Fox Sparrow, which is the MIS in the Sierra Nevada for the montane chaparral habitat created by high-intensity fire. These impacts must be analyzed, given that the SN predicts that the Project will seriously reduce or eliminate the potential for the high-intensity fire effects that create the montane chaparral habitat upon which the Fox Sparrow depends, and given the widespread elimination of montane chaparral habitat in the nearby Moonlight/Wheeler fire area through post-fire logging and conifer plantation establishment, and artificial conifer planting in the absence of salvage logging (p.5).	**ISSUE** The project will reduce or eliminate the potential for high intensity fire, therefore montane chaparral habitat will not be created, and the Fox Sparrow will therefore be adversely affected.	**NON-SIGNIFICANT ISSUE** Currently there is fox sparrow habitat in the Keddie Ridge Project. The wildlife and silviculture effects analyses in the EIS will provide an assessment of the montane chaparral habitat. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	**Effects:** 1. Wildlife 2. Forest Veg
Chad Hanson - John Muir Project - 4/13/2010	1) The SN fails to adequately divulge or analyze the fact that recent research reveals that California spotted owls preferentially select unlogged high-severity fire patches for foraging, while selecting unburned or low-severity areas for roosting (Bond et al. 2009). High-severity patches enhance habitat (e.g., montane chaparral, large downed logs,	**ISSUE** Logging high-intensity fire patches will reduce suitable foraging habitat for spotted owls.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project does not propose treating any burned areas. There is no purpose and need to removed burned timber. All areas that were burned by the Moonlight Fire have been removed from the analysis. The wildlife and silviculture effects analyses in the EIS will provide an	**Effects:** 1. Wildlife 2. Forest Veg

	and snags) for the Spotted Owl's small mammal prey species (Bond et al. 2009). The most recent scientific evidence makes clear that Spotted Owls benefit from natural heterogeneity created by patches of high-severity fire—habitat that is not mimicked by logging. Unlogged high-intensity fire patches, with their rich array of montane chaparral and high abundance of large snags and downed logs (which, again, is not mimicked by logging), provide suitable foraging habitat for Spotted Owls (Bond et al. 2009), and the Project documents are obliged to acknowledge this (p.5).		assessment of spotted owl foraging and nesting habitat. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	3) The SN fails to adequately acknowledge the impacts of the Project on future large snag levels, Spotted Owl prey levels, and Spotted Owls. Verner et al. (1992) recommended at least 20 square feet per acre of basal area of large snags (over 15 inches dbh), or about 7-8 large snags per acre on average, for suitable spotted owl habitat. Abundant large snags are essential for spotted owls	**ISSUE** The project will result in less large snag recruitment. Deficient snag levels will harm wildlife for decades.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is currently planned to retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height	**Effects:** 1. Wildlife 2. Forest Veg

	because owl prey species depend upon them (Verner et al. 1992). The SN admits that the Project would reduce future large snag densities by reducing stand density and reducing competition between trees. However, the SN does not provide estimates of the extent of this reduction on future large snag densities in 10, 20, 30, or 40 years, and the impacts this would have on Spotted Owls (pp. 5-6).		would be used to meet this guideline.The wildlife and silviculture effects analyses in the EIS will provide an assessment of the number of snags per acre. The proposed action does not include and effects analysis. Effects analyses are presented in Chapter 3 of the EIS.	
Chad Hanson - John Muir Project - 4/13/2010	1) The SN implies that stands in the Project Area exceed some desired percentage of the maximum stand density index for ponderosa pine. The SN fails to include any citations to scientific studies to support the statement about what the maximum stand density index is, or to support the SN's contention that it is ecologically desirable and beneficial for forest wildlife species and biodiversity to reduce stand density below some threshold percentage, and further reduce large snag densities in the future (p.6).	**ISSUE** Reducing stand density below some arbitrary threshold will negatively impact wildlife species and further reduce large snag densities.	**NON-SIGNIFICANT ISSUE** The Keddie Ridge Project is incorporating cruise plot data into the FVS model. The FVS model projects a maximum stand density index (SDI), canopy closure, and upper diameter. The silviculture effects analyses in the EIS will provide an assessment of the FVS model inputs and outputs, SDI, canopy closure, and upper diameters, and will be presented in time intervals for future estimates.	**Snags Effects:** 1. Wildlife 2. Forest Veg **SDI Effects:** 1. Forest Veg

Tom Downing - Sierra Pacific Industries - 4/14/2010	Because the costs of falling, yarding, processing, and hauling biomass far outweigh the value of this product delivered to local electric generation plants, we recommend the agency drop the removal of biomass on skyline harvest acres.	**ISSUE** The inclusion of biomass on skyline harvest acres will make the project uneconomical.	**NON-SIGNIFICANT ISSUE** There are a few options for implementing the non-commercial components of this project. Once the analysis for the economics of the project is complete and a decision is issued, a determination will be made to request appropriated monies to implement any remaining service items that cannot be implemented using the value of the commercial-size trees. Economics will be analyzed using current prices in the EIS. Plumas County has 5 co-generation plants within a reasonable haul distance. There is a market for chips.	**Effects:** 1. Forest Veg 2. Fuels 3. Economics
Tom Downing - Sierra Pacific Industries - 4/14/2010	If prescribed fire is to be used as in the 2006 proposal (1604 acres underburned), then the agency may not be able to treat these acres in a timely manner due to unpredictable and limited windows of opportunity to burn. This will add to the current backlog of untreated acres. Therefore, mechanical treatments should be considered because they can reduce ground fuel loading while providing timely	**ISSUE** Prescribed fire treatments as proposed will not get implemented because of unpredictable and limited windows of opportunity to burn, thus adding to your current backlog of acres.	**NON-SIGNIFCANT ISSUE** Currently, the Mt. Hough Ranger District uses prescribed fire (pile and underburning) to treat approximately 1,000-2,000 acres per year. Past and current trends with air quality restrictions, limited burn days, and extended fire seasons, are expected to continue. Therefore, based on the amount of burning the Keddie Ridge Project is proposing (approximately 6,000	**Effects:** 1. Fuels

	implementation.		acres) implementation of prescribed fire would take about 6 years to complete. The estimated 6 years needed to implement approximately 6, 000 acres of underburning and pile burning is considered timely.	
Frank Stewart - Counties' QLG Forester - 4/16/2010	Herbicides should not be included in this project because their use in the project will be used by obstructionists to appeal and challenge the project from going forward. Because herbicides will hold up the project, they should be examined in a separate NEPA document.	**ISSUE** If herbicides are included in the project, then the project will get held up in court and never implemented.	**NON-SIGNIFICANT ISSUE** An alternative will be analyzed that will exclude the use of herbicides for noxious weed control.	**Measurement Indicators:** 1. Botany **Effects:** 1. Botany 2. Grazing 3. Recreation 4. Wildlife
Vanessa Vasquez - CATS - 4/19/2010	How will the undergrowth vegetation that will grow rapidly where the canopy is opened up (after DFPZ creation) in these heavily thinned areas be managed? CATs is concerned that forestry management tactics (i.e. DFPZ creation) will lead to future use of herbicides from native brush re-growth and the spread of invasive plants through disturbance, including greater	**ISSUE** When you create DFPZs, you will need to come back in and use herbicides to clear native brush.	**NON-SIGNIFICANT ISSUE** Herbicides will only be applied to non-native noxious weeds. At this time, there is no intention to apply herbicides to native brush or to maintain DFPZs within the Keddie Ridge Project area.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation

	sunlight reaching the forest floor.			
Vanessa Vasquez - CATS - 4/19/2010	The use of herbicides to manage vegetation creates potential for water pollution (p.1).	**ISSUE** Herbicide use will create the potential for water pollution.	**NON-SIGNIFICANT ISSUE** The effects analysis in the EIS will provide an assessment of herbicide use and the potential for water pollution. In all alternatives, herbicide treatments will be designed to minimize the risk of water contamination; herbicides will be applied at recommended rates, site specifically, and with design criteria specific to each herbicide and/or noxious weed.	Effects: 1. Watershed 2. Wildlife (aquatics) 3. Recreation 4. Human Health Chapter 2, Design Criteria

Vanessa Vasquez - CATS - 4/19/2010	Creating bare earth with herbicides, such as non-selective ones like the proposed glyphosate, creates a situation where banks become destabilized or heavy rains wash dirt into streams and lakes. Therefore, only non-chemical vegetation treatments should be used, and native plant re-seeding and re-vegetation should be designed and implemented to prevent invasion of unwanted species (p.1).	**ISSUE** Glyphosate use will cause bare soil, which will in turn cause erosion.	NON SIGNIFICANT ISSUE The glyphosate treatments proposed within riparian areas incorporate design features that will minimize the amount of bare soil created from herbicide applications. These features focus on minimizing drift to non-target vegetation and include wick applications and wind speed restrictions. In areas where bare soil is considered to be a concern, re-vegetation (using native plants) will be incorporated.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation Chapter 2, Design Criteria
Vanessa Vasquez - CATS - 4/19/2010	Herbicide use in sacred sites and historic collection and foraging areas will affect both native basket weavers and plant materials collectors. What basketry materials are present in the project area? Are basketry materials found in areas where herbicides are planned for use? Do members of the public have permits to gather seeds and other materials in or near the project area? Will signs be posted prior and post herbicide application? The EIS will need to mention the effects of herbicide application to non-target, non-timber forest products collected by tribal members or the general public.	**ISSUE** If you use herbicides in sacred sites or sites where collection occurs, then native basket weavers and plant materials collectors will be adversely affected.	**NON-SIGNIFICANT ISSUE** Consultation has been initiated with tribes. There is one known bear grass area south of Canyon Dam. We will not spray in or around the Canyon Dam bear grass areas. No other plant collection areas are known in the project area. The weed infestations are not documented collecting sites. There are no individuals with permits to collect in these areas. A human health risk assessment will be incorporated into the EIS. Signs may be posted prior and post herbicide application. All relevant federal, state, and local laws will be followed with respect to herbicide application.	Effects: 1. Botany 2. Wildlife 3. Watershed 4. Grazing 5. Recreation 6. Human Health 7. Cultural Resources Appendix I

Vanessa Vasquez - CATS - 4/19/2010	Glyphosate can have harmful effects on non-target plants and native soil microorganisms. Glyphosate and the toxic surfactants it is mixed with translocate from the body of the plant into the root where it leaches into soil and affects soil organisms.	**ISSUE** Glyphosate use will cause harmful affects on plant and native soil microorganisms.	**NON-SIGNIFICANT ISSUE** The EIS will include an analysis of the potential effects of glyphosate on non-target plants and soil microorganisms. All proposed glyphosate treatments include criteria (i.e. wick applications) to minimize herbicide drift to non-target vegetation and the soil surface. The proposed surfactant will be fully analyzed in the EIS.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation Chapter 2, Design Criteria
Vanessa Vasquez - CATS - 4/19/2010	Bare chemically treated soil provides an opportunity for hardy non-native weeds to establish colonies and out-compete the already struggling native plant species.	**ISSUE** Herbicide use will cause bare soil, which will in turn allow non-native weeds to establish.	**NON-SIGNIFICANT ISSUE** The proposed herbicide treatments incorporate features designed to minimize drift and reduce the amount of bare soil resulting from herbicide application; these include the use of selective herbicides wherever feasible and wick application in sensitive habitats. Standard Management Requirements are also incorporated into all Plumas NF projects to limit the risk of noxious weed introduction, establishment, and spread.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation Chapter 2, Design Criteria Appendix H

Vanessa Vasquez - CATS - 4/19/2010	Chlorsulfuron is listed on the California Safe Drinking Water and Toxic Enforcement Act of 1984 (Prop 65) as a known female and male developmental toxin. It is also listed on the CA Department of Pesticide Regulation Groundwater Protection List for its known potential to pollute groundwater. This herbicide seems a particularly risky choice for our public lands and especially a project that aims to “improve watershed health”.	**ISSUE** Chlorsulfuron will cause effects to watershed health.	**NON-SIGNIFICANT ISSUE** Chlorsulfuron will not be used in this project. Publication of chlorsulfuron in the scoping attachment was in error.	N/A
Vanessa Vasquez - CATS - 4/19/2010	Aminopyralid is extremely persistent and when ingested by grazing mammals, it passes through the system unchanged and maintains its toxicity. This chemical is of great concern because of the potential to affect foraging wildlife and non-target plants after excretion.	**ISSUE** Aminopyralid use will cause effects to foraging wildlife and non-target plants.	**NON-SIGNIFICANT ISSUE** The effects analysis in the EIS will provide an analysis of aminopyralid and its potential impact to non-target plants and wildlife. . In all alternatives, herbicide treatments will be designed to minimize the risk of water contamination; herbicides will be applied at recommended rates, site specifically, and with design criteria specific to each herbicide and/or noxious weed.	Effects: 1. Botany 2. Wildlife 3. Cultural Resources 4. Grazing

Vanessa Vasquez - CATS - 4/19/2010	Herbicides are not an appropriate choice of treatment for Canada thistle or Scotch broom because both populations are relatively small and have recorded marginal success with chemical treatments alone. Chemical treatments for these plants will require a follow-up treatment, leading to compounding toxins impacting soil, water, and non-target species.	**ISSUE** Chemical treatments for Canada thistle or Scotch broom will require a follow-up treatment and lead to compounding toxins impacting soil, water, and non-target species.	**NON-SIGNIFICANT ISSUE** Herbicide treatments are not proposed for Scotch broom; publication of herbicide treatment for Scotch broom in the Keddie project scoping attachment was in error. The botany effects analysis in the EIS will provide an analysis of proposed herbicides.	Effects: 1. Botany 2. Wildlife 3. Watershed (risk assessment) 4. Grazing 5. Recreation

Appendix H

Standard Management Requirements and Monitoring

Wildlife and Fisheries

The wildlife and fisheries standard management requirements (SMRs) are contained in the Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment/Biological Evaluation. This report is part of the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) record on file at the Mt. Hough Ranger District; a copy is available upon request.

Bald Eagle

A Limited Operating Period (LOP) would be implemented not allowing area thinning treatments in the Round Valley bald eagle territory (units 75 and 75a) between January 1 and August 15 along National Forest System (NFS) road 26N19. No log haul is to occur on this road during the LOP.

California Spotted Owl

Limited Operating Periods (LOPs) would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections. An LOP would also be applied to haul routes within 0.25 mile of an active nest from March 1 to August 15. LOPs are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location.

Northern Goshawk

Limited Operating Periods (LOPs) would be implemented for treatment units and haul roads within 0.25 mile of active nest sites from February 15 to September 15. The LOPs are expected to eliminate effects from increased human activity and vehicle and equipment noise. If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, protected activity centers (PACs) would be delineated and applicable resource protection measures (such as LOPs) would be applied.

Mountain Yellow-Legged Frog

1. Slash piles would be ignited using a pattern that allows frogs to escape the fire. For example, piles would be lit at one end and an area would be left unlit in order to serve as an escape route.
2. Water drafting sites would be located and managed to minimize adverse effects on sedimentation and in-stream flows required to maintain riparian resources, channel condition, and amphibian habitat. Forest personnel and contractors would use the Forest Service approved suction strainer (FGM 5161) or other foot valves with screens having openings less than 2mm in size at the end of drafting hoses. Drafting sites would be visually surveyed for frogs and their eggs before drafting begins. The suction strainer would be inserted close to the substrate in the deepest water available; the suction strainer would be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid substrate and amphibian disturbance (the Water Drafting Plan is available elsewhere in this appendix).

3. Effectiveness monitoring of all applicable best management practices (BMPs) would occur for all prescribed burns or fuels management projects.
4. The Forest would prevent underburns or broadcast burns from entering riparian vegetation within identified suitable habitat, as delineated by the presence of riparian vegetation. Methods include the timing of ignition, ignition pattern, wet line, use of natural barriers, line construction or other methods that prevent the burn from entering riparian vegetation. If fire lines are employed, they would not be wider than 36 inches, unless they already exist.

Hydrology and Soils

The hydrology and soils standard management requirements (SMRs) are displayed in the Keddie Ridge Hazardous Fuels Reduction Project Watershed Report. This report is part of the Keddie Ridge Project record on file at the Mt. Hough Ranger District; a copy is available upon request.

Water quality would be protected through the use of BMPs (USDA 2000). BMPs are the primary method employed by the Forest Service and the State of California to prevent water quality degradation and to meet California State water quality objectives relating to nonpoint sources of pollution. BMPs were incorporated in the design of the action alternatives and are listed under the regulatory framework (Table 1).

Table 1. Best Management Practices (BMPs).

Resource Concern	Standard Management Requirements		Responsible Person(s)	Timeframe
Implement Best Management Practices (BMPs):				
Timber Management Practices				
Wildlife Fish Soils Hydrology	1.1	Planning Process	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	1.2	Timber Harvest Area Design		
	1.3	Use of Erosion Hazard Rating (EHR) for Timber Harvest Area		
	1.4	Use of Sale Area Maps for Designating Water Quality Protection Needs		
	1.5	Limiting the Operating Period of Timber Sale Activities		
	1.6	Protection of Unstable Lands		
	1.8	Streamside Management Zone Designation		
	1.9	Determining Tractor Loggable Ground		
	1.10	Tractor Skidding Design		
	1.11	Suspended Log Yarding in Timber Havesting	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	1.12	Log Landing Location		
	1.13	Erosion Prevention and Control Measures During Timber Sale Operations		
	1.14	Special Erosion Prevention Measures On disturbed Land		
Wildlife Fish Soils Hydrology	1.15	Re-vegetation of Areas Disturbed by Harvest		
	1.16	Log Landing Erosion Prevention and Control		
	1.17	Erosion Control on Skid Trails		
	1.18	Meadow Protection During Timber Harvesting		
	1.19	Streamcourse Protection		
	1.20	Erosion Control Structure Maintenance		
	1.21	Acceptance of Timber Sale Erosion Control Measures		

Resource Concern	Standard Management Requirements		Responsible Person(s)	Timeframe
		Before Sale Closure		
	1.22	Slash Treatment in Sensitive Areas		
	1.23	Five-Year Reforestation Requirement		
	1.25	Modification of the Timber Sale Contract		
Road and Building Site Construction Practices				
Wildlife Fish Soils Hydrology	2.1	General Guidelines for the Location And Design Of Roads	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	2.2	Erosion Control Plan		
	2.3	Timing of Construction Activities		
	2.4	Stabilization of Road Slope Surfaces and Spoil Disposal Areas		
	2.5	Road Slope Stabilization		
	2.6	Dispersion of Subsurface Drainage from Cut and Fill Slopes		
	2.7	Control of Road Drainage		
	2.8	Timely Erosion Control Measures on Incomplete Roads and Streamcrossing Projects		
	2.9	Timely Erosion Control Measures on Incomplete Roads and Streamcourses		
	2.10	Construction of Stable Embankments (fills)		
	2.11	Control of Sidecast Material		
	2.12	Servicing and Refueling of Equipment (similar to BMP 7.4 – Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasure [SPCC] Plan)		
	2.13	Control of Construction in Streamside Management Zones (the riparian habitat conservation areas [RHCAs])		
	2.14	Controlling In-channel Excavation		
	2.15	Diversion of Flows Around Construction Sites	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	2.16	Streamcourses on Temporary Roads		
	2.17	Bridge and Culvert Installation (disposition of Spoil Materials and Protection of Fisheries)		
	2.19	Disposal of Right-of-way and Roadside Debris		
	2.20	Specifying Riprap Composition		
	2.21	Water Source Development Consistent with Water Quality Protection		
	2.22	Maintenance of Roads		
	2.23	Road Surface Treatment to Prevent Loss of Materials		
	2.24	Traffic Control During Wet Periods		
	2.26	Obliteration or Decommissioning of Roads		
Vegetation Manipulation Practices				
Wildlife Fish Soils Hydrology	5.2	Slope Limitations for Mechanical Equipment Operations	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	5.3	Tractor Operation Limitation in Wetlands and Meadows		
	5.5	Disposal of Organic Debris		
	5.6	Soil Moisture for Mechanical Equipment Operations		
Watershed Management Practices				
Wildlife Fish Soils Hydrology	7.3	Protection of Wetlands	Prep Officer and Timber Sale Administrator (TSA)	Prior and During Treatment
	7.4	Oil and Hazardous Substance Spill Contingency Plan and Spill Prevention Control and Countermeasure (SPCC) Plan		
	7.8	Cumulative Off-site Watershed Effects		

Site-specific measures that relate directly to these BMPs would be used on the Keddie Ridge Project to minimize erosion and resultant sedimentation. The BMPs would also be used to minimize negative changes in other water quality parameters such as dissolved oxygen, water temperature, and turbidity.

These measures follow the Scientific Analysis Team (SAT) guidelines for areas adjacent to stream courses, lakes and wetland areas, and streamside guidelines presented in the Plumas National Forest Land and Resource Management Plan (the Forest Plan). Protection and improvement measures would include minimizing disturbance of riparian habitat conservation areas (RHCAs), retention of snags for wildlife, stream shading, recruitment of large organic debris in stream channels, maintenance of side slope and stream channel stability, and prevention of an over accumulation of activity-generated organic debris in stream channels. Timber sale contracts contain many standard provisions that help ensure protection of soil and water resources. These include provisions for an erosion control plan, road maintenance, and skid trail spacing—see the “Standards and Guidelines for RHCAs” section below for a list. The following measures, which were incorporated in the design of the action alternatives, would further reduce the risk of cumulative and local impacts on water quality and channel stability.

Soil protection measures are described below. Incorporate the following practices into the project design:

1. Unless otherwise agreed to by the physical scientist and sale administrator, landings, skid trail approaches to landings (to a distance of 200 feet), and new temporary roads would be subsoiled through the full depth of compaction to restore soil porosity. The subsoiler would be lifted where substantial root and bole damage to larger trees would occur from subsoiling. Subsoiling would not occur on shallow soils where the displacement of rocks disrupts soil horizons or where there are concerns about the spread of root disease, or damage to tree roots. Vehicle access to temporary roads would be blocked and water bars would be installed prior to subsoiling operations.
2. Ground-based equipment would be restricted to slopes less than 35 percent.
3. Subsoiling to 18 inches minimum depth would occur on temporary roads and landings within the same year as harvest.
4. Trails would be spaced an average of 100 feet. Though larger spacing is typically recommended, the 100 foot spacing may actually reduce off trail harvest traffic.

Implement the following wet weather standards in all mechanically treated units:

1. Operations may occur when soil is dry; that is, in the spring when soil moisture in the upper 8 inches is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped. In the summer and early fall after storm event(s) when soil moisture between 2-8 inches in depth is not sufficient to allow a soil sample to be squeezed and hold its shape, or will crumble when the hand is tapped.
2. Winter operations may occur only when the ground is frozen to a depth of 5 inches or over 8 inches of well packed snow.

Water Drafting Plan

1. New or existing water draft sites would be evaluated with the Mt. Hough district biologist prior to changes or use. Drafting sites shall be visually surveyed for amphibians and their eggs before drafting begins.

2. “Mucked out” debris, bedload sediment, etc. shall be transported to an appropriate disposal site (to be designated) if no apparent site is feasible.
3. Maximum draw-down volumes would be estimated prior to use of the draft site. Minimum pool sites would be maintained during drafting using measurements such as staff gauges, stadia rods, tape measures, etc.
4. Back down ramps would be constructed and or maintained to ensure the streambank stability is maintained and sedimentation is minimized. Rocking, chipping, mulching, or other effective methods are acceptable in achieving this objective. As necessary, earthen or log berm, straw waffle, certified hay or rice straw bale berms, or other containment structures would be constructed at the bank full water line to protect the stream bank.
5. Forest personnel and contractors shall use the Forest Service approved suction strainer (FGM 5161) or other foot vales with screens having openings less than 2mm in size at the end of drafting hoses. The suction strainer shall be inserted close to the substrate in the deepest water available; the suction strainer shall be placed on a shovel, over plastic sheeting, or in a canvas bucket to avoid substrate and amphibian.

Streamside Management Zones

As defined by the Plumas National Forest Land and Resource Management Plan (the Forest Plan), the streamside management zone (SMZ) is the land adjoining a stream channel that is managed to meet water quality and riparian objectives. This zone harbors the most complex biotic communities within the National Forest System (NFS). The management of these communities is particularly challenging, for their high diversity and inherent values demand a sound understanding of the natural processes involved as well as a commitment by management to perpetuate these values. Important qualities associated with the streamside environment include its unique visual character, abundant and diverse wildlife, timber producing capabilities, and recreational opportunities, in addition to its ability to maintain and improve water quality.

Wildlife utilize the riparian environment disproportionately more than other habitat types. Here the microclimate is measurably different from the surrounding forest, grassland, or brushland. Air temperature, relative humidity, wind speed, and radiation are moderated, creating a unique environment available to wildlife. Within this environment, food, cover, and water, are in close proximity, maximizing the density and diversity of wildlife. In addition, the streamside zone along permanent and intermittent streams provides migration routes and travel corridors, serving as a forested connector between forest habitats.

The streamside environment also enhances plant species diversity and fosters high plant biomass production. SMZs are well noted as a premium-growing site for timber. Conifers grow rapidly in these environs and intense shade encourages the growth of good quality timber. Plant species diversity is high and many plants are unique to the moist environments of the streamside area. Botanical interest is acute in these areas.

The streamside area also serves as a moderator of stream temperature and as a filter for sediments originating within or beyond the streamside zone. The vegetation growing here anchors geologic instabilities and secures the stream channel, while downed logs lying across the stream channel dissipate the energy of flowing water, enhancing stream stability. Given water of good quality and a healthy streamside environment, recreational opportunities are numerous. Quality recreational experiences can include swimming, fishing, hiking, aesthetics appreciation, and historical appreciation.

Standards and Guidelines for RHCAs

SAT developed standards and guidelines that address the types of management activities that are allowed in RHCAs. In general, these standards and guidelines prohibit activities in RHCAs that are not designed specifically to improve the structure and function of the RHCA and benefit fish habitat. Further, for areas where riparian conditions are presently degraded, management activities must be designed to improve habitat conditions.

The standards and guidelines that follow apply directly to this project. For a complete description of standard and guidelines for RHCAs, refer to Appendix L of the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (HFQLG EIS). In addition, watershed and riparian area management on National Forest System (NFS) lands is guided by a variety of direction, including BMPs, Land and Resource Management Plans, Forest Service manuals and handbooks, and other plans and directives.

Timber Management

TM-1. Prohibit scheduled timber harvest, including fuelwood cutting, in RHCAs. Allow unscheduled harvest only as described in TM-2 and TM-3.

TM-2. Where catastrophic events such as fire, flooding, volcanic eruptions, severe winds, or insect or disease damage result in degraded riparian conditions, allow unscheduled timber harvest (salvage and fuelwood cutting) to attain RMOs. Remove salvage trees only when site-specific analysis by an interdisciplinary team determines that present and future woody debris needs are met and other RMOs are not adversely affected.

TM-3. Design silvicultural prescriptions for RHCAs and allow unscheduled harvest to control stocking, reestablish and culture stands, and acquire desired vegetation characteristics needed to attain RMOs.

Roads Management

RF-1. Keep road and landing construction in RHCAs to a minimum. No new roads or landing would be constructed in RHCAs until watershed, transportation, and geotechnical analyses are completed. Appropriate standards for road construction, maintenance, and operations would be developed from this analysis to ensure that RMOs are met. Valley bottom and mid-slope road locations may be used only when this analysis indicates that roads can be constructed and maintained in these locations and meet RMOs.

RF-2. Require that all roads on NFS lands, including those operated by others, are maintained and operated in a manner consistent with the planned uses and with meeting RMOs.

RF-5. Locate design, construct, maintain, and operate roads to minimize disruption to natural hydrologic flow paths. This includes road-related activities that would divert streamflow and/or interrupt surface or subsurface flow paths.

RF-6. Apply design construction, and maintenance procedures to limit sediment delivery to streams from the road surface. Outsloping of the roadway surface is preferred unless outsloping would increase sediment delivery to streams or where outsloping is infeasible. Road drainage would be routed away from potentially unstable channels and hillslopes.

RF-7. Construct, reconstruct, and maintain all road crossings of existing and historic fish-bearing streams to provide for fish passage.

RF-9. Designate sites to be used as water drafting locations during project-level analysis, or as part of road maintenance for fire management planning. Do not locate drafting sites where instream flows could become limiting to aquatic organisms. During periods of low flow, examine the drafting site and decide if water can continue to be extracted from that site. Design, construct, and maintain water drafting sites so they would not destabilize stream channels or contribute sediment to streams.

RF-10. Prohibit sidecasting of loose material in RHCAs during construction or maintenance activities.

General Riparian Area Management

RA-1. Exclude heavy equipment from RHCAs, unless specifically approved for road construction and maintenance, or unless an interdisciplinary team finds that proposed activity is needed to meet the RMOs.

RA-2. Fell hazard trees only when they are found to pose an unacceptable safety risk. Such trees may be removed from RHCAs only when adequate sources of woody debris remain to meet RMOs. If long-term sources of woody debris are inadequate, and a tree is found to pose an unacceptable safety risk, that risk must be reduced in a way that contributes to woody debris objectives.

Project Specific RHCA Design Criteria

Management activities in RHCAs must contribute to improving or maintaining watershed and aquatic habitat conditions described in the RMOs (appendix E). Equipment restriction zones in RHCAs, would be implemented according to the following tables:

Table 2. Design Criteria for RHCAs

Criterion	Actions
RHCA Equipment constraints	No mechanical equipment operations on slopes steeper than 25 percent. Establish equipment exclusion zones adjacent to stream channels according to table 2-24 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.

Criterion	Actions
Diameter constraints	Within mechanical harvest areas, implement a 20-inch upper diameter limit, except where needed for operability. Minimize damage to trees larger than 20 inches dbh as much as practicable. In equipment exclusion zones, implement an 8-inch upper diameter limit on hand thinning treatments.
Residual species preference	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees.Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches dbh and 20 feet in height would be used to meet this guideline.
Burn constraints	Establish pile burning exclusion zones (see table 2-25 below) adjacent to stream channels, according to the table below. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.
Fireline	Construct firelines using hand crews around areas to be underburned or pile burned, as needed,, Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain large woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Fish passage improvement	Reclaim fish passage and habitat by improving or replacing culverts at specific locations where roads cross streams.

Table 3. Scientific Analysis Team (SAT) Guidelines for RHCA Buffer Widths Based on Stream Type (USDA 1999b, page 2-11)

Stream Type	Prescribed Stream Buffer Widths
Perennial, fish bearing[1]	300 feet
Perennial, non-fish bearing[2]	150 feet
Intermittent[3]	100 feet
Ephemeral[3]	100 feet

[1]-Perennial fish bearing streams and lakes.
[2]-Perennial non-fish bearing streams, ponds, wetlands greater than 1 acre, and lakes.
[3]-intermittent and ephemeral streams, wetlands less than 1 acre, and landslides.

Table 3 displays the Scientific Analysis Team guidelines for RHCA buffer widths based on stream type. For the Keddie Ridge Project, the above listed widths would be the maximum buffer width identified for each stream type. Ponds, reservoirs, and wetlands greater than one acre in size would be protected by a RHCA width of 150 feet, springs and seeps less than one acre in size would be protected by a RHCA width of 100 feet, measured from the outer edge of the feature. SMZ widths would be 50 feet for those stream segments that are not classified as RHCAs, but require protection from equipment to ensure the integrity of subsurface flow is maintained. These channels, commonly referred to as ‘swales’, do not show indications of annual scour or deposition. Table 4 below displays an additional buffer (inner buffer or equipment exclusion zone) within the RHCA and within the SAT guideline buffer identified above.

For example, there is a perennial fish bearing stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 150 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 150 feet. Equipment can enter the remaining 150 feet of the 300 foot maximum buffer.

When the slope within the SAT guideline buffer is greater than 25 percent, no mechanical equipment is allowed to enter the RHCA (Table 4). For example, there is a perennial stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 100 feet from the edge of the active channel, the slope is 32 percent; no equipment is allowed within any portion of the 300 foot buffer.

Table 4. Equipment Exclusion Zones in RHCAs

	Slope Class		
Stream Type	**0–15% (feet)**	**15%–25% (feet)**	**Greater Than 25%**
Perennial, fish bearing	100	150	No mechanical equipment allowed

Stream Type	Slope Class		
	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial, no fish	50	100	No mechanical equipment allowed
Intermittent	25	50	No mechanical equipment allowed
Ephemeral	25	25	No mechanical equipment allowed
Reservoirs/wetlands greater than 1 acre	50	75	No mechanical equipment allowed

Within the SAT guideline buffer, a project specific distance (feet) is applied to the placement of piles for future burning (Table 5). For example, there is an ephemeral stream within a treatment unit; a 100 foot buffer is applied. Within that 100 foot buffer, approximately 70 feet from the active stream channel, the slope is 26 percent. First, no mechanical equipment is allowed within any portion of the 100 foot buffer (Table 4). Second, piles must be placed 15 feet from the center of the stream bed (Table 5). Distances shown would apply to each side of the stream channel and are based on stream type and slope steepness.

Table 5. Pile Burning Exclusion Zones in RHCAs

Stream Type	Slope Class	
	0–15% (feet)	Greater Than 15% (feet)
Perennial	25	40
Intermittent	15	25
Ephemeral	15	15
Reservoirs/wetlands greater than 1 acre	15	25
Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.		

Botanical Resources and Noxious Weeds

The SMRs for botanical resources and noxious weeds, as well as the associated site-specific maps, are provided in the Biological Evaluation, Noxious Weed Risk Assessment, and the Plant Protection Plan for the Keddie Ridge Project. These reports are part of the Keddie Ridge Project record, which is on file at the Mt. Hough Ranger District and available upon request.

Botanical Resources

Table 6 identifies those sensitive plant species that would be protected under all action alternatives through the designation of control areas. No herbicide applications or ground-disturbing activities would occur within any of the control areas. Limited prescribed fire activities and some hand thinning treatments would be allowable within some of the control areas identified below.

Table 6. Sensitive Plant Species Within Designated Control Areas

Species	Control Area Locations	Restrictions
Arabis constancei (Constance's rock cress)	Units: 64 and 71	Prohibit ground disturbing activities (such as mechanical thinning, group selection harvest, construction of fireline, etc.) within control areas; hand thinning treatments would be allowed. Pile slash at a sufficient distance (i.e. 20 feet or greater) to protect individual plants and the seedbank from excessive heat.
Cypripedium fasciculatum (clustered lady's-slipper)	Units: 51, 52, 54, 55, 66, 67, and 68	Prohibit ground disturbing activities (such as mechanical thinning, group selection harvest, construction of fireline, etc.) within control areas; hand thinning treatments would be allowed. Manipulate fuels within control areas to reduce impacts to individuals during prescribed fire treatments. Pile slash at a sufficient distance (i.e. 20 feet or greater) to protect individual plants and the seedbank from excessive heat.
Lupinus dalesiae (Quincy lupine)	Units: 78a, 78b, and 89	Allow hand thinning and prescribed fire treatments within control areas. Construct hand piles at least 20 feet from plants to protect individuals and the seedbank from excessive heat.
Oreostemma elatum (Plumas alpine-aster)	Units: 11 and 66	Prohibit all ground disturbing (such as mechanical thinning, group selection harvest, construction of fireline, etc.) activities within control areas; prescribed fire treatments would be allowed.

Noxious Weeds

The following noxious weed SMRs were developed in accordance with the direction provided in Table 2.4 of the HFQLG EIS to reduce the introduction and spread of noxious weeds on NFS lands.

Cleaning Off-Road Equipment. Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be free of weeds. Clean all equipment and vehicles of all mud, dirt, and plant parts. This would be done at a vehicle washing station or steam-cleaning facility before the equipment and vehicles enter the project area. Cleaning is not required for vehicles that would stay on the roadway. All off-road equipment must be cleaned *prior to leaving designated weed units* if weeds are present at the time of implementation and are unavoidable.

Staging Areas. Do not stage equipment, materials, or crews in noxious weed-infested areas where there is a risk of spread to areas of low infestation.

Control Areas. Where feasible, noxious weed locations would be designated as control areas, where equipment and soil-disturbing project activities would be excluded. These areas would be identified on project maps and delineated in the field with day-glow orange noxious weed flagging. If avoidance is not possible, off-road equipment would be cleaned prior to leaving the designated weed unit.

Road Construction, Reconstruction, and Maintenance. All earth-moving equipment, gravel, fill, or other materials need to be weed free. Onsite sand, gravel, rock, or organic matter would be used where possible.

Revegetation. If skid trails, landings, or stream crossings require soil stabilization, weed-free equipment, mulches, and seed sources would be used. On-site material would be chipped to use as mulch to the extent possible. If mulch is imported to the site use weed free rice straw (preferred) or certified weed free straw. Avoid seeding in areas where revegetation would occur naturally, unless noxious weeds or erosion are a concern. Save topsoil from disturbance and put it back to use in onsite revegetation, unless contaminated with noxious weeds. All activities that require seeding or planting would need to use locally collected native seed sources or those identified by the Botanist. A seed mix would be developed when specific site locations and conditions (dry, moist, wet, etc) are determined.

Heritage Resources

These heritage SMRs are displayed in the Keddie Ridge Hazardous Fuels Reduction Project Heritage Resource Inventory Report. This report is part of the Keddie Ridge Project record on file at the Mt. Hough Ranger District; a copy is available upon request.

1. All proposed activities, facilities, improvements, and disturbances would avoid heritage resource sites. “Avoidance” means that no activities associated with the project that may affect heritage resource sites would occur within a site’s boundaries, including any defined buffer zones. Portions of the project may need to be modified, redesigned, or eliminated to properly avoid heritage resource sites.
2. All heritage resource sites within the area of potential effect would be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
3. Buffer zones may be established to ensure added protection where the Forest or District archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District archaeologist on a case-by-case basis.
4. When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes would be completed prior to initiating any activities.
5. Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.
6. If heritage resources are inadvertently discovered during project implementation, the Mt. Hough Ranger District archaeologist would be contacted immediately. The heritage resources would be recorded, clearly delineated, and protected.

Treatment Implementation

Pre-existing skid trails and landings would be used whenever available, feasible, and in a desirable location. In order to avoid loss of land base productivity, no more than 15 percent of timber stands would be dedicated to landings and permanent skid trails (USDA 1988). In areas where pre-existing skid trails and landings are not present, construction of such facilities would occur as agreed upon by the Forest Service and purchaser. All landings and skid trails utilized would conform to the standards and guidelines set forth in the Timber Sale Administration Handbook (FSH 2409.15) and the Forest Plan.

Monitoring

Soils

The Forest Plan sets out objectives and protocol for monitoring of plan standards and guidelines, BMP compliance and effectiveness, and soil productivity parameters. Monitoring is to be completed by Forest staff on a per annum basis, either project by project, or a sampling of projects. Sampling should include at least five units each on granite and metasedimentary rock soils for a total of ten units for implementation monitoring. Specific methods would be defined by district watershed personnel. In addition, effectiveness and forensic monitoring would occur on watersheds that exceed the threshold of concern, as required by California Central Valley Regional Water Quality Control Board Resolution R5-2005-0052, "Conditional Waiver of Waste Discharge Requirements for Discharges Related to Timber Harvest Activities".

Heritage Resources

Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

Aquatic Wildlife

Stream condition inventory, including rapid bioassessment: Stream habitat features are measured according to the stream condition inventory (SCI) manual. The following streams are monitored within the Watershed Analysis Area: Little Antelope Creek, Clark's Creek, Boulder Creek (just outside), Lone Rock Creek, Upper Moonlight Creek, Light's Creek, Hungry Creek and Cold Stream. Upper Moonlight, Lights Creek, and Lone Rock Creek have been monitored post fire in 2008 and would be completed the first year after the proposed project implementation and monitored every five years thereafter.

Noxious Weeds

Monitoring during and after project implementation would be used to assess the effectiveness of the SMRs and the control measures at preventing the introduction and spread of noxious weed species in the project area. The measurement indicators described in this analysis—for example, the number of existing infestations and the number of acres treated—would be used in this assessment. Post-treatment monitoring would identify the need for follow-up treatment, assess the effectiveness of the different treatment methods, and/or identify the need for alternative methods of control. Monitoring would be conducted by District personnel during and following project implementation and is expected to greatly reduce the likelihood of uncontrollable weed spread in the Keddie Ridge Project area.

Range

End of season use monitoring is done at the designated monitoring area for the Lights Creek Allotment at Indicator Meadow each year at the end of the growing season. Indicator Meadow is outside of the treatment area. There is no range monitoring done within the treatment area because livestock use is limited, there is no meadow, nor ‘C’ channels within the treatment areas. End of season use monitoring includes: bank alteration; percent meadow use, and percent use of riparian shrubs.

Appendix I

Human Health Risk Assessment

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Human Health Risk Assessment

Introduction

The treatments proposed under the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) present some risks to human health and safety. The risks associated with hand thinning, mechanical thinning, and prescribed fire have been analyzed in detail under the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (EIS) (USDA 2003) and are hereby incorporated by reference. The purpose of this appendix is to present a summary of the potential risks to human health from the proposed herbicide and fungicide treatments.

The hazards associated with using aminopyralid, glyphosate, and borax have been determined through comprehensive reviews of available toxicological studies; these reviews, which are compiled in a group of risk assessments completed by Syracuse Environmental Research Associates (SERA) under contract with the Forest Service, are also incorporated by reference into this risk assessment. Copies of these risk assessments are included in the project record.

The proposed application rates for aminopyralid, glyphosate, and borax fall within the range analyzed in the most recent SERA risk assessments (SERA 2003, 2006, 2007a); therefore a separate human health risk assessment for the Keddie Ridge Project is not required. Consequently, this appendix includes those portions of the human health risk assessment that pertain to the proposed use of aminopyralid, glyphosate, and borax formulations within the Keddie Ridge Project area. It also presents project-specific results from an analysis conducted for the Keddie Ridge Project to further characterize risk of herbicide exposure to workers and members of the general public. The tables included in this appendix are a summary of calculations contained in worksheets in the project file and are based on the most recent and relevant SERA risk assessments (SERA 2003, 2006, 2007a).

Table 1. Comparison of the Chemicals and Application Rates Proposed Under the Keddie Ridge Project with those Analyzed Under the SERA Risk Assessments (SERA 2003, 2006, 2007a).

Chemical	Keddie Ridge Project		SERA Risk Assessment	
	Lower Application Rate[1]	Upper Application Rate[1]	Lower Application Rate[1]	Upper Application Rate[1]
Aminopyralid	0.05 a.e. lbs/acre	0.11 a.e. lbs/acre	0.03 a.e. lbs/acre	0.11 a.e. lbs/acre
Glyphosate	1 a.e. lbs/acre	3 a.e. lbs/acre	0.5 a.e. lbs/acre	7 a.e. lbs/acre
Borax	0.1 a.e. lbs/acre	2.7 a.e. lbs/acre	0.1 a.e. lbs/acre	5 a.e. lbs/acre

[1] application rate units: acid equivalent pounds per acre (a.e. lbs/acre)

The application of aminopyralid, glyphosate, and borax, as proposed by the Keddie Ridge Project, is expected to present a low risk to human health and safety. Based on the available information, the addition of the proposed surfactant and dye, would also pose a low risk to human health and safety. The incorporation of Best Management Practices (included in Appendix H) would also reduce the level of exposure and associated risk to the health and safety of workers and members of the general public. This is based on the analysis included in the SERA risk assessments (SERA 2003, 2006, 2007a) as well as the project-level risk characterization described in this appendix, which was conducted using the specific chemicals, application rates, and volumes proposed for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project.

Summary of Project Proposal

Two herbicides (aminopyralid and glyphosate) and one fungicide (borax) are proposed under alternatives A and D for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project area. Aminopyralid and glyphosate are proposed for treatment of hoary cress, yellow starthistle, and Canada thistle. Aminopyralid (e.g. Milestone® or an equivalent formulation) would be applied over a maximum of 61 acres; glyphosate (e.g. Accord® or an equivalent formulation) would be applied over a maximum of one acre. A non-ionic modified vegetable oil surfactant (such as Competitor® or an equivalent formulation) and a marker dye (such as Hi-Lite Blue® or an equivalent formulation) would also be used to increase the efficacy of the herbicide treatments. Herbicide treatments would occur over a period of two to five years, as needed.

Alternatives A and D also propose the use of the fungicide borax (e.g., Sporax® or an equivalent formulation) for control of *Heterobasidion* root disease within the Keddie Ridge Project area. Under these alternatives, borax would be applied in granular form to all harvested conifer stumps 14 inches and greater in diameter within treatment units 45, 46, 49, and 50. Application rates within thinning units would range from 0.1 pounds per acre (lbs/acre) to 1.1 lbs/acre; rates within group selection units would be higher with as much as 2.7 lbs/acre applied.

The proposed applications would comply with all applicable state and federal regulations for the safe use of pesticides (including the label requirements). For example, applicators would be adequately trained, medical aid would be available, wash water and eye wash water would be on-site or nearby, and personal protective equipment would be used (e.g. eye protection, gloves, long-sleeved shirt, and long pants). Best Management Practices for pesticide application, including a spill contingency plan, would be implemented.

The proposed application rates for all of the proposed chemicals are included in Table 1 above. Chapter 2 also provides a more detailed summary of the herbicide and fungicide treatment design elements that are proposed under alternatives A and D.

Hazard Analysis

A considerable body of information describing the hazards associated with using each of the proposed herbicides and the proposed fungicide is contained in the risk assessments completed by SERA (SERA 2003, 2006, 2007a) under contract to the Forest Service and in the HFQLG final supplemental EIS (USDA 2003). All of these documents are incorporated by reference into this risk assessment. The following section includes relevant portions of the hazard analysis provided in the most recent SERA risk assessments (SERA 2003, 2006, 2007a).

A note specific to impurities and metabolites - virtually no chemical synthesis yields a totally pure product. Technical grade herbicides and fungicides, as with other technical grade products, undoubtedly contain some impurities. The U.S. Environmental Protection Agency (EPA) defines the term impurity as "…any substance…in a pesticide product other than an active ingredient or an inert ingredient, including un-reacted starting materials, side reaction products, contaminants, and degradation products" (40 CFR 158.153(d)). To some extent, concern for impurities in technical grade herbicides and fungicides is reduced by the fact that the existing toxicity studies on these herbicides and fungicides were conducted with the technical grade product. Thus, if toxic impurities are present in the technical grade product, they are likely to be encompassed by the available toxicity studies on the technical grade product. An exception to this general rule involves carcinogens, most of which are presumed to act by non-threshold mechanisms. Because of the non-threshold assumption, any amount of a carcinogen in an otherwise non-carcinogenic mixture is assumed to pose some carcinogenic risk.

As with contaminants, the potential effect of metabolites on a risk assessment is often encompassed by the available *in vivo* toxicity studies under the assumption that the toxicological consequences of metabolism in the species on which toxicity studies are available will be similar to those in the species of concern (human in this case). Uncertainties in this assumption are encompassed by using an uncertainty factor in deriving the reference dose (RfD) and may sometimes influence the selection of the study used to derive the RfD.

Unless otherwise specifically referenced, all of the information in the following sections was taken directly from the executive summary of the most recent SERA risk assessment (SERA 2003, 2006, 2007a).

Aminopyralid (Source: SERA 2007a)

Because aminopyralid is a new herbicide, no information is available in the published literature on the toxicity of aminopyralid to humans or other mammalian species. The only information on aminopyralid that is available for assessing potential hazards in humans is a series of toxicity studies that have been submitted to and evaluated by the U.S. EPA's Office of Pesticides in support of the registration for aminopyralid.

Although the mechanism of action of aminopyralid and other pyridine carboxylic acid herbicides is fairly well characterized in plants, the mechanism of action of aminopyralid in mammals is not well characterized. The weight-of-evidence suggests that aminopyralid may not have any remarkable systemic toxic effects. The effects that are most commonly seen involve effects on the gastrointestinal tract after oral exposure and these may be viewed as portal of entry effects rather than systemic toxic effects. The location of these effects within the gastrointestinal tract appears to vary among species with the ceca being the most common site of action in rats and the stomach being the most common site of action in dogs and rabbits. Mice do not seem to display any remarkable gastrointestinal effects after oral doses of aminopyralid. The reason for these differences among species is not clear but may simply reflect differences in methods of exposure (gavage versus dietary) and/or differences in anatomy.

In one acute oral toxicity study in rats using the aminopyralid TIPA formulation, lacrimation and cloudy eyes were noted in all test animals on the first day of the study but not on subsequent days.

Clouding of the eyes is an unusual effect that has not been noted in other studies on aminopyralid, either the acid or the TIPA salt. The significance of this observation, if any, is unclear.

Aminopyralid is rapidly absorbed and excreted and is not substantially metabolized in mammals. As a consequence of rapid absorption and excretion, gavage and dietary exposures probably lead to very different patterns in the time-course of distribution in mammals. The oral LD_{50} of aminopyralid has not been determined because aminopyralid does not cause any mortality at the dose limits set by the U.S. EPA for acute oral toxicity studies – i.e. up to 5,000 mg/kg bw. Similarly, subchronic and chronic toxicity studies have failed to demonstrate any clear signs of systemic toxic effects. Developmental studies involving gavage administration, however, have noted signs of incoordination in adult female rabbits. The incoordination was rapidly reversible and did not persist past the day of dosing. Two chronic oral bioassays have been conducted, one in mice and the other in rats, and a 1-year feeding study is available in dogs. Based on the results of the chronic bioassays as well as the lack of mutagenic activity in several mutagenicity screening assays, there is no basis for asserting that aminopyralid is a carcinogen. Similarly, based on the chronic bioassays and several additional subchronic bioassays in mice, rats, dogs, and rabbits, there is no basis for asserting that aminopyralid will cause adverse effects on the immune system or endocrine function. The potential for effects on the nervous system is less clear. Aminopyralid has also been subject to several bioassays for developmental toxicity and one multi-generation study for reproductive performance. No adverse effects on offspring have been noted in these studies other than decreased body weight in offspring that is associated with decreased food consumption and decreased body weight in adult females.

Glyphosate (Source: SERA 2003)

The herbicidal activity of glyphosate is due primarily to the inhibition of the shikimate pathway which is involved in the synthesis of aromatic amino acids in plants and microorganisms. This metabolic pathway does not occur in humans or other animals and thus this mechanism of action is not directly relevant to the human health risk assessment. Two specific biochemical mechanisms of action have been identified or proposed for glyphosate: uncoupling of oxidative phosphorylation and inhibition of hepatic mixed function oxidases. Both glyphosate and the polyethoxylated tallow amine (POEA) surfactant used in Roundup will damage mucosal tissue, although the mechanism of this damage is likely to differ for these two agents. Many of the effects of acute oral exposure to high doses of glyphosate or Roundup are consistent with corrosive effects on the mucosa.

The available experimental studies indicate that glyphosate is not completely absorbed after oral administration and is poorly absorbed after dermal applications. Two dermal absorption studies have been published on glyphosate and both of these studies indicate that glyphosate is very poorly absorbed across the skin.

Like all chemicals, glyphosate as well as commercial formulations of glyphosate may be toxic at sufficiently high exposure levels. In rats and mice, acute oral LD_{50} values of glyphosate range from approximately 2,000 to 6,000 mg/kg. Formulations of glyphosate with a POEA surfactant have been used in many suicides and attempted suicides. Gastrointestinal effects (vomiting, abdominal pain, diarrhea), irritation, congestion, or other forms of damage to the respiratory tract, pulmonary edema, decreased urinary output sometimes accompanied by acute renal tubular necrosis, hypotension, metabolic acidosis, and electrolyte imbalances, probably secondary to the gastrointestinal and renal effects, are seen in human cases of glyphosate/surfactant exposure.

One of the more consistent signs of subchronic or chronic exposure to glyphosate is loss of body weight. This effect has been noted in mice, rats, dogs, and rabbits. This observation is consistent with experimental data indicating that glyphosate may be an uncoupler of oxidative phosphorylation. Other signs of toxicity seem general and non-specific. A few studies report changes in liver weight, blood chemistry that would suggest mild liver toxicity, or liver pathology. Changes in pituitary weight have also been observed. Signs of kidney toxicity, which might be expected based on the acute toxicity of glyphosate, have not been reported consistently and are not severe. Various hematological changes have been observed that may be secondary to mild dehydration.

Glyphosate has been specifically tested for neurotoxicity in rats after both acute and subchronic exposures and has been tested for delayed neurotoxicity in hens. In both the animal data as well as the clinical literature involving suicide attempts, there is no clear pattern suggestive of a specific neurotoxic action for glyphosate or its commercial formulations. The weight of evidence suggests that any neurologic symptoms associated with glyphosate exposures are secondary to other toxic effects. No studies are reported that indicate morphologic abnormalities in lymphoid tissues which could be suggestive of an effect on the immune system. As discussed in the ecological risk assessment, one study has asserted that glyphosate causes immune suppression in a species of fish. This study, however, is deficient in several respects and does not provide a basis for impacting the hazard identification for effects on the immune system.

Only three specific tests on the potential effects of glyphosate on the endocrine system have been conducted and all of these tests reported no effects. All of these assays are *in vitro* – i.e., not conducted in whole animals. Thus, such studies are used qualitatively in the hazard identification to assess whether there is a plausible biologic mechanism for asserting that endocrine disruption is plausible. Because they are *in vitro* assays, measures of *dose* and quantitative use of the information in dose/response assessment is not appropriate. For glyphosate, these studies do not indicate a basis for suggesting that glyphosate is an endocrine disruptor. Nonetheless, glyphosate has not undergone an extensive evaluation for its potential to interact or interfere with the estrogen, androgen, or thyroid hormone systems. Thus, the assessment of the potential endocrine effects of glyphosate cannot be overly interpreted.

Glyphosate has been subject to multi-generation reproduction studies which measure overall effects on reproductive capacity as well as teratology studies which assay for a compounds ability to cause birth defects. Signs of teratogenic activity have not been observed in standard assays in both rats and rabbits. In a multi-generation reproduction study in rats, effects on the kidney were observed in male offspring. This effect is consistent with the acute systemic toxicity of glyphosate, rather than a specific reproductive effect. Several other subchronic and chronic studies of glyphosate have been conducted with no mention of treatment-related effects on endocrine glands or reproductive organs. A single study has reported substantial decreases in libido, ejaculate volume, sperm concentrations, semen initial fructose and semen osmolality as well as increases in abnormal and dead sperm in rabbits after acute oral exposures to glyphosate. This study is inconsistent with other studies reported on glyphosate and is poorly documented –i.e., specific doses administered to the animals are not specified. In addition, the use of gelatin capsules, as in this study results, in a high spike in body burden that is not typical or particularly relevant to potential human exposures – other than attempted suicides. Numerous epidemiological studies have examined relationships between pesticide exposures or assumed pesticide exposures in agricultural workers and reproductive outcomes. Of those studies that have specifically addressed potential risks from glyphosate exposures, adverse reproductive effects have not been noted.

Based on standard animal bioassays for carcinogenic activity *in vivo*, there is no basis for asserting that glyphosate is likely to pose a substantial risk. The Re-registration Eligibility Decision (RED) document on glyphosate prepared by the U.S. EPA indicates that glyphosate is classified as Group E: Evidence of non-carcinogenicity for humans. This classification is also indicated in U.S. EPA's most recent publication of tolerances for glyphosate and is consistent with an assessment by the World Health Organization. This assessment has been challenged based on some studies that indicate marginal carcinogenic activity. As with any compound that has been studied for a long period of time and tested in a large number of different systems, some equivocal evidence of carcinogenic potential is apparent and may remain a cause of concern, at least in terms of risk perception. While these concerns are understandable, there is no compelling basis for challenging the position taken by the U.S. EPA and no quantitative risk assessment for cancer is conducted as part of the current analysis.

Glyphosate formulations used by the Forest Service are classified as either non-irritating or only slightly irritating to the skin and eyes in standard assays required for product registration. Based on a total of 1513 calls to a poison control center reporting ocular effects associated with the use of Roundup, 21 percent were associated with no injury, 70 percent with transient minor injury, 2 percent with some temporary injury. The most frequently noted symptoms included blurred vision, a stinging or burning sensation, lacrimation. No cases of permanent damage were reported.

Various glyphosate formulations contain a POEA surfactant at a level of up to about 20 percent. Other formulations of glyphosate recommend the use of a surfactant to improve the efficacy of glyphosate. While surfactants are typically classified as “inert” ingredients in herbicides, these compounds are not toxicologically inert and some surfactants may be more toxic than the herbicides with which they are used. Although surfactants may play a substantial role in the interpretation of a large number of suicides and attempted suicides involving the ingestion of glyphosate formulations, primarily Roundup, the acute mammalian toxicity of different glyphosate formulations do not appear to differ substantially. This is in contrast to the available data on the toxicity of various formulations to aquatic species, as detailed in the ecological risk assessment.

Borax (Source: SERA 2006)

The toxicity of borate compounds has been extensively studied in both humans and laboratory animals, with most studies conducted using boric acid and borax. Boric acid and borax have similar toxicological properties across different species. In order to facilitate any comparisons between borax and boric acid, data are expressed in terms of the dose or concentration of borate compound (borax or boric acid) and in terms of boron equivalents (B).

At physiologic pH, borate salts convert almost entirely to unionized boric acid; thus, boric acid and borate salts have similar toxicologic properties. Inorganic borates are well absorbed following oral administration, with an oral absorption of greater than 90 percent of the administered dose. Borate is not readily absorbed through intact skin but is more quickly absorbed across abraded skin. Percutaneous absorption of borax from intact human skin was shown to be very low, with a dermal permeability coefficient of 1.8×10^{-7} cm/hr. Boron is also absorbed following inhalation exposure to borate dust, but absorption does not appear to be complete. Borates are distributed in body soft tissues and eliminated in the urine, primarily in the form of boric acid, with a half-life of approximately 12 hours. Due to the excessive energy required to break the boron-oxygen bond, borates are not metabolized by humans or animals.

Based on the results of acute exposure studies, borax is classified as moderately toxic, with an LD_{50} in male rats of 4.5 g borax/kg. Clinical signs of toxicity observed following acute exposures include depression, ataxia and convulsions. In dogs, acute exposure to borax produced a strong dose-dependent emetic response. As expected of a compound with low percutaneous absorption, the LD_{50} of borax following single dermal application is > 5 g borax/kg in rats and >2 g borax/kg in rabbits. Results of a single inhalation exposure study yield a 4-hour LC_{50} > 2.0 mg borax/kg.

Results of developmental, subchronic and chronic toxicity studies show that the primary targets for borate toxicity are the developing fetus and the male reproductive system. Regarding developmental effects, gestational exposure of rats, mice, and rabbits to boric acid resulted in increased fetal deaths, decreased in fetal weight, and increased fetal malformations. The types of fetal malformations observed include anomalies of the eyes, central nervous system, cardiovascular system, and axial skeleton in rats, short rib XIII and other skeletal anomalies pertaining to ribs in mice, and cardiovascular malformations in rabbits. The most sensitive effect observed following gestational exposure to boric acid is decreased body weight. No mechanism has been identified for the developmental effects of borates. Results of subchronic and chronic toxicity studies show that the testis is the primary target organ for borate compounds in adult animals. Testicular toxicity is characterized by atrophy of the testes, degeneration of the seminiferous epithelium, and sterility. Results of reproductive studies show a dose-dependent decrease in fertility in male rats and dogs, with dogs being slightly more sensitive than rats. At lower exposure levels, testicular effects and infertility may be reversed, but adverse effects can persist for at least 8 months at higher exposure levels. Results of one study in rats indicate that borax exposure may also reduce ovulation in female rats. Although no mechanism has been identified for borax-induced toxicity to the male reproductive system, data are consistent with the Sertoli cell as the primary target. Borax and borate compounds do not appear to act as direct neurotoxins or cause effects on immune system function. Studies assessing carcinogenic and mutagenic potential show no carcinogenic or mutagenic activity for borax and other borate compounds. Borax is not irritating to skin (Toxicity Category 4). Borax can cause severe irritation to eyes (Toxicity Category 1). In standard mammalian studies to assay ocular irritation, the damage persisted for the duration of the study – i.e., 14 days.

Exposure Assessment

This exposure assessment examines the potential health effects to two groups of people that are most likely to be exposed to aminopyralid, glyphosate, or borax: workers and members of the public. Workers include applicators, supervisors, and other personnel directly involved in the application of herbicides. The public includes other Forest Service personnel, visitors, or nearby residents who could be exposed through herbicide drift, contact with sprayed vegetation, by drinking water that contains herbicide residue, or by eating contaminated vegetation (such as berries or foliage), game, or fish.

In these analyses, data are displayed for three different exposure scenarios: typical, lower, and upper. The upper level represents a conservative estimate of a worst-case scenario resulting from the highest application rate, lowest dilution rate, and largest number of acres treated per day. This approach is used to encompass as broadly as possible the range of potential exposures.

Workers

Pesticide applicators are the individuals who are most likely to be exposed to a pesticide during the application process. For purpose of this analysis, two different types of worker exposure assessments were considered: general and accidental/incidental. General exposure scenarios were used to analyze exposure resulting from normal use (i.e. handling and application) of the chemicals (SERA 2007b). Accidental and incidental exposure scenarios were used to analyze specific types of exposures associated with mischance or mishandling of a chemical (SERA 2007b).

The USDA Forest Service has generally used an absorption-based model for worker exposure modeling, in which the amount of chemical absorbed is estimated from the amount of chemical handled. Absorption based models have been used by the USDA Forest Service because of two common observations from field studies. First, most studies that attempt to differentiate occupational exposure by route of exposure indicate that dermal exposure is the dominant route of exposure for pesticide workers. Second, most studies of pesticide exposure that monitored both dermal deposition and chemical absorption or some other method of bio-monitoring noted a very poor correlation between the two values (e.g., Cowell et al. 1991, Franklin et al. 1981, Lavy et al. 1982, referenced in SERA 2007b). In this exposure assessment for workers, the primary goal is to estimate the absorbed dose so that the absorbed dose estimate can be compared with available information on the dose-response relationships for the chemical of concern.

Although pesticide application involves many different job activities, exposure rates can be defined for three broad categories: directed application such as those involving the use of backpacks or similar devices; broadcast hydraulic spray applications; and broadcast aerial applications. All of the methods proposed for control of noxious weeds and *Heterobasidion* root disease in the Keddie Ridge Project (i.e. backpack spraying, wick, and spot application) fall under the category of direct application; therefore only the risks associated with this job activity will be presented in this risk analysis.

Exposure rates for workers are calculated using a number of factors that include: proposed application rates, dilution rates, estimated hours worked per day, number of acres treated per hour and human dermal absorption rates. As described in SERA (2007b), worker exposure rates are expressed in units of milligrams (mg) of absorbed dose per kilogram (kg) of body weight per pound of chemical handled (mg/kg/lb applied). A summary of the exposure scenarios calculated for workers is provided in the tables at the end of this section.

General Exposure

Table 2 and Table 3 display the exposure rates calculated for a scenario involving general exposure to aminopyralid and glyphosate. This scenario represents the type of exposure that might be expected to occur over the course of each work day during a prolonged application program. Borax is not included in this scenario because of the method in which it is applied (i.e. granular form to the surfaces of cut tree stumps). Although there are several reports detailing local irritant effects resulting from occupational exposures to borate dust, these exposures are not considered in this assessment due to the implausibility of inhalation exposures in the field reaching the high concentrations of boron that are reported in confined industrial facilities (SERA 2006). Therefore, the only exposure scenario that is considered plausible for workers is accidental dermal exposure to the hands and lower legs of granular borax during application, which is discussed in the next section.

Accidental and Incidental Exposures

Typical occupational exposures may involve multiple routes of exposure (i.e., oral, dermal, and inhalation); nonetheless, dermal exposure is generally the predominant route for herbicide applicators. Typical multi-route exposures are encompassed by the methods used in general exposures. Accidental exposures, on the other hand, are most likely to involve splashing a solution of herbicide or fungicide into the eyes or to involve various dermal exposure scenarios.

The available literature does not include quantitative methods for characterizing exposure or responses associated with splashing a solution of a chemical into the eyes; furthermore, there appear to be no reasonable approaches to modeling this type of exposure scenario quantitatively. Consequently, accidental exposure scenarios of this type are considered qualitatively in the risk characterization.

There are various methods for estimating absorbed doses associated with accidental dermal exposure. Two general types of exposure are modeled: those involving direct contact with a solution of the herbicide and those associated with accidental spills of the herbicide or fungicide onto the surface of the skin. Any number of specific exposure scenarios could be developed for direct contact or accidental spills by varying the amount or concentration of the chemical on or in contact with the surface of the skin and by varying the surface area of the skin that is contaminated.

Exposure scenarios involving direct contact with solutions of the chemical are characterized by immersion of the hands for one minute or wearing contaminated gloves for one hour. Generally, it is not reasonable to assume or postulate that the hands or any other part of a worker will be immersed in a solution of an herbicide for any period of time. On the other hand, contamination of gloves or other clothing is quite plausible. For these exposure scenarios, the key element is the assumption that wearing gloves grossly contaminated with a chemical solution is equivalent to immersing the hands in a solution.

In either case, the concentration of the chemical in solution that is in contact with the surface of the skin and the resulting dermal absorption rate are essentially constant.

Exposure scenarios involving chemical spills on to the skin are characterized by a spill on to the lower legs as well as a spill on to the hands. In these scenarios, it is assumed that a solution of the chemical is spilled onto a given surface area of skin and that a certain amount of the chemical adheres to the skin. The absorbed dose is then calculated as the product of the amount of the chemical on the surface of the skin (i.e., the amount of liquid per unit surface area multiplied by the surface area of the skin over which the spill occurs and the concentration of the chemical in the liquid) the first-order absorption rate, and the duration of exposure. For both scenarios, it is assumed that the contaminated skin is effectively cleaned after one hour. As with the exposure assessments based on Fick's first law, this product (mg of absorbed dose) is divided by bodyweight (kg) to yield an estimated dose in units of mg chemical/kg body weight. The specific equation used in these exposure assessments is taken from SERA (2007b).

Summary of Worker Exposures

The following tables provide a summary of the general and accidental exposure scenarios calculated for workers.

Table 2. Summary of Worker Exposure Scenarios for Aminopyralid Applied at the Maximum Application Rate of 0.11 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.001	5×10^{-5}	0.009
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	1×10^{-7}	1×10^{-8}	5×10^{-6}
Contaminated Gloves, 1 hour	6×10^{-6}	9×10^{-7}	0.0003
Spill on hands,1 hour	2×10^{-5}	3×10^{-6}	0.002
Spill on lower legs,1 hour	6×10^{-5}	7×10^{-6}	0.004

Table 3. Summary of Worker Exposure Scenarios for Glyphosate Applied at the Maximum Application Rate of 3 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
General Exposure (dose in mg/kg/day)			
Backpack application	0.04	0.003	0.2
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	4×10^{-6}	7×10^{-7}	0.0002
Contaminated Gloves, 1 hour	0.0003	4×10^{-5}	0.01
Spill on hands,1 hour	0.0006	0.0001	0.02

Spill on lower legs,1 hour	0.001	0.0003	0.04

Table 4. Summary of Worker Exposure Scenarios for Borax Applied at the Maximum Application Rate of a.e. lbs/Acre.

Scenario[1]	**Typical Dose (mg/kg/day)**	**Lower Range (mg/kg/day)**	**Upper Range (mg/kg/day)**
Accidental/Incidental Exposures (dose in mg/kg/day)			
Immersion of hands, 1 minute	4×10^{-5}	2×10^{-5}	9×10^{-5}
Contaminated Gloves, 1 hour	3×10^{-4}	1×10^{-4}	7×10^{-4}

[1]Note that many of the scenarios included for aminopyralid and glyphosate (above) are not applicable to borax because of the granular stump application method

General Public

Under normal conditions, members of the general public should not be exposed to substantial levels of aminopyralid, glyphosate, or borax. Nonetheless, exposure scenarios can be constructed for the general public, depending on various assumptions regarding application rates, dispersion, canopy interception, and human activity. Several highly conservative scenarios are utilized to characterize this risk.

The two types of exposure scenarios developed for the general public include acute exposure and longer-term or chronic exposure. All of the acute exposure scenarios are primarily accidental. They assume that an individual is exposed to the compound either during or shortly after its application. Specific scenarios are developed for direct spray, dermal contact with contaminated vegetation, and consumption of contaminated fruit, vegetation, water, and fish. Most of these scenarios should be regarded as extreme, some to the point of limited plausibility (SERA 2007b). The longer-term or chronic exposure scenarios parallel the acute exposure scenarios for the consumption of contaminated fruit, vegetation, water, and fish but are based on estimated levels of exposure for longer periods after application. A summary of the exposure scenarios calculated for workers is provided in the three tables at the end of this section.

As discussed in the exposure assessment for workers (SERA 2006), the atypical application method for borax limits the number of exposure scenarios for the general public that can be reasonably expected to occur; therefore, typical exposures involving spray of a chemical to vegetation, such as dermal contact with contaminated vegetation and the consumption of contaminated fruit, are not applicable to the assessment of borax. Exposure scenarios based on oral exposures from consumption of contaminated fish are also not considered since borate compounds do no bio-accumulate in fish (SERA 2006).

The two types of exposure scenarios that are considered most likely for borax include ingestion of borax from a tree stump by a child and ingestion of contaminated water. For ingestion of borax from a tree stump, only acute exposure is considered. Exposure scenarios developed for the general public for contaminated water include acute exposure and longer-term or chronic exposure. The scenarios developed for this risk assessment should tend to over-estimate exposures in general.

Direct Spray

Direct sprays involving ground applications are modeled in a manner similar to accidental spills for workers. In other words, it is assumed that the individual is sprayed with a solution containing the compound and that an amount of the compound remains on the skin and is absorbed by first-order kinetics. As with the worker exposure scenarios, the first-order absorption kinetics are estimated from the empirical relationship of first-order absorption rate coefficients to molecular weight and octanol-water partition coefficients (SERA 2007b).

For direct spray scenarios, it is assumed that during a ground application, a naked child is sprayed directly with the herbicide. The scenario also assumes that the child is completely covered (that is, 100 percent of the surface area of the body is exposed), which makes this an extremely conservative exposure scenario that is likely to represent the upper limits of plausible exposure. An additional set of scenarios are included involving a young woman who is accidentally sprayed over the feet and legs. For each of these scenarios, some standard assumptions are made regarding the surface area of the skin and body weight.

Dermal Exposure from Contaminated Vegetation

In this exposure scenario, it is assumed that the herbicide is sprayed at a given application rate and that an individual comes in contact with sprayed vegetation or other contaminated surfaces at some period after the spray operation. For these exposure scenarios, some estimates of dislodgeable residue and the rate of transfer from the contaminated vegetation to the surface of the skin must be available. When no such data are directly available for these herbicides the estimation methods of Durkin et al. (SERA 2007b) are used. Other estimates used in this exposure scenario involve estimates of body weight, skin surface area, and first-order dermal absorption rates.

Contaminated Water

Water can be contaminated from runoff, as a result of leaching from contaminated soil, from a direct spill, or from unintentional contamination from applications. For this risk assessment, the two types of estimates made for the concentration of these herbicides in ambient water are acute/accidental exposure from an accidental spill and longer-term exposure to the herbicides in ambient water that could be associated with the typical application of these compounds to a 100-acre treatment area.

The acute exposure scenario assumes that a young child (2- to 3-years old) consumes one liter (L) of contaminated water (a range of 0.6 to 1.5 L) shortly after an accidental spill of 200 gallons of a field solution into a pond that has an average depth of 1 meter and a surface area of 1000 square meters or about one-quarter acre. Because this scenario is based on the assumption that exposure occurs shortly after the spill, no dissipation or degradation of the herbicide is considered. This is an extremely conservative scenario dominated by arbitrary variability. The actual concentrations in the water would depend heavily on the amount of compound spilled, the size of the water body into which it is spilled, the time at which water consumption occurs relative to the time of the spill, and the amount of contaminated water that is consumed. It is also unlikely that ponds would be the water body receiving any herbicides in this project. Flowing streams are the more likely recipients, so dilution would occur.

The scenario for chronic exposure to these herbicides from contaminated water assumes that an adult (70 kg male) consumes contaminated ambient water for a lifetime. There are some monitoring studies available on these herbicides (i.e. glyphosate) that allow for an estimation of expected concentrations in ambient water associated with ground applications of the compound over a wide area. However, for others (i.e. aminopyralid), such monitoring data does not exist. For those herbicides without monitoring data, for this component of the exposure assessment, estimates of levels in ambient water were made based on the Groundwater Loading Effects of Agricultural Management Systems (GLEAMS) model.

GLEAMS is a root zone model that can be used to examine the fate of chemicals in various types of soils under different meteorological and hydro-geological conditions (SERA 2007b). SERA (2004) illustrated the general application of the GLEAMS model to estimating concentrations in ambient water. The results of the GLEAMS modeling runs are displayed in the respective SERA risk assessments. It is important to note that water monitoring conducted in the Pacific Southwest Region since 1991 involving glyphosate (USDA 2001) has shown that the assumptions in this risk assessment (in terms of water contamination) provide for a conservative (i.e. protective) assessment of risk.

The borax application method considered in this risk assessment (i.e. application to tree stumps) has a limited potential to contaminate water. Nonetheless, after application of tree stumps, rainfall and consequent runoff could lead to contamination of standing water or streams. In addition, accidental spills of the borax formulation into a small body of water are possible. Exposure assessments for both of these scenarios are presented.

Oral Exposure from Contaminated Fish

Many chemicals may be concentrated or partitioned from water into the tissues of animals or plants in the water. This process is referred to as bio-concentration. Generally, bio-concentration is measured as the ratio of the concentration in the organism to the concentration in the water. For example, if the concentration in the organism is 5 mg/kg and the concentration in the water is 1 mg/L, the bio-concentration factor (BCF) is 5 L/kg. As with most absorption processes, bio-concentration depends initially on the duration of exposure but eventually reaches steady state. Details regarding the relationship of bio-concentration factor to standard pharmacokinetic principles are provided in Calabrese and Baldwin (1993, referenced in SERA 2007b).

Both of the herbicides in this risk assessment have BCF values for fish of one or less. These values are generally determined from a standardized test that is required as part of the registration process. Borate compounds do not bio-concentrate in fish (Ohlendorf et al.1986; Klasing and Pilch 1988 referenced in SERA 2006)

For both the acute and longer-term exposure scenarios involving the consumption of contaminated fish, the water concentrations of the herbicides used are identical to the concentrations used in the contaminated water scenarios. The acute exposure scenario is based on the assumption that an adult angler consumes fish taken from contaminated water shortly after an accidental spill of 200 gallons of a field solution into a pond that has an average depth of one meter and a surface area of 1,000 square meters or about one-quarter acre. No dissipation or degradation is considered. Because of the available and well-documented information and substantial differences in the amount of caught fish consumed by the general public and Native American subsistence populations (U.S. EPA 1996, referenced in SERA 2007b), separate exposure estimates are made for these two groups. The chronic exposure scenario is constructed in a similar way.

Oral Exposure from Contaminated Vegetation

Under normal circumstances and in most types of applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. Nonetheless, any number of scenarios could be developed involving either accidental spraying of edible wild vegetation, like berries, or the spraying of plants collected by Native Americans for basket weaving or medicinal use. Again, in most instances and particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure. Notwithstanding that assertion, it is conceivable that individuals could consume contaminated vegetation.

One of the more plausible scenarios involves the consumption of contaminated berries after treatment along a road or some other area in which wild berries grow. The two accidental exposure scenarios developed for this exposure assessment include one scenario for acute exposure and one scenario for longer-term exposure. In both scenarios, the concentration of herbicide on contaminated vegetation is estimated using the empirical relationships between application rate and concentration on vegetation developed by (Hoerger and Kenaga 1972, referenced in SERA 2007b). For the acute exposure scenario, the estimated residue level is taken as the product of the application rate and the residue rate. For the longer-term exposure scenario, a duration of 90 days is used and the dissipation on the vegetation is estimated based on the estimated or established foliar half-times.

Although the duration of exposure of 90 days may appear to be somewhat arbitrarily chosen, it is intended to represent the consumption of contaminated vegetation that might be available over one season. Longer durations could be used for certain kinds of vegetation but would lower the estimated dose (i.e., would result in a less conservative exposure assessment). The central estimate of dose for the longer-term exposure period is taken as the time-weighted average of the initial concentration and concentration after 90 days. For the acute exposure scenario, it is assumed that a woman consumes one pound (0.4536 kg) of contaminated fruit. Based on statistics summarized in EPA (1996, referenced in SERA 2007b), this consumption rate is approximately the mid-range between the mean and upper 95 percent confidence interval for the total vegetable intake for a 64 kilogram woman. The longer-term exposure scenario is constructed in a similar way, except that the estimated exposures include the range of vegetable consumption (U.S. EPA 1996, referenced in SERA 2007b) as well as the range of concentrations on vegetation and the range of application rates for the herbicides.

Oral Exposure of Borax Applied to Tree Stumps

For borax, the acute exposure scenario is used in which a child ingests borax applied to tree stumps. There is no information in the available literature to estimate the amount of borax that a child could be predicted to consume in one day. The estimated amount of borax that a child may consume in one day is based on the amount of soil that an average child may ingest per day. According to the EPA Exposure Factors Handbook (U.S. EPA 1996, referenced in SERA 2006), the mean amount of soil that a child consumes per day is estimated to be 100 mg soil/day, with an upper bound estimate of 400 mg soil/day. For this risk assessment, the amount of borax consumed from tree stumps in a single day is taken as the range of 50 (an estimated lower bound) to 400 mg borax /day. A central estimate for borax consumption is taken as 100 mg borax /day. It should be emphasized that this exposure estimate is highly uncertain and not based on empirical data for consumption of any borate compound; thus exposures via this scenario may be under- or overestimated.

Summary of General Public Exposures

The following tables provide a summary of the exposure scenarios calculated for members of the general public.

Table 5. Summary of General Public Scenarios for Aminopyralid Applied at the Maximum Application Rate of 0.11 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.0009	0.0001	0.06
Direct Spray, lower legs, woman	9×10^{-5}	1×10^{-5}	0.006
Dermal Exposure, contaminated vegetation	0.0001	2×10^{-5}	0.0005
Contaminated Fruit	0.001	0.0006	0.02
Contaminated Vegetation	0.02	0.001	0.2
Contaminated Water, spill, child	0.02	0.001	0.6
Consumption of Fish, general public	0.0005	6×10^{-5}	0.01
Consumption of Fish, subsistence populations	0.002	0.0003	0.06
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.0003	0.0001	0.005
Contaminated Vegetation	0.004	0.0002	0.04
Consumption of Water	0.0001	2×10^{-6}	0.001
Consumption of Fish, general public	6×10^{-7}	2×10^{-8}	4×10^{-6}
Consumption of Fish, subsistence population	5×10^{-6}	1×10^{-7}	3×10^{-5}

Table 6. Summary of General Public Scenarios for Glyphosate Applied at the Maximum Application Rate of 3 a.e. lbs/Acre

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct Spray, entire body, child	0.02	0.004	0.7
Direct Spray, lower legs, woman	0.002	0.0004	0.07
Dermal Exposure, contaminated vegetation	0.003	0.001	0.008
Contaminated Fruit	0.04	0.02	0.6
Contaminated Vegetation	0.5	0.03	4.05
Contaminated Water, spill, child	0.4	0.03	15.4
Consumption of Fish, general public	0.005	0.0006	0.2
Consumption of Fish, subsistence populations	0.02	0.003	0.6
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Contaminated Fruit	0.02	0.009	0.3
Contaminated Vegetation	0.3	0.02	2.2
Consumption of Water	9×10^{-5}	6×10^{-6}	0.0008
Consumption of Fish, general public	2×10^{-7}	2×10^{-8}	1×10^{-6}
Consumption of Fish, subsistence population	1×10^{-6}	1×10^{-7}	1×10^{-5}

Table 7. Summary of General Public Scenarios for Borax Applied at the Maximum Application Rate of a.e. lbs/Acre.

Scenario	Typical Dose (mg/kg/day)	Lower Range (mg/kg/day)	Upper Range (mg/kg/day)
Acute/Accidental Exposures (dose in mg/kg/day)			
Direct consumption from tree stump, child	0.9	0.4	3.2
Contaminated Water, spill, child	0.05	0.01	0.1
Contaminated Water, ambient, child	0.01	0.001	0.03
Chronic/Longer Term Exposures (dose in mg/kg/day)			
Consumption of Water	0.001	0.0001	0.007

Dose Response Assessment

The purpose of this section is to describe the degree or severity of risk as a function of dose (SERA 2007b). In general, dose-response assessments use reference doses (RfD), or dose levels associated with a negligible or defined level of risk, as indices of “acceptable exposure” (SERA 2007b). Table 8 provides a summary of the established reference doses (RfD) for aminopyralid, glyphosate, and borax. In this table, RfD values are derived for both acute exposures (i.e. those occurring within a short time frame) as well as chronic exposures (i.e. long-term exposures).

Table 8. Summary of the Reference Doses (RfD) Established for the two Proposed Herbicides and the one Proposed Fungicide. (SERA 2003, 2006, 2007a).

Chemical	Reference Dose (RfD)	
	Acute (mg/kg bw)[a]	Chronic (mg/kg bw/day)
Aminopyralid	1	0.5
Glyphosate	2	2
Borax	0.2	0.2

[a] mg/kg/day = milligrams of agent per kilogram of body weight per day.

The following sections contain relevant excerpts from the dose response assessment contained within the SERA risk assessments for aminopyralid, glyphosate, and borax (SERA 2003, 2006, 2007a). Unless otherwise specifically referenced, all of the information in the following sections was taken directly from the executive summary of the most recent SERA risk assessments (SERA 2003, 2006, 2007a).

Aminopyralid (Source: SERA 2007a)

The Office of Pesticide Programs of the U.S. EPA has derived a chronic RfD of 0.5 mg/kg/day for aminopyralid. This RfD is based on a chronic rat NOAEL [No Observed Adverse Effect Level] of 50 mg/kg/day and an uncertainty factor of 100. The Office of Pesticide Programs has also derived an acute RfD of 1 mg/kg bw/day based on a NOAEL from a reproduction study of about 100 mg/kg/day. In deriving both of these RfD values, the U.S. EPA used an uncertainty factor of 100, a factor of 10 for extrapolating from animals to humans and a factor of 10 for extrapolating to sensitive individuals within the human population. Both of these RfD values are based on NOAELs for the most sensitive endpoint in the most sensitive species and studies in which LOAEL values were identified. In addition, both of the NOAEL values are supported by other studies. Thus, the RfD values recommended by the U.S. EPA are adopted directly in the current risk assessment.

Glyphosate (Source: SERA 2003)

Generally, the dose-response assessments used in Forest Service risk assessments adopt RfDs proposed by the U.S. EPA as indices of 'acceptable' exposure. An RfD is basically defined as a level of exposure that will not result in any adverse effects in any individual. The U.S. EPA RfDs are used because they generally provide a level of analysis, review, and resources that far exceed those that are or can be conducted in the support of most Forest Service risk assessments. In addition, it is desirable for different agencies and organizations within the federal government to use concordant risk assessment values.

The most recent RfD on glyphosate is that proposed by the U.S. EPA Office of Pesticide Programs. This RfD of 2 mg/kg/day was proposed originally in the RED for glyphosate and was also used in the recent glyphosate pesticide tolerances. This RfD is based on teratogenicity study in rabbits (Rodwell et al. 1980b in 2003) in which no effects observed in offspring at any dose levels and maternal toxicity was observed at 350 mg/kg/day with a NOAEL of 175 mg/kg/day . Using an uncertainty factor of 100 – 10 for sensitive individuals and 10 for species-to-species extrapolation – U.S. EPA/OPP derived the RfD of 2 mg/kg/day, rounding the value of 1.75 mg/kg/day to one significant digit.

For the current risk assessment, the RfD 2 mg/kg/day derived by U.S. EPA/OPP is used as the basis for characterizing risk from longer-term exposures in this risk assessment. For short-term exposures, the value of 2 mg/kg/day recommended by U.S. EPA's Office of Drinking Water is used. Since this is identical to the chronic RfD, this approach is equivalent to applying the same RfD to be short-term and long-term exposures. Given the lack of a significant dose-duration relationship for glyphosate, this approach seems appropriate.

Borax (Source: SERA 2006)

The U.S. EPA (2004, as referenced in 2006) has recently derived a chronic RfD of 0.2 mg/kg/day for boron (from boric acid and borates), using the combined data of two developmental toxicity studies in rats using decreased fetal weight as the most sensitive endpoint. The RfD is based benchmark dose analyses identifying a 5 percent decrease in mean fetal body weight compared to control as the benchmark response (BMR) level. The 95 percent lower bound on the dose corresponding to the BMR, i.e., the $BMDL_{05}$, of 10.3 mg B/kg/day is used as the *critical dose* value to calculate the RfD. The uncertainty factor of 66, which considers both the toxicokinetic and toxicodynamic aspects associated with interspecies and interindividual variability, was applied to the critical dose to derive the chronic RfD of 0.2 mg B/kg/day. The U.S. EPA has not derived an acute RfD for boron. Therefore, the chronic RfD of 0.2 mg B/kg/day will also be used to characterize risks associated with incidents or accidents that involve an exposure period of 1 day.

Risk Assessment

The following section presents a quantitative summary of the risk to workers and members of the general public associated with exposure to aminopyralid, glyphosate, and borax. This assessment utilizes the specific chemicals, application rates, and volumes proposed for control of noxious weeds and *Heterobasidion* root disease within the Keddie Ridge Project.

Risk characterization is a process that compares doses that people may get from applying pesticides (i.e. workers) or from being near an application site (i.e. members of the general public) with the U.S. Environmental Protection Agency's established Reference Doses (RfD), a level of exposure considered protective of lifetime or chronic exposures. Risk characterization is expressed as a hazard quotient; a hazard quotient of one or less indicates that the likelihood of adverse effects are low (SERA 2006).

The only reservation attached to this assessment is that associated with any risk assessment: absolute safety cannot be proven and the absence of risk can never be demonstrated. No chemical has been studied for all possible effects and the use of data from laboratory animals to estimate hazard or the lack of hazard to humans is a process that contains uncertainty. Prudence dictates that normal and reasonable care should be taken in the handling of these chemicals.

Workers

Table 9 and Table 10 illustrate that none of the exposure scenarios for workers approach a level of concern (i.e. are greater than one). The highest hazard quotient is 0.1, which is below the level of concern (1.0) by a factor of 10. Based on these values, the risk characterization for workers is considered negligible. This implies that even under the maximum proposed application rates, workers can apply aminopyralid, glyphosate, and borax over the long-term without any expected toxic effects. It also implies that even under the most conservative set of accidental exposures (which should be infrequent events) workers will not face an unacceptable level of risk. All of these chemicals can cause irritation and damage to the skin and eyes (see below); however these effects can be minimized or avoided by safe handling practices and the use of personal protective equipment such as eye protection.

As noted in the Exposure Assessment Section, borax is not included in either the general or the accidental spill scenario because of the method in which it is applied, which is in granular form to the surfaces of cut tree stumps. Therefore, the only exposure scenario that is considered plausible for workers is accidental dermal exposure to the hands and lower legs of granular borax during application, which is displayed in Table 10.

Table 9. Hazard Quotients for Backpack Applicators from General (Non-Accidental) Exposures to Aminopyralid and Glyphosate.

Chemical	Hazard Quotient[a]		
	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.003	0.0001	0.02
Glyphosate	0.02	0.0007	0.1

[a] Hazard Quotient is the level of exposure divided by the RfD (reference dose), then rounded to one significant digit.

Table 10. Hazard Quotient for Herbicides (Backpack Applicators) and Fungicide (Granular Application) for Accidental/Incidental Exposures to Lower and Upper Application Rates.

Chemical	Hazard Quotient[a]							
	Immersion of Hands (1 minute)		Contaminated Gloves (1 hour)		Spill on Hands (1 hour)		Spill on Lower Legs (1 hour)	
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Aminopyralid	1×10^{-8}	5×10^{-6}	9×10^{-7}	0.0003	3×10^{-6}	0.002	7×10^{-6}	0.004
Glyphosate	3×10^{-7}	1×10^{-4}	2×10^{-5}	0.007	6×10^{-5}	0.009	0.0001	0.02
Borax[b]	8×10^{-5}	4×10^{-4}	0.0006	0.004	N/A	N/A	N/A	N/A

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.
[b] Spill on Hands and Spill on Lower Legs scenarios are not applicable to granular formulations of borax.

Technical grade aminopyralid in powder form can cause severe eye irritation with corneal damage (SERA 2007a); however aminopyralid applications within the Keddie Ridge Project area propose solutions of aminopyralid-triisopropanolamine (TIPA) salt in water (such as that found in Milestone®), which is considered much less irritating to the eyes. The U.S. EPA has classified aminopyralid-TIPA as a

Category IV, the minimal classification for eye irritants (U.S. EPA/OPP-HED 2005, referenced in SERA 2007a).

Glyphosate is considered a skin and eye irritant. As discussed in SERA (2003), the irritation level of glyphosate with a POEA surfactant (which is not included in the proposed formulation under Keddie) has been shown to be equivalent to standard dishwashing detergents, all purpose cleaners, and baby shampoos.

Boric acid is rated as a Category III skin irritant (moderate irritant) and anhydrous borax is rated as a Category IV skin irritant (mild irritant) (U.S. EPA 1993a, referenced in SERA 2006). Borax is not irritating to the skin (Toxicity Category IV), but can cause severe irritation to the eyes (Toxicity Category I). Effects to the eyes and skin from aminopyralid, glyphosate, and borax can be minimized or avoided by safe handling practices.

General Public

Direct Spray

As seen in Table 11, the hazard quotients for the two direct spray scenarios are below one; therefore, it can be determined that based on the available information and under the foreseeable conditions of application there is no route of exposure or scenario that suggests that the general public will be at any substantial risk from general exposure.

Table 11. Hazard Quotient for the General Public - Direct Spray Scenario.

Chemical	Hazard Quotient[a]					
	Child (whole body)			Woman (feet and lower legs)		
	Typical Application Rate	Lower Application Rate	Upper Application Rate	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.0009	0.0001	0.06	9×10^{-5}	1×10^{-5}	0.006
Glyphosate	0.01	0.002	0.3	0.001	0.0002	0.03

[a] Hazard Quotient is the level of exposure divided by the reference dose (RfD), then rounded to one significant digit.

Contaminated Vegetation

Table 12 demonstrates that, for members of the general public that may contact vegetation sprayed with aminopyralid or glyphosate, there is a negligible level of exposure risk. Due to the method of application, this scenario is not applicable to borax.

Table 12. Hazard Quotient for the Public – Contact with Vegetation Sprayed with Herbicides.

Chemical	Hazard Quotient[a]		
	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid	0.0001	2×10^{-5}	0.0005
Glyphosate	0.002	0.0005	0.004

[a.] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Contaminated Water

For the accidental spill scenarios, the only exposure level that exceeds the level of concern (i.e. a hazard quotient greater than one) is in the scenario involving a child that consumes water contaminated with glyphosate (Table 13). When interpreting this scenario, it is important to take into consideration that this is an arbitrary exposure scenario. In other words, scenarios that are more or less severe (all of which may be equally probable or improbable) could easily be constructed. All of the specific assumptions used to develop this scenario have a simple linear relationship to the resulting hazard quotient. Therefore, if the accidental spill were to involve 20 rather than 200 gallons of a field solution of glyphosate, all of the hazard quotients would be a factor of 10 less.

Table 13. Hazard Quotient for the Public - Drinking Water Contaminated by Herbicides and Fungicide.

Chemical	Hazard Quotient[a]					
	Acute-Spill Scenario (child)			Chronic-Spill Scenario (adult male)		
	Typical	Lower	Upper	Typical	Lower	Upper
Aminopyralid	0.02	0.001	0.6	0.0003	4×10^{-6}	0.002
Glyphosate	0.2	0.02	**8**	4×10^{-5}	3×10^{-6}	0.0004
Borax	0.2	0.07	0.7	0.006	0.0006	0.04

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Another conservative aspect to the water contamination scenario is that it represents standing water, with no dilution or decomposition of the herbicide. This is unlikely in a forested situation where flowing streams are more likely to be contaminated in a spill, rather than a standing pond of water. Nonetheless, this and other acute scenarios help to identify the types of scenarios that are of greatest concern and those that may warrant the greatest steps to mitigate. For glyphosate, such scenarios involve oral (contaminated water) rather than dermal (spills or accidental spray) exposure.

Oral Exposure from Contaminated Fish

For members of the general public, there is no unacceptable level of risk associated with consumption of fish caught from water contaminated with either aminopyralid or glyphosate (see Table 14).
The highest hazard quotient under these scenarios is 0.3, which was calculated using the upper application limits to represent the worst-case scenario; this value is below the level of concern (1.0) by a factor of 3.

Table 14. Hazard Quotient for the Public – Consumption of Fish Caught from Water Contaminated by Aminopyralid and Glyphosate. Upper Limits are Presented to Represent the Worst-Case Scenario.

Chemical	Hazard Quotient[a]			
	Fish Consumption (accidental spill)		Chronic Fish Consumption	
	Adult Male	Subsistence Population	Adult Male	Subsistence Population
Aminopyralid	0.01	0.05	8×10^{-6}	7×10^{-5}

Glyphosate	0.06	0.3	7×10^{-7}	5×10^{-6}

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Oral Exposure from Contaminated Vegetation

Table 15 displays the hazard quotient values for scenarios involving a woman eating contaminated fruit and vegetation shortly after spraying and for 90 days after they were sprayed. Under the lower and typical rates of application, the hazard quotients are well below one for both the chronic and acute scenarios. However, at the upper application rate, the hazard quotient is slightly above one in the case of acute and chronic exposure to glyphosate as a result of consuming contaminated vegetation.

Table 15. Hazard Quotient for the Public – Ingesting Fruit and Vegetation Contaminated by Herbicides

Chemical	Hazard Quotient a					
	Acute Exposure			Chronic Exposure		
	Typical Application Rate	Lower Application Rate	Upper Application Rate	Typical Application Rate	Lower Application Rate	Upper Application Rate
Aminopyralid						
Fruit	0.001	0.0006	0.02	0.0006	0.0002	0.01
Vegetation	0.02	0.001	0.1	0.008	0.0004	0.08
Glyphosate						
Fruit	0.02	0.008	0.3	0.01	0.004	0.2
Vegetation	0.2	0.02	**2**	0.1	0.009	**1.1**

[a.] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

These hazard quotients illustrate that there is some uncertainty regarding the potential effects of consuming contaminated vegetation; however considering that these hazard quotients are very close to one (the acceptable level of risk), it is unlikely that adverse health effects would result in either of these scenarios. It is also important to take into account the fact that these scenarios do not include the mitigative effects of washing contaminated vegetation. Also, after treatment, vegetation would show obvious signs of herbicide effects and would likely be undesirable for consumption.

Oral Exposure of Borax Applied to Tree Stumps

As seen in Table 16, the hazard quotients for consumption of borax from a tree stump by a child range from 2 to 16 for ingestion of 50 to 400 mg of borax. These estimated levels of exposure are below the levels of exposure associated with nonlethal effects such as diarrhea and vomiting by factors of about 4 to 32 (SERA 2006). They are also below the documented lethal doses, which range from 505 mg/kg/day and 765 mg/kg/day, by factors of about 11 to 135. Therefore, while this exposure scenario raises concern in that the RfD could be substantially exceeded in a child directly consuming borax from a treated stump, the most likely adverse effects would probably be vomiting and diarrhea (SERA 2006).

Table 16. Hazard Quotient for the Public – Acute-Oral Ingestion of Borax by a Child.

Chemical	Hazard Quotient[a]

	Typical Application Rate	Lower Application Rate	Upper Application Rate
Borax	4	2	16

[a] Hazard Quotient is the level of exposure divided by the Reference Dose (RfD), then rounded to one significant digit.

Risk Assessment Summary

The risk characterization for workers is reasonably simple and unambiguous; based on a generally conservative and protective set of assumptions regarding both the toxicity of the proposed chemicals and the potential exposures, there is no basis for suggesting that adverse effects are likely in workers even at the maximum application rates proposed under the Keddie Ridge Project for aminopyralid, glyphosate, or borax (SERA 2003, 2006, 2007a). From a practical perspective, the most likely accidental exposure for workers (i.e. one that might require medical attention) may involve accidental contamination of the eyes. All of the proposed chemicals can cause irritation and damage to the skin and eyes; however these effects can be minimized or avoided by safe handling practices and the use of personal protective equipment such as eye protection.

For members of the general public, aminopyralid applications would result in a negligible risk under all of the scenarios. Even at the highest application rate of 0.11 lb a.e./acre, the hazard quotients are below the level of concern by factors of 2 to 122,000 for longer term exposures.

For borax, the only general public scenario that yielded a hazard quotient above the level of concern (above 1.0) was the scenario in which a child ingests borax straight from the tree stump. While this exposure scenario does raise concern that the reference dose (RfD) could be substantially exceeded if a child directly consumes borax from a treated stump, the most likely adverse effects would probably be vomiting and diarrhea (SERA 2006). This scenario is also extreme and highly unlikely as 1) treatment units are away from high visitor-use or recreation areas, and 2) borax would be applied during or immediately after active logging operations where unsupervised visitor-use is highly discouraged for safety reasons.

For glyphosate, the only two general public scenarios that exceeded the level of concern (i.e. a hazard quotient above 1.0) were the scenario involving a child drinking from a spill-contaminated pond and the scenario involving short and long-term exposure from consumption of contaminated vegetation. For all of these scenarios, the hazard quotient only exceeded the level of concern in the upper range of the application rate; the typical and lower application ranges produced hazard quotients that were below the level of concern.

The exposure scenario that involved the consumption of contaminated water after an accidental spill of glyphosate into a small pond produced a hazard quotient of eight (Table 13). This sort of scenario is routinely used in Forest Service risk assessments as an index of the measures that should be taken to limit exposure in the event of a relatively large spill into a relatively small body of water. For glyphosate, as well as for most other chemicals, this exposure assessment indicates that such an event would require measures to ensure that members of the general public do not consume contaminated water. As detailed in Table 6, the upper range of the exposure scenario involves a dose of 15.4 mg/kg bw. While this is an unacceptable level of exposure, it is far below doses that would likely result in overt signs of toxicity. As detailed in the SERA risk assessment (2003), a dose of 184 mg/kg as Roundup (i.e. glyphosate plus a surfactant) was not associated with any overt signs of toxicity in humans; mild signs of toxicity were apparent at doses of 427 mg/kg, which is over 27 times higher than the upper range of 15.4 mg/kg in the accidental spill scenario.

The only other general public scenario that produced a hazard quotient above one was one that involved the consumption of glyphosate-contaminated vegetation. Under normal circumstances, particularly in the case of noxious weed treatment applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. One exception to this could be plants collected by Native Americans for basket weaving or medicinal use. However, in most instances, particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure.

Cumulative Effects

Cumulative effects from the proposed herbicides or fungicide may result from (a) repeated exposure to one particular chemical or (b) simultaneous exposure to a particular chemical and other agents that may cause the same effect or effects by the same or similar modes of action.

In terms of repeated exposure to one particular chemical, the analysis of chronic exposure scenarios discussed in this risk analysis specifically addresses the potential long-term cumulative impacts associated with aminopyralid, glyphosate, and (to a limited extent) borax. This risk assessment determined that there is a low likelihood of cumulative adverse effects associated with long-term or repeated exposures to the proposed chemicals.

Since these herbicides persist in the environment for a relatively short time (generally less than one year), do not bio-accumulate, and are rapidly eliminated from the body, additive doses from re-treatments in subsequent years are not anticipated. According to work completed by Ando et al. (2003), some plant material can contain glyphosate residues up to 67 weeks after treatment, however, these levels were less than one part per million (Ando et al. 2003). Based on the re-treatment schedule proposed under alternatives A and D (2 to 5 years), it is possible that residues from the initial herbicide application could still be detectable during subsequent re-treatments the following year, but these plants would represent a low risk to humans as they would show obvious signs of herbicide effects and would be undesirable for collection.

It is conceivable that workers or members of the public could be exposed to herbicides as a result of treatments on surrounding public or private forestlands. Where individuals could be exposed by more than one route, the risk of such cases can be quantitatively characterized by simply adding the hazard quotients for each exposure scenario. Using glyphosate as an example, the typical levels of exposure for a woman being directly sprayed on the lower legs (HQ = 0.00009), staying in contact with contaminated vegetation (HQ = 0.002), eating contaminated fruit (HQ = 0.02), and consuming contaminated vegetation (HQ = 0.2) leads to a combined hazard quotient of 0.22. With the exception of a child ingesting borax from a treated stump (discussed in the section above), using the typical rates of application, the addition of all possible exposure scenarios leads to hazard quotients that are substantially less than one for all of the proposed pesticides.

Additional sources of pesticide exposure include use of herbicides and fungicides on adjacent private timberlands or home use by a worker or member of the general public. Table 17 displays the total reported herbicide application (in pounds) within Plumas County. The Plumas NF has not been extensively involved in herbicide applications in the last five years; therefore much of this reported use is on private lands.

Table 17. Total Herbicide Applications (in Pounds) within Plumas County between 2004 and 2008. Data are not Currently Available for 2009 or 2010.

Report Year	Total pounds of pesticide reported
2004	10,882
2005	6,815
2006	6,272
2007	18,505
2008	38,551
Average	**16,205**

Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County. This table includes all pesticides used between 2004 and 2008, not just the three proposed for use in Keddie Ridge Project.

Table 18 shows that between 2004 and 2008, the average amount of active ingredient applied annually within Plumas County was approximately 50 lbs of aminopyralid, 4,775 lbs of glyphosate, and 1,393 lbs of borax (California DPR 2009). Over this same time period the average number of acres treated annually was 88 acres of aminopyralid, 2,251 acres of glyphosate, and 2,030 acres of borax (California DPR 2009).

Table 18. Total Pounds of Aminopyralid, Glyphosate, and Borax Applied within Plumas County between 2004 and 2008. Data are not currently available for 2009 or 2010.

Chemical	Total pounds of pesticide reported (by year)					Average per year
	2004	2005	2006	2007	2008	
Aminopyralid					50	50
Glyphosate	4,546	1,826	3,726	2,144	11,632	4,775
Borax	3,592	350	955	38	2,031	1,393

Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County.

Table 19. Approximate Number of Acres Treated with Aminopyralid, Glyphosate, and Borax Within Plumas County between 2004 and 2008. Data are not currently available for 2009 or 2010.

Chemical	Estimated number of acres treated (by year)					Average per year
	2004	2005	2006	2007	2008	

Aminopyralid					88	88
Glyphosate	2948	538	1204	870	5697	2,251
Borax	2093		1966			2,030

[a] Acres Treated are only for forestry and rangeland uses as these are the only categories that have acres reported in the CDPR database.
Source - California Department of Pesticide Regulation, 2009 Annual Pesticide Use Report for Plumas County.

We assume that, with the exception of the use proposed under alternatives A and D, there would not be any significant changes in the use patterns displayed above in the near future. At this time there are no other pesticide-related projects listed on the Plumas National Forest Schedule of Proposed Action (SOPA) that occur within the proposed Keddie Ridge Project area.

Under alternatives A and D it is estimated that approximately 62 acres of noxious weeds (hoary cress, Canada thistle, and yellow starthistle) would be treated with aminopyralid or glyphosate for a period of two to five years. Alternatives C and E would not involve any herbicide use. The average number of acres treated annually with aminopyralid and glyphosate in Plumas County (calculated from Table 19) is approximately 2,339 acres. Therefore, alternatives A and D would result in at most a three percent increase in the number of acres treated with these two herbicides in Plumas County.

The U.S. EPA has developed the theoretical maximum residue contribution (TMRC), which can be used to consider the cumulative effects associated with use of these herbicides outside of the Keddie Ridge Project. The TMRC is an estimate of maximum daily exposure to chemical residues that a member of the general public could be exposed to from all published and pending uses of a pesticide on a food crop (Table 20). Adding the TMRC to this project's chronic dose estimates can be used as an estimate of the cumulative effects of this project with theoretical background exposure levels of these herbicides. The result of doing this doesn't change the risk conclusions based on the project-related HQ values.

Table 20. TMRC Values for U.S. Population as a Whole.

Pesticide	TMRC (mg/kg/day)	Percent of RfD
Aminopyralid	0.0002	0.1
Glyphosate	0.03	1.5

Sources: (U.S. Environmental Protection Agency 2000, 2004)

Cumulative effects can also be caused by the interaction of different chemicals with a common metabolite or a common toxic action; however, neither the herbicides nor fungicide in this analysis has been demonstrated to share a common metabolite.

Inert Ingredients

The approach used in USDA (1989, as referenced in USDA 2008), the SERA Risk Assessments (SERA 2003, 2006, 2007a), and this analysis to assess the human health effects of inert ingredients and full formulations has been to: (1) compare acute toxicity data between the formulated products (including inert ingredients) and their active ingredients alone; (2) disclose whether or not the formulated products have undergone chronic toxicity testing; and (3) identify, with the help of EPA and the chemical companies, ingredients of known toxicological concern in the formulated products and assess the risks of those ingredients.

Researchers have studied the relationships between acute and chronic toxicity and while the biological end-points are different, relationships do exist and acute toxicity data can be used to give an indication of overall toxicity (Zeise, et al. 1984, as referenced in USDA 2008). The court in *NCAP v. Lyng*, 844 F.2d 598 (9th Cir 1988) decided that this method of analysis provided sufficient information for a decision maker to make a reasoned decision. In SRCC v. Robertson, Civ.No. S-91-217 (E.D. Cal., June 12, 1992) and again in *CATs v. Dombeck*, Civ. S-00-2016 (E.D. Cal., Aug 31, 2001) the district court upheld the adequacy of the methodology used in USDA (1989, as referenced in USDA 2008) for disclosure of inert ingredients and additives.

Since most information about inert ingredients is classified as "Confidential Business Information" (CBI) the Forest Service asked EPA to review the thirteen herbicides for the preparation of USDA 1989 (includes glyphosate) and the commercial formulations and advise if they contained inert ingredients of toxicological concern (Inerts List 1 or 2) (USDA 1989, as referenced in USDA 2008). The EPA determined that there were no inerts on List 1 or 2. In addition, the CBI files were reviewed in the development of the most recent SERA risk assessments (SERA 2003, 2006, 2007a). Information has also been received from the companies who produce the herbicides and spray additives.

Comparison of acute toxicity (LD_{50} values) data between the formulated products (including inert ingredients) and their active ingredients alone shows that the formulated products are generally less toxic than their active ingredients (SERA 2003, 2006, 2007a, USDA 1989, as referenced in USDA 2008).

According to the SERA risk assessment (2006), Sporax contains 100 percent sodium tetraborate decahydrate (borax) and has no other active or inert ingredients. The sole inert ingredient listed for the formulations of aminopyralid and glyphosate most likely to be used in the Keddie Ridge project (i.e. Milestone® and Accord®) is water (SERA 2003, 2007a).

While these formulated products have not undergone chronic toxicity testing like their active ingredients, the acute toxicity comparisons, the EPA review, and our examination of toxicity information on the inert ingredients in each product leads us to conclude that the inert ingredients in these formulations do not significantly increase the risk to human health and safety over the risks identified for the active ingredients.

Additives

Additives (also known as adjuvants) are mixed with an herbicide solution to improve the performance of the spray mixture by either enhancing the activity of the herbicide's active ingredient or by offsetting problems associated with application, such as water or wind factors (Bakke 2007). The two additives proposed for use in the Keddie Ridge Project are: an esterified vegetable oil surfactant (e.g., Competitor® or an equivalent formulation) to facilitate and enhance the spreading and penetrating properties of the herbicides and a marker dye (e.g., Hi-light® Blue or an equivalent formulation) to allow for the identification of plants that have been treated. Borax would not be applied in combination with other products or additives.

Additives are not under the same registration guidelines as are pesticides; therefore much of the information that describes the active ingredients in additives is considered confidential business information (CBI). The EPA does not register or approve the labeling of spray additives, although the California Department of Pesticide Regulation (DPR) does require the registration of those that are considered to increase the action of the pesticide it is used with. All additives are generally field tested by the manufacturer in combination with several different herbicides and weed species, and under a number of different environmental conditions (Bakke 2007).

The most common risk factor associated with the use of the proposed additives is skin or eye exposure. This risk can be minimized through good industrial hygiene practices (i.e. personal protective eyewear and gloves) while utilizing these products. Overall, the additives proposed for use within the Keddie Ridge Project are not expected to pose an adverse risk to the health and safety of workers or members of the general public. This is based on information provided on the product labels as well as in the discussion contained in Bakke (2007) in which the two additives proposed for use under this project are discussed and some acute toxicity data presented. The following provides further discussion of the additives analyzed for the Keddie Ridge Project.

Competitor® (or an Equivalent Formulation)

Product labels contain “signal words” (caution, warning, danger, and poison) which indicate the product’s relative toxicity to humans. The signal word is assigned using a combination of acute toxicity studies and the toxicity of each of the product’s components (Tu et al. 2001). Competitor® has been assigned a “caution” signal word and the label indicates that improper use may cause irritation to the skin and eyes.

The main ingredient in Competitor® is an esterified vegetable oil. It also contains two emulsifiers, sorbitan alkylpolyethoxylate ester and dialkyl polyethoxylene glycol. Vegetable oil surfactants are gaining in popularity due to their capability to increase herbicide absorption and spray retention (Bakke 2007). The U.S. Food and Drug Administration (FDA) considers methyl and ethyl esters of fatty acids produced from edible fats and oils to be food grade additives (21 CFR 172.225). However, because of the lack of exact ingredient statements on these surfactants, it is not always clear whether the oils used meet the U.S. FDA standard.

Hi-light® Blue (or an Equivalent Formulation).

Hi-Light® Blue dye is not required to be registered as a pesticide; therefore there is no signal word included on the label. However, according to Bakke (2007), this product would likely have a “caution” signal word if required to identify one. The label does indicate that this product is mildly irritating to the skin and eyes. Hi-Light® Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (SERA 1997). This dye is water-soluble, contains no listed hazardous substances, and is considered virtually non-toxic to humans (SERA 1997, Bakke 2007) .The effect of use on non-target terrestrial and aquatic species is unknown; however the use of this dye use has not resulted in any known problems (Bakke 2007).

The use of Hi-Light® Blue in the proposed herbicide formulations would result in almost no increased risk to the health and safety of the workers or members of the general public. In fact, the use of dye in herbicide application can reduce likelihood and risk of exposure by facilitating avoidance of treated vegetation.

Synergistic Effects

Synergistic effects are those effects resulting from exposure to a combination of two or more chemicals that are greater than the sum of the effects of each chemical alone (additive). Refer to USDA (1989, as referenced in USDA 2003) for a detailed discussion on synergistic effects.

It is not anticipated that synergistic effects would be seen with the additives proposed in the Keddie Ridge Project. Based on a review of several recent studies, there is no demonstrated synergistic relationship between herbicides and surfactants (Abdelghani et al 1997; Henry et al 1994; Lewis 1992; Oakes and Pollak 1999, 2000 as referenced in Bakke 2007).

Although the combination of surfactant and herbicide might indicate an increased rate of absorption through the skin, a review of recent studies indicates this is not often true (Ashton et al 1986; Boman et al 1989; Chowan and Pritchard 1978; Dalvi and Zatz 1981; Eagle et al 1992; Sarpotdar and Zatz 1986; Walters et al 1993, 1998; Whitworth and Carter 1969 as referenced in Bakke 2007). For a surfactant to increase the absorption of another compound, the surfactant must affect the upper layer of the skin. Without some physical effect to the skin, there will be no change in absorption as compared to the other compound alone. The studies indicate that in general non-ionic surfactants have less of an effect on the skin, and hence absorption, then anionic or cationic surfactants. Compound specific studies indicate that the alkylphenol ethoxylates generally have little or no effect on absorption of other compounds. In several studies, the addition of a surfactant actually decreased the absorption through the skin. It would appear that there is little support for the contention that the addition of surfactants to herbicide mixtures would increase the absorption through the skin of these herbicides.

Borax is not applied in combination with other products or additives. In addition, no data are available regarding the effects of boron compounds applied in conjunction with other chemicals. Thus, an assessment of toxicological effects of borax mixed with other chemicals cannot be made.

Sensitive Individuals

The uncertainty factors used in the development of the reference dose (RfD) takes into account much of the variation in human response. The uncertainty factor of 10 for sensitive subgroups is sufficient to ensure that most people will experience no toxic effects. “Sensitive” individuals are those that might respond to a lower dose than average, which includes women and children. As stated in National Academy of Sciences (1993, as referenced in USDA 2003), the quantitative differences in toxicity between children and adults are usually less than a factor of approximately 10-fold. An uncertainty factor of 10 for sensitive subgroups may not cover all individuals that may be sensitive to herbicides because human susceptibility to toxic substances can vary by two to three orders of magnitude. Factors affecting individual susceptibility include diet, age, heredity, preexisting diseases, and life style. Individual susceptibility to the herbicides proposed in this project cannot be specifically predicted. Unusually sensitive individuals may experience effects even when the HQ is equal to or less than 1. Further information concerning risks to sensitive individuals can be found in USDA (1989, as referenced in USDA 2003).

There is no information to suggest that specific groups or individuals may be especially sensitive to the systemic effects of aminopyralid or glyphosate (SERA 2003, 2007a). The primary targets for boron toxicity are the developing fetus and the testes. Thus, exposure of pregnant women to borate compounds places the developing fetus at risk. Since the oral (chronic) RfD for boron and borates is based on the effects in the developing fetus, risk to this subgroup is assessed throughout the risk assessment (SERA 2006). Regarding other sensitive subgroups, males with underlying testicular dysfunction could be at increased risk for boron-induced testicular toxicity; however, no data are available to quantify this risk.

Worksheets

All worksheets related to the information noted in this document can be found in the Keddie Ridge Project record and are hereby incorporated by reference.

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Glossary

Acid equivalent – when making herbicide rate recommendations for herbicides that are available as either salts or esters or both, it is common practice to make the recommendations on the basis of pounds of the acid equivalent of the active ingredients per acre (lb ae / A). The acid equivalent of a salt or ester form of a herbicide is that portion of the molecule that represents the parent acid (herbicidal portion) form of the molecule (Wood et al. 1996).

Adjuvant – Additives that are mixed with an herbicide solution to improve the performance of the spray mixture by either enhancing the activity of the herbicide's active ingredient or by offsetting problems associated with application, such as water or wind factors

Hazard Quotient – the ratio of the estimated level of exposure to the reference dose or some other index of acceptable exposure.

LC_{50} (lethal concentration) – a calculated concentration of a chemical in air to which exposure for a specific length of time is expected to cause death in 50 percent of a defined experimental animal population.

LD_{50} (lethal dose) – the dose of a chemical calculated to cause death in 50 percent of a defined experimental animal population over an observation period, typically 14 days.

No Observed Adverse Effect Level (NOAEL) – the dose of a chemical at which no statistically or biologically significant increases in frequency of severity of adverse effects were observed between the exposed population and its appropriate control. Effects may be produced at this dose, but they are not considered to be adverse.

RfD, reference dose – a daily dose which is not anticipated to cause any adverse effects in a human population over a lifetime of exposure. These values are derived by the U.S. Environmental Protection Agency.

Surfactant – a vegetable oil or silicon-based adjuvant (e.g., Competitor® or an equivalent formulation) added to herbicides in order to facilitate and enhance their spreading and penetrating properties.

Appendix J

Project Specific Land Allocation Maps

Introduction

This appendix provides an overview of the Plumas National Forest Land and Resource Management Plan (PNF LRMP)(USDA 1988) as amended by two other plan amendments. Each plan or plan amendment discussion includes a brief overview of: the plan or plan amendment; land allocations or management areas that apply; and a figure to provide a spatial relationship of land allocations and, in some cases, associated prescriptions.

Forest Plan Direction

Forest Plan

The proposed action and alternatives are guided by the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003b, 2003c), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b). In addition, the HFQLG/SNFPA Implementation Consistency Crosswalk, revised December 2007, provides clarification for applying standards and guidelines for 2004 SNFPA FSEIS and ROD (USDA 2004a, 2004b) and for HFQLG FEIS and ROD (USDA 1999a, 1999b, 2003b 2003c) (HFQLG/SNFPA Implementation Consistency Crosswalk and cover letter, December 12, 2007) (USDA 2007). This project is being planned under authorization of the Healthy Forest Restoration Act (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process).

Land allocations within the Plumas National Forest have been allocated to certain primary uses through three planning processes: the original PNF LRMP (USA1988) development process, the HFQLG FEIS, FSEIS, and RODs (USDA 1999a, 1999b, 2003b, 2003c), and the SNFPA ROD (USDA 2004a, 2004b). Each of these plan components include standards and guidelines for land and resource management unique to each land allocation. Many of these allocations overlap. During the life of the HFQLG Act Pilot Project, HFQLG land allocations are to be employed for vegetation management projects, with one exception (SNFPA ROD allocation for Northern goshawk PACs).

Prescriptions in the PNF LRMP are still applicable in whole or in part, because they were not superseded by three amendments. Those allocations still in effect for the Keddie Ridge Project area are discussed further below.

The PNF LRMP (USDA 1988) displays management areas, which include descriptions, standards and guidelines, prescriptions, and management objectives specific to each management area (page 4-113). Management areas that overlap with the Keddie Ridge Project area include: Rich (#20), Grizzly Ridge (#23), Butt Lake (#26), Indian Valley (#27), Lights Creek (#28), Antelope (#29), and Ward (#30). Management areas that overlap with proposed treatment units within the Keddie Ridge Project area include: Indian Valley (#27) and Lights Creek (#28). Because Rich, Grizzly Ridge, Butt Lake, Antelope, and Ward management areas do not overlap with treatment units and very small portions of the management areas overlap with the Keddie Ridge Project area, these management areas are removed from further discussion. Of the management areas that overlap with proposed treatment units, prescriptions that apply include: Rx5-Recreation Area Prescription; Rx3-Special Interest Areas Prescription; Rx6-Developed Recreation Site Prescription; Rx7-Minimal Management Prescription; Rx8-Semi-Primitive Area Prescription; Rx10-Visual Retention Prescription; Rx13-Goshawk Habitat Prescription; Rx14-Visual Partial Retention Prescription; Rx 15-Timber Emphasis Prescription; and Rx16-Intensive Ranger. Areas of general direction and standards and guidelines are located on pages 4-274 – 4-293. Figure 1 displays management areas that overlap with the Keddie Ridge Project area. Figure 2 displays the prescriptions specific to Indian Valley and Lights Creek management areas, which overlap with the Keddie Ridge Project area and treatment units.

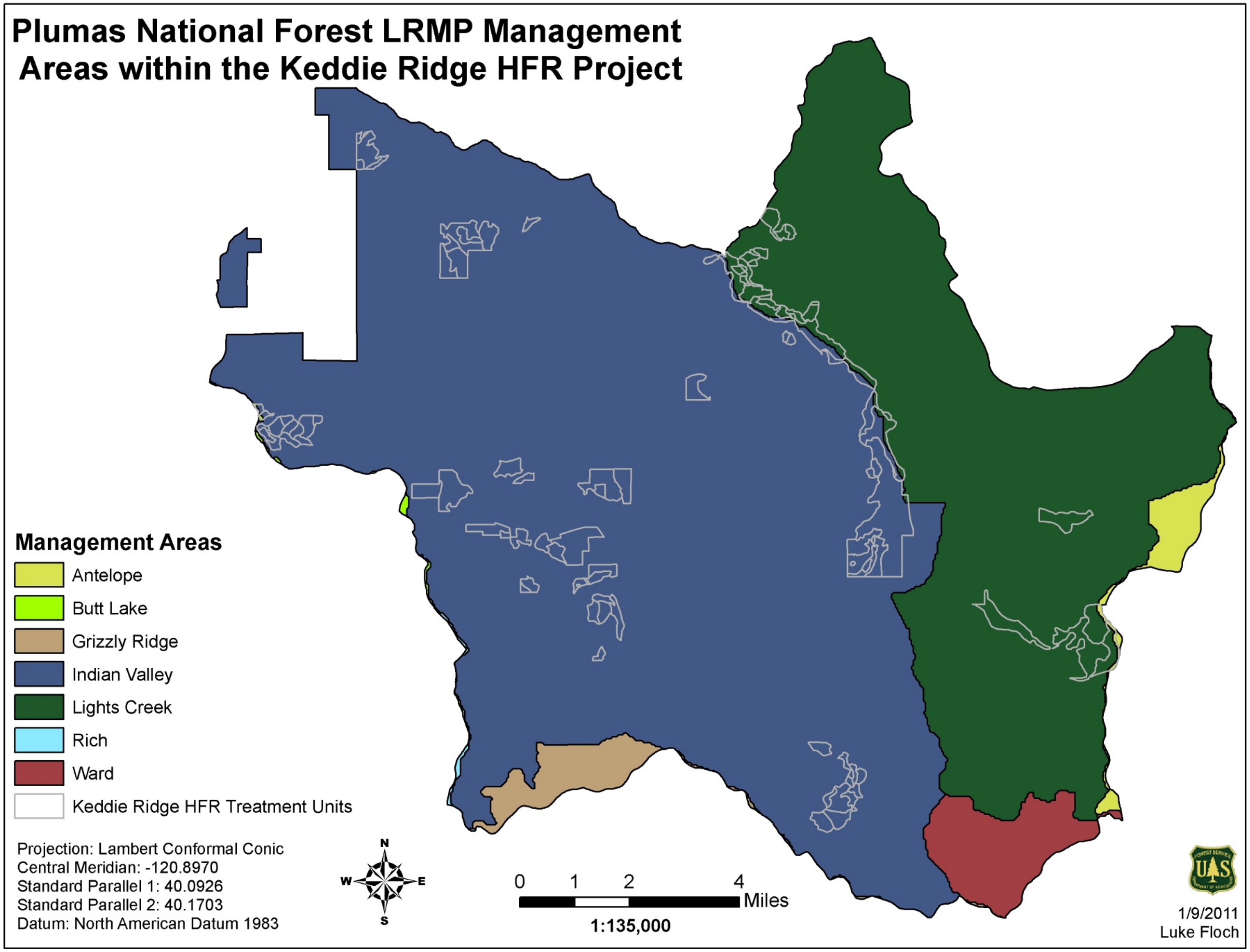

Figure 1 Plumas National Forest Land Resource Management Plan Management Areas within the Keddie Ridge Project Area

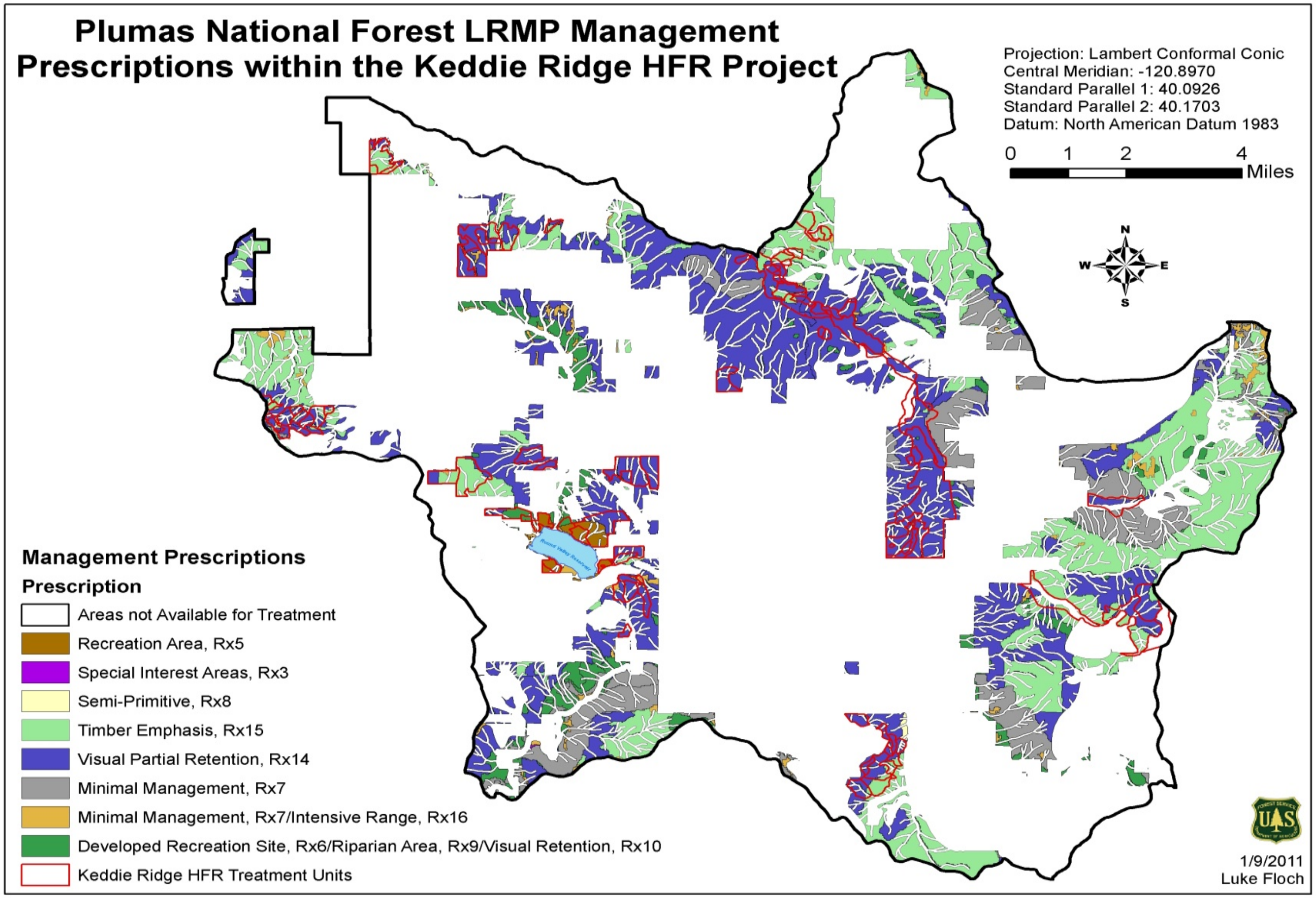

Figure 2 Plumas National Forest Land Resource Management Plan Management Areas within the Keddie Ridge Project Area

Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the Department of the Interior and Related Agencies Appropriations Act, including section 401—the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of group selection across the Pilot Project Area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA Forest Service 1999). The Record of Decision amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG Final Supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA Forest Service 2003). In February 2003, the Department of the Interior and Related Agencies Appropriations Act was signed and extended the HFQLG Pilot Project legislation by another five years. The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

The 1999 HFQLG Record of Decision (pages 8-10) displays the changes in management direction applicable to the HFQLG Pilot Project Area. Amendments to the PNF LRMP are discussed in detail in the HFQLG Final Environmental Impact Statement on pages 2-6 – 2-18. Land allocations that apply to the Pilot Project area include offbase and deferred lands, late-successional old-growth stands (ranks 4 and 5), California spotted owl protected activity centers (PAC), spotted owl habitat areas (SOHA), and riparian habitat conservation areas (RHCAs).

The HFQLG Act has specific standards and guidelines listed on pages 8-10 of the HFQLG ROD and pages 2-6 – 2-18 of the HFQLG FEIS. Figure 3 displays HFQLG land allocations specific to the Keddie Ridge Project.

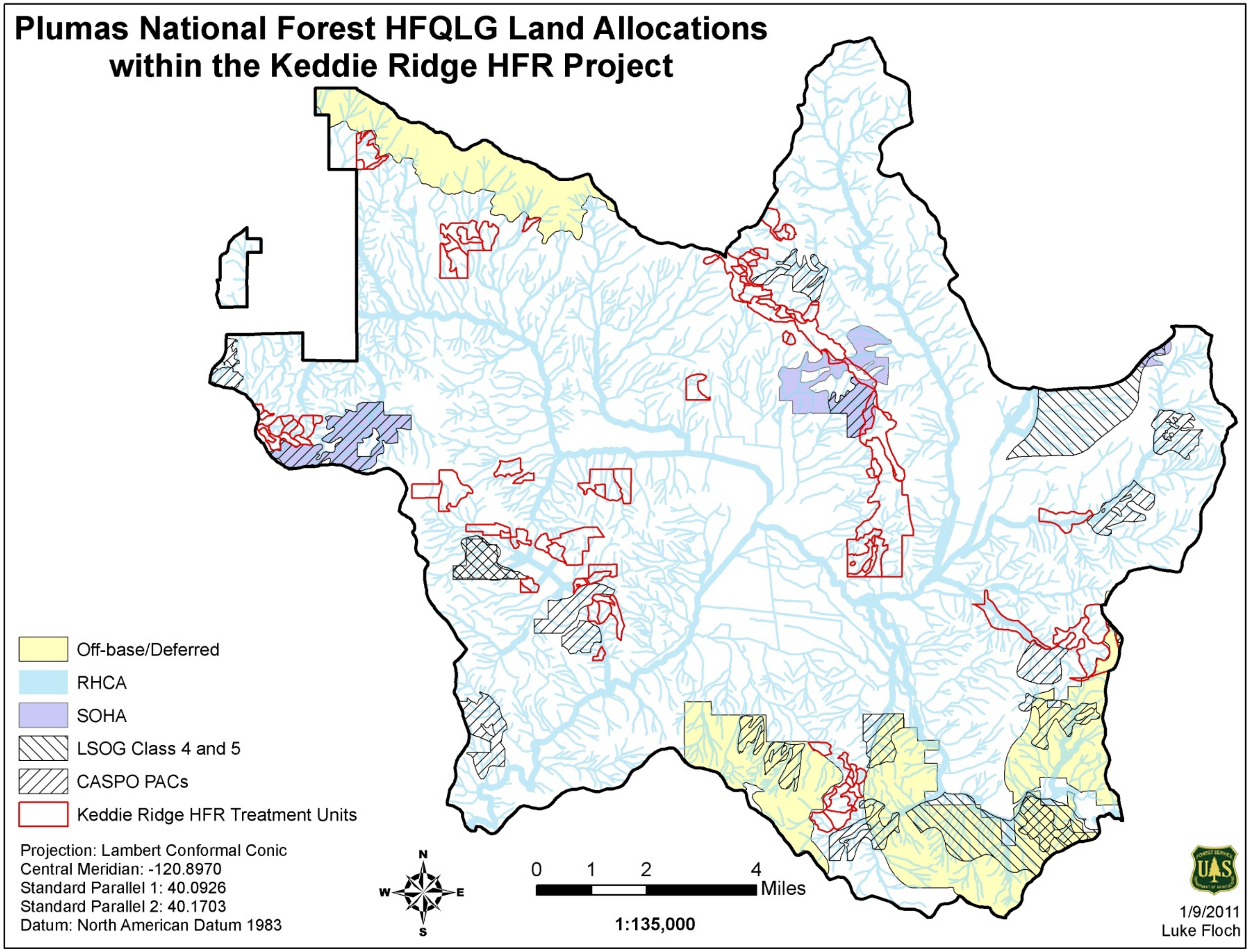

Figure 3 HFQLG Land Allocations within the Keddie Ridge Project Area

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA Final Supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA Final Supplemental EIS.

The 2004 Record of Decision on the SNFPA Final Supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires will lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

The 2004 SNFPA Record of Decision (pages 68 and 69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposal, in addition to the PNF LRMP and HFQLG ROD and FEIS, include California spotted owl home range core areas (HRCAs), Northern goshawk PACs, wildland urban interface (WUI), and extended WUI.

The SNFPA ROD has specific standards and guidelines listed on pages 68 and 69 of the SNFPA ROD (Table 2). Figure 4 displays SNFPA ROD land allocations specific to the Keddie Ridge Project.

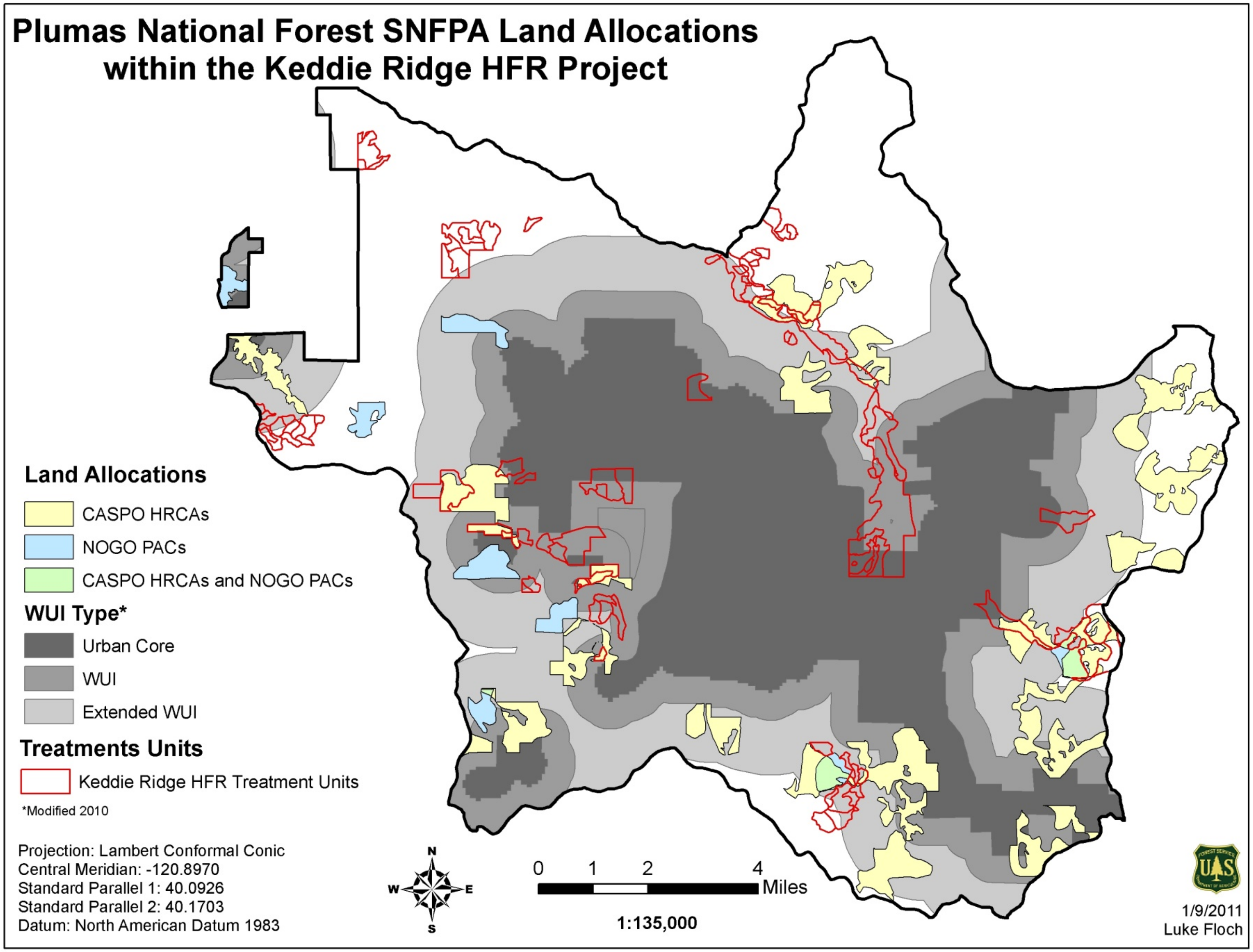

Figure 4 SNFPA ROD Land Allocations within the Keddie Ridge Project Area

Keddie Ridge Hazardous Fuels Reduction Project

Final Environmental Impact Statement

Mt. Hough Ranger District, Plumas National Forest

Plumas County, California

R5-MB-236a

Lead Agency: **USDA Forest Service**

Responsible Official: **Alice B. Carlton, Forest Supervisor**
P.O. Box 1150
159 Lawrence Street, Quincy, CA 95971

For Information Contact: **Katherine Carpenter, Project Leader**
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(530) 283-7619

Abstract: The *Keddie Ridge Hazardous Fuels Reduction Project Final Environmental Impact Statement* documents the analysis of the proposed action (alternative A), the no action alternative (alternative B), and three other action alternatives for modifying fire behavior, improving forest and watershed health, protecting and enhancing habitat for sensitive plants and wildlife, and reducing the spread and introduction of noxious weeds. To meet the purpose and need the following treatments have been proposed: Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments in the Indian Valley area. The preferred alternative, alternative A (proposed action) and collaboration alternative, is planned utilizing the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD), incorporating ideas and recommendations from interested parties, and includes ideas from the General Technical Report PSW–GTR-220 (USDA 2009). Within the 103,000 acre project area, alternative A proposes to construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs); implement 494 acres of area thinning (AT) outside of DFPZs, where 34 acres of area thinning treatments would occur within a bald eagle territory; construct 284 acres of group selection (GS) within DFPZ and AT units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. Alternative B proposes no action. Alternative C (non-commercial funding alternative) is required in all projects with purpose and needs that include fuels reduction and excludes any activities other than fuels reduction to meet the proposed purposes and needs. Alternative C proposes 5,431 acres of DFPZ construction and 522 acres of AT outside of DFPZs, while retaining all live trees greater than or equal to

12 inches diameter at breast height (DBH) in both DFPZs and AT units. Alternative D (2001 SNFPA ROD consistent alternative) was suggested for analysis during the scoping process; this alternative follows the direction and standards and guidelines in the 2001 SNFPA ROD. Alternative D would construct 4,976 acres of DFPZ; construct 467 acres of AT outside of DFPZ units, where 34 acres of area thinning treatments would occur within a bald eagle territory; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. Alternative E (2004 SNFPA ROD consistent alternative) was also requested for analysis during scoping and follows the direction and standards and guidelines in the 2004 SFNPA ROD. Alternative E would construct 5,112 acres of DFPZs; construct 513 acres of AT outside of DFPZ units; construct 328 acres of GS within DFPZ and AT units, where 34 acres of area thinning treatments would occur within a bald eagle territory; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 89 acres of noxious weed infestations using a combination of hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicide use is proposed under alternative E.

Objections will only be accepted from those who have previously submitted written comments specific to the project during scoping or other opportunity for public comment. Written, facsimile, hand-delivered, and electronic objections will be accepted for 30 calendar days following publication of a legal notice in the *Feather River Bulletin* (anticipated July 13, 2011). The publication date in the newspaper of record is the exclusive means for calculating the objection period for this proposal. Those wishing to object should not rely on dates or timeframe information provided by any other source. It is the responsibility of persons providing objections to submit them by the close of the objection period. Written objections must be submitted to: Randy Moore, Reviewing Official, USDA Forest Service, Regional Office R5, 1323 Club Drive, Vallejo, CA, or via facsimile to (707) 562-9229. The office business hours for those submitting hand-delivered objections are: 8:00 a.m. to 4:00 p.m., Monday through Friday, excluding holidays. Electronic objections must be submitted in a format such as an email message, plain text (.txt), rich text format (.rtf), portable document format (.pdf), or Word (.doc) to the following email address: appeals-pacificsouthwest-regional-office@fs.fed.us.

An objection must include: objector's name, address and phone number; signature or other verification of authorship upon request (scanned signature for electronic mail is acceptable); identification of the lead objector if multiple names are listed; the name of the proposed project; name and title of the Responsible Official, and name of the National Forest and/or Ranger District on which the proposed project will be implemented. It is the objector's responsibility to provide specific issues related to the project and to suggest remedies which would resolve the objection. Incorporation of documents by reference is not allowed.

Summary

The Plumas National Forest (PNF) proposes to implement the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) in order to modify fire behavior, improve forest and watershed health, protect and enhance habitat for sensitive plants and wildlife, and reduce the spread and introduction of noxious weeds through the following activities: Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments. The area affected by the proposal is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye. The Keddie Ridge Project boundary encompasses all or portions of T. 25 N., R. 9 E., sec. 1-4, 8-12; T. 25 N., R. 10 E., sec. 1-6, 8-16, 22-24; T. 25 N., R. 11 E., sec. 5-8, 17-19; T. 26 N., R. 8 E., sec. 1, 2, T. 26 N., R. 9 E., sec. 1-17, 20-29, 32-36, T. 26 N., R. 10 E., sec. 1-36; T. 26 N., R. 11 E., sec. 2-10, 15-20, 30-32; T. 27 N., R. 8 E., sec. 1, 12, 14-15, 26-27, 34-36; T. 27 N., R 9 E., sec. 5-11, 13-36; T. 27 N., R. 10 E., sec. 2-5, 8-10, 14-36; T. 27 N., R. 11 E., sec. 27, 28, 31-34; T. 28 N., R. 10 E., 33-35, MDBM.

The Mt. Hough Ranger District has designed the project proposal to move the landscape from current toward desired conditions. There is a need for fire behavior to be modified in specific stands in order to reduce high fuel loading and resulting increased risks to people, structures, and resources. There is a need for forest health to be improved because current high stand densities in the Keddie Ridge Project area are leading to mortality from drought, insects, and fire. Overcrowded stands and high fuel loads reduce the quality of the habitat for three Region 5 Forest Service sensitive plant and wildlife species (clustered lady’s-slipper orchid, Constance’s rock cress, and bald eagle) and increase the risk of high severity, stand-replacing wildfire. There is a need to improve watershed health. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat. The presence of highly invasive noxious weeds, including Canada thistle, Scotch broom, medusahead, yellow starthistle, and hoary cress, greatly increases the need for control measures to reduce the risk of weed introduction, establishment, and spread.

The desired conditions for fuels and forest health include an uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. This forest structure has a lower probability of crown fire initiation and spread under 90th percentile weather conditions. The desired condition within clustered lady’s slipper sites is a fire-resilient forest with sufficient canopy cover that allows for filtered light conditions on the forest floor; a diversity of plants in the understory; adequate soil moisture and duff levels; and the maintenance of soil mycorrhizal (fungal) relationships. The desired condition for Constance’s rock cress is a habitat characterized by serpentine soils, open tree canopy, and reduced levels of litter and duff; these conditions promote the expansion of individuals into sites that are currently unsuitable. The desired condition for bald eagles is to provide uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches DBH with overstory canopy cover of 40-60 percent. National Forest System (NFS) roads should ensure safe travel for forest users, and provide a transportation system that is adequate for all resource management needs. The desired condition for noxious weeds is to prevent the introduction and

establishment of new weeds and to contain and control established infestations so that high priority noxious weed species are reduced or eliminated.

The proposed action is designed to meet the standards and guidelines for land management activities described in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b).

The Keddie Ridge Project was originally scoped in December 2006 and was being planned under authorization of the Healthy Forest Restoration Act (HFRA) (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process). At the time, the direction for HFRA projects was to use The Healthy Forests Initiative and Healthy Forests Restoration Act Interim Field Guide (USDA Forest Service and DOI Bureau of Land Management, FS-799, February 2004). The HFRA field guide included a decision diagram that helped determine whether a project meets the definition of "authorized" or "covered" by the HFRA. It was difficult to discern from this field guide and the associated decision models if HFRA was the correct authority to use. Portions of the Keddie Ridge Project overlap with Wildland Urban Interfaces (WUIs), the project is within a municipal watershed, and there are no areas of blowdown, wind throw, or damage by ice storms. Originally portions of the project did not qualify for HFRA authority.

The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

Individuals and organizations that expressed interest during previous scoping efforts (December 2006) were contacted to schedule collaboration meetings. Twelve individuals and organizations continued to express interest in the Keddie Ridge Project. Meetings were held from July 31 through September 1, 2009 and included the following organizations: Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman's Association, Sierra Access Coalition, and Sierra Forest Legacy. Collaboration efforts continued with the Quincy Library Group (QLG), Sierra Forest Legacy, and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association through April 2010.

An open house was held September 15, 2009 at the Mt. Hough Ranger District and nine individuals attended.

A Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register on April 1, 2010. Thirteen scoping letters were received.

A second open house was held June 16, 2010 at the Greenville Town Hall and seven individuals attended.

The Forest Service hosted a public field trip for all interested parties on May 26, 2010 and three individuals attended.

The Forest Service initiated an official 45 day comment period once the Notice of Availability was published in the Federal Register on February 4, 2011. A comment period notice was also published in the *Feather River Bulletin* on the following Wednesday, February 9, 2011. Ten comments were received from three agencies and seven organizations. A response to comments can be found in appendix G of this EIS. A compilation of comments received during the comment period is located in the project record at Mt. Hough Ranger District in Quincy, CA.

There were no significant issues that led the agency to develop alternatives to the proposed action. The three action alternatives, in addition to the proposed action, are required by court order or were requested during scoping.

Major conclusions include:

- Alternative A provides about 189 direct and indirect jobs and approximately $6.8 in employee related income. However, alternative A has a potential value to the US government 11 percent less than alternative E.
- Large woody debris guidelines would be met in areas proposed for treatment.
- Alternative A treatment activities would not cause any subwatersheds to exceed the Threshold of Concern.
- Alternative A may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for the mountain yellow-legged frog, bald eagle, California spotted owl, Northern goshawk, American marten, or Pacific fisher.
- Alternative A would have no effect on two Federally listed species present on the Plumas National Forest, *Desmoceras californicus dimorphus* (valley elderberry longhorn beetle) or *Rana aurora draytonii* (California red-legged frog).
- Alternative A may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress). *Cypripedium fasciculatum* (clustered lady's-slipper), or *Lupinus dalesiae* (Quincy lupine).
- The proposed noxious weed treatments under alternatives A and D, which include manual removal, prescribed burning, and herbicide application, are expected to reduce or eliminate infestations of hoary cress, yellow starthistle, Canada thistle, and Scotch broom.
- Under alternative A, 100 percent of the stands treated would meet the desired condition for the reduction of fuels.
- Alternative A would enhance landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral conditions, and promoting the development of later seral conditions.

Given the purposes and needs, the Responsible Official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, select a different alternative, or take no action at this time.

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Chapter 1. Purpose of and Need for Action

Document Structure

The Forest Service has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This Environmental Impact Statement discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters, and includes appendices and an index:

- **Chapter 1. Purpose and Need for Action:** This chapter briefly describes the proposed action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- **Chapter 2. Alternatives, including the Proposed Action:** This chapter provides a detailed description of the agency's proposed action as well as alternative actions that were developed in response to comments raised by the public during scoping. The end of the chapter includes a summary table comparing the proposed action and alternatives with respect to their environmental impacts.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the environmental impact statement.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the environmental impact statement.
- **Index:** The index provides page numbers by document topic.

Additional documentation, including more detailed analyses of resource specific impacts, may be found in the project record located at the Mt. Hough Ranger District office, 39696 Highway 70, Quincy, CA 95971.

Introduction

This chapter describes the need for resource management activities in the proposed Keddie Ridge Hazardous Fuels Reduction Project area and identifies the project's geographical locations. This chapter also discusses the purposes, objectives, needs, and desired condition buffer widths based on stream types (USDA 1999b, page 2-11) for each proposed activity and the measurement indicators used in the analysis for each objective. The applicable laws, policies, and direction that influence the scope of this analysis are described in this chapter. This chapter also includes information about public involvement, scoping, and the concerns that guided the development of alternatives and the analyses of effects.

Background

Recent high-intensity wildfires fueled by overcrowded stand conditions have caused concern in local communities due to the potential for loss of life and property, timber values, water quality, and wildlife habitat. In the Moonlight and Antelope Complex fires of 2007, over 54,000 acres burned with stand-replacing high severity fire. Approximately 20 California spotted owl protected activity center (PACs) and their associated home range cores areas (HRCAs) were lost due to high severity wildfire effects and were removed from the Plumas National Forest PAC network. The resource values lost were tremendous and much of the existing landscape in the Keddie Ridge Project area resembles the conditions leading up to the fire season of 2007. The Keddie Ridge Project surrounds the communities of Crescent Mills, Greenville, Taylorsville, and all of Indian Valley. The landscape conditions coupled with the proximity of adjacent communities makes the Keddie Ridge Project a priority for treatment.

To address these concerns, the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD) allows for full implementation of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project. The HFQLG Act established certain vegetation management activities to be implemented in order to test their effectiveness in: reducing the potential size of wildfires, reducing risk to firefighters, and supplying timber for the economic stability of rural communities, while promoting ecological health of a forest through uneven-aged timber management.

Through collaboration with a wide array of stakeholders including the Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman’s Association, Sierra Access Coalition, Sierra Forest Legacy (SFL), Quincy Library Group (QLG), and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association, the Forest Service has identified the following project purposes and needs for action.

Purpose and Need for Action

Purpose 1: Reduce Hazardous Fuel Accumulation

Objective: Modify fire behaviorby reducing hazardous fuels to protect communities, fire fighters, and biological resources.

Need for Action: There is a need for the reduction of hazardous fuelaccumulations within the Keddie Ridge Project area. High densities of small and intermediate-sized trees and heavy fuel loads within forested stands contribute to hazardous accumulations of surface, ladder, and canopy fuels within the project area. These conditions are highly susceptible to crown fire initiation and spread under fire weather conditions, and increase the potential for high-severity stand-replacing fire events. This potential fire behavior leads to increased risk to communities and forest and riparian ecosystems within and adjacent to the Keddie Ridge Project area.

In areas where roads and landings are absent, construction of temporary roads and landings are needed to permit the removal and utilization of material.

Desired Condition: The desired condition is an uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. This forest structure has a lower probability of crown fire initiation and spread under 90th percentile weather conditions.

Measures of modifying fire behavior include: predicted flame lengths (feet), fire type (surface versus crown fire), and predicted mortality (percent basal area).

Purpose 2: Improve Forest Health

Objective: Modify forest structure, density, and species composition to improve forest health and promote the growth and development of a heterogeneous, uneven-aged, multistoried, fire-resilient forest.

Need for Action: There is a need for the improvement of forest health. The landscape within the project area is dominated by homogeneous, closed canopy mid-seral forests. These forests are characterized by high densities of small and intermediate-sized trees which contribute to stressed stand conditions due to competition for water, light, and nutrients. Growth of trees into larger diameters is limited due to competition and dense forested stands are more susceptible to mortality caused by drought, insects, disease, and fire.

In addition, these high stand densities create closed canopy conditions that are not favorable for regeneration, growth, and development of shade-intolerant and fire resistant species such as ponderosa pine. These shade-intolerant species require more sunlight from open canopy stands and gaps to regenerate successfully.

In areas where roads and landings are absent, construction of temporary roads and landings are needed to permit the removal and utilization of material.

Desired Condition: The desired condition is an uneven-aged, multistoried, fire-resilient forest of open forest stands dominated by large fire-tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Stand densities would generally be low, characteristic of an active-fire stand structure, which would promote the growth and development of large diameter trees, reduce inter-tree competition, and improve forest resiliency to drought, fire, and insect and disease occurrences. In addition, low density, open canopy forest conditions would promote the regeneration, growth, and development of fire-resistant shade intolerant species such as ponderosa pine and black oak, and would contribute to landscape heterogeneity.

Measures of modifying forest structure and species composition include: stand structure attributes (Trees per acre, basal area per acre, relative stand density, species composition (relative abundance of shade-intolerant species), and landscape structure (distribution of CWHR size class and density, average stand diameter, and percent of open canopy forest conditions created).

Purpose 3: Protect and Enhance Habitat for Region 5 Forest Service Sensitive Plant and Wildlife Species

Objective 1: Reduce the threat of high-severity, stand-replacing wildfire within clustered lady's-slipper orchid (*Cypripedium fasciculatum*) and bald eagle nesting habitats.

Objective 2: Modify forest conditions to enhance habitat and support the long-term viability of clustered lady's-slipper and Constance's rock cress (*Arabis constancei*).

Need for Action: Dense stands and high fuel loads increase the risk of high-severity, stand-replacing wildfire in both (a) the primary nesting zone of the Round Valley bald eagle territory and (b) the fourteen clustered lady's-slipper orchid sites located within project treatment units. High-severity wildfires decrease the quality of bald eagle nesting habitat by removing overstory nest structures. In addition, clustered lady's-slipper orchids are intolerant of high-severity fires that eliminate the duff layer or damage the orchid's underground stems. Closed canopy conditions created by high densities of small trees also contribute to a decline in habitat quality for clustered lady's-slipper and Constance's rock cress through decreased light to the forest floor and an increase in leaf litter and duff.

Desired Condition: The desired condition within clustered lady's slipper sites is a fire-resilient forest with sufficient canopy cover that allows for filtered light conditions on the forest floor; a diversity of plants in the understory; adequate soil moisture and duff levels; and the maintenance of soil mycorrhizal (fungal) relationships. The desired condition for Constance's rock cress is a habitat characterized by serpentine soils, open tree canopy, and reduced levels of litter and duff; these conditions promote the expansion of individuals into sites that are currently unsuitable. The desired condition for bald eagles is to provide uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches diameter at breast height (DBH) with overstory canopy cover of 40-60 percent. Protection and enhancement of nesting habitat by thinning smaller conifers would improve the growth of the residual ponderosa and sugar pines, while surface and ladder fuel reduction would protect the larger tree component for future nest trees.

Measures of reducing threat of high severity wildfire and habitat enhancement include: Region 5 Forest Service sensitive plants (number of occurrences and acres of habitat protected and enhanced) and Region 5 Forest Service sensitive wildlife (stand structure attributes—relative stand density, trees per acre by size class, basal area per acre, canopy cover, average stand diameter and species composition—relative abundance of shade-intolerant species).

Purpose 4: Improve Watershed Health

Objective: Reduce the number of improperly constructed or unmaintained roads.

Need for Action: There is a need for improved watershed health. Roads are the largest single human-caused source of sedimentation and habitat degradation within the project area. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat. The interdisciplinary team (IDT) process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A—Administration of the Forest Transportation System, 16 U.S.C. 551, 23 U.S.C. 205).

Desired Condition: Roads that are needed are maintained and improved to accommodate vehicle traffic. The proposed treatments would provide roads that would ensure safe travel for forest users, and provide a transportation system that is adequate for all resource management needs. Unneeded roads would be eliminated, closed, or obliterated in accordance with the 1988 Forest Plan, as amended, and Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD) (September 2010). Roads that are causing a high level of resource damage would be decommissioned or improved. Poorly located roads would be relocated to stable areas. Aquatic species would have access to suitable habitat and would not be restricted from that habitat by roads. Open road densities would be reduced to lessen the impact of roads on wildlife.

Measures of improving watershed health: number of stream crossings, miles of road decommissioned, and miles of road drainage disconnected from streams.

Purpose 5: Reduce Noxious Weed Infestations

Objective: Control the spread and introduction of noxious weeds.

Need for Action: Five invasive plant species of high management concern have been documented within the Keddie Ridge Project area. These include approximately 0.2 acre of hoary cress (*Cardaria draba*), 4 acres of Canada thistle (*Cirsium arvense*), 58 acres of yellow starthistle (*Centaurea solstitialis*), 0.1 acre of Scotch broom (*Cytisus scoparius*), and 45 acres of medusahead (*Taeniatherum caput-medusae*). Past efforts to control these weeds using manual treatment methods have not been effective. Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure. The large existing area occupied by weed species, coupled with the proposed ground-disturbing activities, greatly increase the potential for introduction and spread of noxious weeds.

Desired Condition: The desired condition is to prevent the introduction and establishment of new weeds and to contain and control established infestations so that high priority noxious weed species are reduced or eliminated.

Measures for controlling the spread and introduction of noxious weeds: risk of invasion and spread; effectiveness of the proposed weed treatments; number and acres of noxious weed infestations treated.

Proposed Action

The actions proposed by the Forest Service to meet the purposes and needs are to construct 5,148 acres of Defensible Fuel Profile Zones (DFPZs) through a combination of mechanical thinning, hand thinning, masticating, and prescribed underburning treatments; construct 518 acres of area thinning (AT) outside of DFPZs; construct 287 acres of group selection (GS) within DFPZ and AT units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The proposed action is described in more detail in Chapter 2, Alternative A.

Decision Framework

Given the purposes and needs, the Responsible Official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, select a different alternative, or take no action at this time.

Forest Plan Direction

Forest Plan

The proposed action and alternatives are guided by the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b). In addition, the HFQLG/SNFPA Implementation Consistency Crosswalk, revised December 2007, provides clarification for applying standards and guidelines for 2004 SNFPA FSEIS and ROD (USDA 2004a, 2004b) and for HFQLG FEIS and ROD (USDA 1999a, 1999b, 2003a 2003b) (HFQLG/SNFPA Implementation Consistency Crosswalk and cover letter, December 12, 2007) (USDA 2007a). This project is being planned under authorization of the Healthy Forest Restoration Act (H.R. 1904; Public Law 108-148; 36 CFR §218 – Predecisional Administrative Review Process).

Land allocations within the Plumas National Forest have been allocated to certain primary uses through three planning processes: the original PNF LRMP (USDA 1988) development process, the HFQLG FEIS, FSEIS, and RODs (USDA 1999a, 1999b, 2003a, 2003b), and the SNFPA ROD (USDA 2004a, 2004b). Each of these plan components includes standards and guidelines for land and resource management unique to each land allocation. Many of these allocations overlap. During the life of the HFQLG Act Pilot Project, HFQLG land allocations are to be employed for vegetation management projects, with one exception (SNFPA ROD allocation for Northern goshawk PACs).

Certain allocations (called prescriptions) in the PNF LRMP are still applicable in whole or in part, because they were not superseded by three amendments. Those allocations still in effect for the Keddie Ridge Project area are included in appendix J of this EIS and discussed further below.

The PNF LRMP (USDA 1988) displays management areas, which include descriptions, standards and guidelines, prescription allocations, and management objectives specific to each management area (page 4-113). Management areas that overlap with the Keddie Ridge Project area include: Rich (#20), Grizzly Ridge (#23), Butt Lake (#26), Indian Valley (#27), Lights Creek (#28), Antelope (#29), and Ward (#30). Management areas that overlap with proposed treatment units within the Keddie Ridge Project area include: Indian Valley (#27) and Lights Creek (#28). Because Rich, Grizzly Ridge, Butt Lake, Antelope, and Ward do not overlap with treatment units and very small portions of the management areas overlap with the Keddie Ridge Project area, these management areas are removed from further discussion. Of the management areas that overlap with proposed treatment units, prescription allocations that apply include: Rx5-Recreation Area Prescription; Rx3-Special Interest Areas Prescription; Rx6-Developed Recreation Site Prescription; Rx7-Minimal Management Prescription; Rx8-Semi-Primitive Area Prescription; Rx10-

Visual Retention Prescription; Rx13-Goshawk Habitat Prescription; Rx14-Visual Partial Retention Prescription; Rx 15-Timber Emphasis Prescription; and Rx16-Intensive Ranger. Areas of general direction and standards and guidelines are located on pages 4-274 – 4-293 and in appendix J of this EIS.

Herger-Feinstein Quincy Library Group Forest Recovery Act

On October 21, 1998, the President of the United States signed the Department of the Interior and Related Agencies Appropriations Act, including section 401—the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act). The HFQLG Act states that the Secretary of Agriculture, acting through the Forest Service, and after completion of an EIS, shall conduct a pilot project for five years on federal lands in the Lassen and Plumas National Forests and the Sierraville District of the Tahoe National Forest.

The HFQLG Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel-reduction objectives. Full implementation of the HFQLG Pilot Project would result in an annual average of 8,700 acres of group selection across the Pilot Project Area, consistent with protection of ecosystems, watersheds, and other forest resources; good silvicultural practices; and economic efficiency.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

The HFQLG Act EIS was completed on August 17, 1999, and the Record of Decision was signed on August 20, 1999 (USDA 1999b). The Record of Decision amended the land and resource management plans for the three National Forests (Plumas, Lassen, and Tahoe) and gave direction to implement the resource management activities required by the HFQLG Act. The Record of Decision on the HFQLG Final Supplemental EIS addressing DFPZ maintenance was adopted on July 31, 2003 (USDA 2003b). In February 2003, the Department of the Interior and Related Agencies Appropriations Act was signed and extended the HFQLG Pilot Project legislation by another five years. The 2008 Consolidated Appropriations Act extended the HFQLG Pilot project to September 30, 2012. It also applied some portions of the Healthy Forest Restoration Act (Sections 104-106) to HFQLG projects. These sections relate to environmental analysis, public notice, comment and objection processes, and judicial review. In March 2009, the Omnibus Appropriations Act amended this, clarifying that Section 106 of the Healthy Forest Restoration Act (related to expedited judicial review) shall apply to all HFQLG projects, while Sections 104 and 105 (related to environmental analysis and objection processes) may be applied to HFQLG projects.

The 1999 HFQLG Record of Decision (pages 8-10) displays the changes in management direction applicable to the HFQLG Pilot Project Area. Amendments to the PNF LRMP are discussed in detail in the HFQLG Final Environmental Impact Statement on pages 2-6 – 2-18. Land allocations that apply to the Pilot Project area include offbase and deferred lands, late-successional old-growth stands (ranks 4 and 5), California spotted owl protected activity centers (PAC), spotted owl habitat areas (SOHA), riparian habitat conservation areas (RHCAs), and the National Forest System (NFS) lands outside these allocations that are available for vegetation and fuels management activities.

NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 8-10 of the HFQLG ROD, pages 2-6 – 2-18 of the HFQLG FEIS, and appendix J of this EIS.

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

In January 2004, the Regional Forester signed the SNFPA Final Supplemental EIS Record of Decision, which replaced the 2001 Record of Decision on the SNFPA final EIS and changed management direction to allow full implementation of the HFQLG Pilot Project, consistent with the goals identified in the HFQLG Act. The 2001 SNFPA final EIS and Record of Decision are incorporated by reference in the 2004 Record of Decision on the SNFPA Final Supplemental EIS.

The 2004 Record of Decision on the SNFPA Final Supplemental EIS directed the Plumas National Forest to implement the HFQLG Pilot Project, which includes creation of DFPZs for the proposed project. These treatments are needed in order to limit the potential size and loss of resources from large high-intensity wildfires. DFPZs are strategically located and designed strips of land where surface fuels (excess down woody material), ladder fuels, and canopy fuels are treated so that large, destructive canopy fires would lose intensity and transition to surface fires. DFPZs are wide enough to capture short-range spot fires in the treated area and are designed to provide fire suppression personnel a safe location from which to take fire-suppression actions. DFPZs are usually located along roads, ridgetops, meadows, or rocky areas to enhance their effectiveness and accessibility.

The 2004 SNFPA Record of Decision (pages 68 and 69) displays the standards and guidelines applicable to the HFQLG Pilot Project Area. Land allocations that apply to this proposal, in addition to the PNF LRMP and HFQLG ROD and FEIS, include California spotted owl home range core areas (HRCAs), Northern goshawk PACs, wildland urban interface (WUI), and extended WUI.

NFS lands outside of the above mentioned allocations and available for vegetation and fuels management activities specified in the HFQLG Act have specific standards and guidelines listed on pages 68 and 69 of the SNFPA ROD (Table 2) and appendix J of this EIS.

Public Involvement

The Keddie Ridge Project has been listed in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) since December 6, 2006. A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Keddie Ridge Project was published in the Federal Register on Thursday, April 1, 2010. The notice asked that comments on the proposed action be received by Friday, April 16, 2010. The purpose of the scoping process was to inform the public about the proposed action and purpose and need in order to seek different points of view on the pending action and issues to be addressed during the project analysis period. In addition, as part of the public involvement process and collaboration requirements under the Healthy Forest Restoration Act (HFRA), the Forest Service held two open houses – September 15, 2009 at Mt. Hough Ranger District in Quincy, California and June 16, 2010, at Greenville Town Hall in Greenville, California. Announcements for each open house were published in the *Feather River Bulletin* and informational flyers were sent to the Plumas National Forest key contacts, including media. The Forest Service also held individual collaboration meetings with interest groups from July throughout April 2010 and hosted a field trip for all interested parties on May 26, 2010.

One verbal and thirteen written comments on the proposed action were received during the scoping period. The scoping comments and issues presented in the comments are summarized in appendix G of this EIS. A compilation of scoping comments is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The following individuals, organizations, and agencies provided scoping comments on the proposed action and/or comments during the official 30 day scoping period:

- Darca Morgan, Craig Thomas, and Pat Gallagher, Sierra Forest Legacy
- Michael DeSpain, Mechoopda Indian Tribe of Chico Rancheria
- Tom Downing, Sierra Pacific Industries
- Melany Johnson, Susanville Indian Rancheria
- Ren Reynolds, Estom Yumeka Tribe of Enterprise Rancheria
- Stephanie Skophammer, U.S. Environmental Protection Agency
- Frank Stewart, Counties' Quincy Library Group Forester
- Hank Alrich
- Vanessa Vasquez, Californians for Alternatives to Toxics
- Dixie Dursteler-Harrington
- Chad Hanson, John Muir Project
- Steven Brink, California Forestry Association
- Rex Fisher
- Jerry Hurley, Plumas County Fire Safe Council

The Forest Service initiated an official 45 day comment period once the Notice of Availability was published in the Federal Register on February 4, 2011. A comment period notice was also published in the *Feather River Bulletin* on the following Wednesday, February 9, 2011. Ten comments were received from three agencies and seven organizations. A response to comments can be found in appendix G of this EIS. A compilation of comments received during the comment period is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The following individuals, organizations, and agencies provided comments during the official 45 day comment period:

- Tom Downing, Sierra Pacific Industries
- Kathleen Goforth, U.S. Environmental Protection Agency
- Bill Wickman, American Forest Resource Council
- Karina Silvas-Bellanca, Craig Thomas, Pat Gallagher, and Darca Morgan, Sierra Forest Legacy
- Chad Hanson, John Muir Project
- Bill Wickman, Plumas County Economic Recovery Committee
- John Sheehan, Plumas Corporation
- Frank Stewart, Counties' Quincy Library Group Forester
- Patricia Sanderson Port, United States Department of the Interior

The final EIS (FEIS) will be sent to agencies, organizations, and individuals that submitted comments throughout the project planning process, individuals who requested a copy, and thirteen reviewing agencies (listed in chapter 4 of this EIS).

Issues

Comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. Issues are phrased as cause-effect relationships, the concept of describing a specific action and the environmental effect(s) expected to result from that action applies whether one is using an EA or an EIS. Issues (cause-effect relationships) serve to highlight effects or unintended consequences that may occur from the proposed action, providing opportunities during the analysis to explore alternative ways to meet the purpose and need for the proposal while reducing adverse effects. The Mt. Hough Interdisciplinary Team (IDT) separated the issues into two groups: significant and non-significant. Significant issues were defined as those where there may be a cause-effect relationship between a proposed action and a significant effect and the disclosure of that effect is documented in an EIS. Non-issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; 4) conjectural and not supported by scientific or factual evidence; or 5) the comment could not be phrased as a cause-effect relationship. Non-significant issues were identified as those not resulting in a significant effect. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…". A list of non-significant issues and reasons why they were found non-significant may be found in the project record located at the Mt. Hough Ranger District in Quincy, CA.

As for significant issues, the Forest Service did not identify any significant issues during scoping. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. A list of issues and non-significance determinations from comments is available in appendix G of this EIS. Two alternatives, D and E, were requested by commenters who submitted scoping comments during the scoping period.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project). It describes both alternatives considered in detail and those eliminated from detailed study. The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

Alternatives Considered in Detail

Based on requests identified through public comment on the proposed action, the Forest Service developed two alternative proposals that achieve the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a no action alternative and a non-commercial funding alternative. The proposed action, other action alternatives, and the no action alternative are described in detail below.

Alternative A

The Proposed Action – Collaboration Alternative (Preferred Alternative)

Collaboration is required under the Healthy Forest Restoration Act. Collaboration should occur when developing the proposed action. In collaboration, stakeholders work together to: 1) identify and better understand each other's interests, and 2) refine project design so as to better meet all interests within the Responsible Official's decision space and criteria. Ideas and suggestions received during the scoping period were applied to this alternative where appropriate and applicable.

Individuals and organizations that expressed interest during previous scoping efforts (December 2006) were contacted to schedule collaboration meetings. Twelve individuals and organizations expressed interest in the Keddie Ridge Project. Meetings were held from July 31 through September 1, 2009 and included the following organizations: Plumas County Fire Safe Council, Plumas County Board of Supervisors, Plumas County Horseman's Association, Sierra Access Coalition, and Sierra Forest Legacy. Collaboration efforts continued with the Quincy Library Group (QLG), Sierra Forest Legacy, and local industry groups such as Sierra Pacific Industries, American Forest Resource Council, and California Forestry Association through April 2010.

Many variables were considered in developing the proposed action and associated treatment unit specific prescriptions, such as purpose and need, proposed treatment, California Wildlife Habitat Relationship (CWHR) system type, size, and density, land allocation, visual quality objectives, and guidance from the General Technical Report PSW–GTR-220, *An Ecosystem management Strategy for Sierran Mixed-Conifer Forests* (USDA 2009).

Unit specific prescriptions and maps are located in appendix B, and address Riparian Habitat Conservation Areas (RHCAs), and California Wildlife Habitat Relationship (CWHR) system specific canopy cover (CC), general retention size for trees, and post-treatment underburning.

Each prescription is unique and the variables that change are: canopy cover (CC), general retention size for trees, and the land allocation for which these variables apply. Overall, the proposed action applies more restrictive prescriptions to RHCAs, CWHR 5M/5D, and California spotted owl home range core area (HRCA) land allocations, as they relate to CCs and general retention size for trees.

Under alternative A, Defensible Fuel Profile Zones, Area Thinning, Group Selection, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments, would be implemented to accomplish the purpose and need. All live trees greater than or equal to 30 inches diameter at breast height (DBH) would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within specific units, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease. Approximately 5,175 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance’s rock cress habitat and five acres of clustered lady’s slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent canopy cover (CC), retain all live trees greater than or equal to 30 inches DBH; **except** in **CWHR 5M/5D**, thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (824 acres).
    - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (255 acres).

  - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (870 acres).
  - Thin to 40-50 percent CC, generally retain live trees greater than or equal to 20 inches DBH, and underburn (180 acres).
  - Thin to 30-50 percent CC, generally retain live trees greater than or equal to 12 inches DBH, and underburn (206 acres).
  - In units 45, 46, 49, and 50, apply borax to pine stumps greater than 14 inches diameter within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 494 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-24 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
  - Thin to 30-40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, generally retain live trees greater than or equal to 24 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (262 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Group Selections (GSs)

Group selection is proposed in mechanical thinning units within DFPZs and AT units (284 acres) using mechanical equipment. Group selection involves harvest of trees less than 30 inches in diameter in small (0.5 to 2 acres) patches. All live trees greater than or equal to 30 inches DBH would be retained. Healthy, vigorous, undamaged, shade intolerant trees 20 inches in diameter and greater would be considered for retention for seed tree and forest structure purposes, where appropriate. Within units 45, 46, 49, and 50, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, would be proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: out sloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips to sufficiently disconnect the road drainage system from nearby stream channels would be determined by District watershed staff. Refer to appendix C for a list of these roads.

Noxious Weeds

Five noxious weed species would be treated using a combination of herbicide applications, manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The number of acres proposed for each treatment (or combination of treatments) is provided in Table 1. It is important to note that the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years). Species specific noxious weed treatments proposed under alternative A are included in Table 2.

Table 1. Noxious Weed Treatments and Acres Proposed under Alternatives A and D

Treatment	Acres
Rx 1: aminopyralid	16
Rx 1: aminopyralid / Rx 3: spring underburn	45
Rx 2: glyphosate	0.8
Rx 2: glyphosate / Rx 3: spring underburn	0.2
Rx 3: spring underburn	45
Rx 4: hand pull	0.2
Total	107

Table 2. Proposed Treatments for Noxious Weeds under Alternatives A and D

Noxious Weed Species	Proposed Treatments
***Centaurea solstitialis* (yellow starthistle)**	Approximately 58 acres would be treated with the herbicide aminopyralid. Spring underburning and/or revegetation using native seed would be considered within treatment units at a site-specific level. Follow-up treatments would include a combination of hand pulling, cutting with a hand-held string trimmer (i.e. weed whacker), or flaming with a propane torch. Revegetation of treated sites using native seed would be considered at a site-specific level.
***Taeniatherum caput-medusae* (medusahead)**	Spring underburning would be used as a treatment on approximately 45 acres. Infestations that are considered to be a high risk for spread (i.e. on roads and landings) may be treated by flaming with a propane torch. Revegetation of treated sites using native seed would be considered at a site-specific level.
***Cirsium arvense* (Canada thistle)**	Treatment would include the application of two herbicides: approximately 3.5 acres of aminopyralid (in upland areas) and 0.8 acre of glyphosate (in lowland areas). Underburning and/or revegetation of treated sites using native seed would be considered at a site-specific level.
***Cardaria draba* (hoary cress)**	Approximately 0.2 acres would be treated with the herbicide glyphosate. Manual methods, such as hand pulling and digging, would be used as a follow-up treatment. Revegetation of treated sites using native seed would be considered at a site-specific level.
***Cytisus scoparius* (Scotch broom)**	Treatment of approximately 0.1 acres would consist of manual methods, primarily hand pulling and removal using a weed wrench.

Alternative B

No Action Alternative

Under the no action alternative, the proposed action would not take place. No DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, or noxious weed treatments would be implemented to accomplish the purpose and need.

Alternative C

Non-Commercial Funding Alternative

A recent court ruling requires that all projects with a singular purpose and need for fuels reduction, or with multiple purposes and needs that include fuels reduction, must have a non-commercial funding alternative. A non-commercial funding alternative is an alternative where the sole purpose is to achieve the fuels reduction element of the purpose and need and where all the proposed treatments are solely directed at reducing hazardous fuels. In a non-commercial funding alternative, there can be no additional timber harvesting added beyond that needed to meet the fuel reduction purpose and need (*Sierra Forest Legacy v. Mark Rey*, Case 2:05-cv-00205-MCE-GGH, Morrison C. England, Jr., United States District Court Judge, United States District Court, Eastern District of California, November 4, 2009).

Alternative C includes DFPZ and AT treatments, which would be implemented to accomplish the purpose and need for modifying fire behavior only. No other treatments proposed under any other action alternative would be proposed under this alternative. All live trees greater than or equal to 12 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 12 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Approximately 5,431 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance's rock cress habitat and five acres of clustered lady's slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 12 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-12 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent canopy cover (CC), retain all live trees greater than or equal to 12 inches DBH; **except** in **CWHR 5M/5D**, thin to 40-50 percent CC, generally retain all live trees greater than or equal to 12 inches DBH; in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 12 inches DBH; and underburn (2,591 acres). Spring underburn in areas infested with noxious weeds (3.6 acres).
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity. Approximately 80 acres, which are infested with noxious weeds, would be burned in the spring to reduce the risk of spread.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 522 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat. Underburning would occur in the spring within areas of noxious weed infestations (4.6 acres).
- Mechanically thin trees less than 12 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-12 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent CC, retain all live trees greater than or equal to 12 inches DBH; **except** in **CWHR 4M/4D**, thin to 40 percent CC, retain all live trees greater than or equal to 12 inches DBH; in **CWHR 5M/5D** thin to 40-50 percent CC, retain all live trees greater than or equal to 12 inches DBH; in **RHCAs**, thin to 50 percent CC, retain all live trees greater than or equal to 12 inches DBH; and underburn (290 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Alternative D

2001 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) Consistent Alternative

This alternative was developed under the 2001 SNFPA ROD (USDA 2001a, 2001b) in response to scoping comments. Under the 2001 SNFPA ROD consistent alternative, DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and noxious weed treatments would be implemented to accomplish the purpose and need. There are fewer acres proposed under this alternative because the 2001 SNFPA ROD incorporates different prescriptions and applies retention levels for specific land allocations compared to the 2004 SNFPA ROD (alternatives A and E). All live trees greater than or equal to 20 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 20 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Within specific units, borax, a fungicide would be applied to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of

Heterobasidion root disease. Approximately 4,976 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,464 acres). Hand thin, pile, and burn within approximately 76 acres of Constance's rock cress habitat and five acres of clustered lady's slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing. Retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 20 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-20 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn (71 acres).
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 15 percent of the stand untreated; and underburn (709 acres).
    - Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; **except** in **CWHR 5M/5D** thin to 50 percent CC retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (574 acres).
    - Thin to minimum 50 percent CC while only reducing the CC less than 10 percent, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (346 acres).
    - In units 45, 46, 49, and 50, apply borax to pine stumps greater than 14 inches within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease.
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 467 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (301 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 20 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-20 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:

- Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH, and leave 25 percent of the stand untreated; and underburn (26 acres). This would occur within the primary nesting zone of the Round Valley bald eagle territory.
- Thin to 50 percent CC, retain all live trees greater than or equal to 20 inches DBH; **except** in **CWHR 5M/5D**, thin to 50 percent CC, retain all live trees greater than or equal to 12 inches DBH, and leave 25 percent of the stand untreated; and underburn (140 acres).

Group Selection (GS)

No group selection would occur under this alternative.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, is proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips to sufficiently disconnect the road drainage system from nearby stream channels would be determined by District watershed staff. Refer to appendix C for a list of these roads.

Noxious Weeds

Five noxious weed species would be treated using a combination of herbicide applications, manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. The noxious weed prescriptions proposed under alternative D are identical to those listed under the proposed action and can be found in Table 1 and Table 2.

Alternative E

2004 Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD) Consistent Alternative

This alternative was developed under the 2004 SNFPA ROD in response to scoping comments. Under alternative E, DFPZs, AT, GS, R5 Forest Service sensitive wildlife and plant species treatments, watershed treatments, and limited noxious weed treatments would be implemented to accomplish the purpose and need. This alternative follows the direction and standards and guidelines for the HFQLG Pilot Project Area and 2004 SNFPA ROD land allocations (USDA 2004b, Table 2, pages 68 and 69). All live trees greater than or equal to 30 inches DBH would be retained throughout all treatments and prescriptions, except to allow for operations. Impacts to live trees greater than or equal to 30 inches DBH would be minimized as much as practicable.

Defensible Fuel Profile Zones (DFPZs)

DFPZs would be constructed using a combination of hand thinning, piling, and burning; masticating; mechanical thinning; and prescribed underburning treatments. Riparian Habitat Conservation Areas (RHCAs) within DFPZ units would be treated. Approximately 5,134 acres of DFPZs would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (1,026 acres). Hand thin, pile, and burn within approximately 76 acres of Constance's rock cress habitat and five acres of clustered lady's slipper habitat.
- Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH (357 acres).
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:
    - Thin to 30-40 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **CWHR 5M/5D**, thin to 40 percent CC, retain all live trees greater than or equal to 30 inches DBH; in **RHCAs**, thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (2,242 acres).
    - Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (53 acres).
- Low to moderate intensity prescribed underburn (1,456 acres). Two underburn units, 38 and 39, overlap with a SOHA. The total amount of SOHA acres proposed for underburning is 106 acres and would be underburned at low intensity.

Area Thinning (AT)

Area thinning units would be constructed using a combination of hand thinning, piling, and burning; mechanical thinning; and prescribed underburn treatments. Riparian Habitat Conservation Areas (RHCAs) within AT units would be treated. Approximately 493 acres of AT would be constructed through the following treatments and associated prescriptions:

- Hand thin, pile, and burn trees less than 8 inches DBH and underburn (231 acres). Approximately four acres of treatment would occur within clustered lady's slipper habitat.
- Mechanically thin trees less than 30 inches DBH utilizing ground-based and skyline logging systems. Trees less than 10 inches DBH would be removed as biomass and trees between 10-30 inches DBH would be removed as sawlogs. In some skyline units (as described under design criteria common to all action alternatives), trees less than 10 inches DBH would be hand thinned, piled, and burned. The following prescriptions would be implemented:

- Thin to 40-50 percent CC, retain all live trees greater than or equal to 30 inches DBH; **except** in **RHCAs** thin to 50 percent CC, generally retain live trees greater than or equal to 20 inches DBH; and underburn (261 acres). Approximately 46 acres of mechanical thinning would occur within the primary nesting zone of the Round Valley bald eagle territory.

Group Selection (GS)

Group selection is proposed in mechanical thinning units within DFPZs and AT units (326 acres) using mechanical equipment. Group selection involves harvest of trees less than 30 inches in diameter in small (0.5 to 2 acres) patches. All live trees greater than or equal to 30 inches DBH would be retained.

Watershed Improvements

Approximately 0.6 mile of NFS road 28N38A would be proposed for decommissioning upon project completion. Approximately 0.4 mile of non-system road, a continuation of NFS road 28N38A, would be proposed for decommissioning upon project completion.

Roads that are to remain open but are improperly constructed or unmaintained would be improved. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips would be determined by district watershed staff in order to sufficiently disconnect the road drainage system from nearby stream channels. Refer to appendix C for a list of these roads.

Noxious Weeds

Three noxious weed species would be treated using a combination of manual removal, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicides are proposed in alternative E. The number of infested acres proposed for each treatment (or combination of treatments) is provided in Table 3. It is important to note that all of the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years). An overview of the noxious weed treatments proposed under alternative E is included in Table 4.

Table 3. Noxious Weed Treatments and Acres Proposed under Alternative E

Treatment	Acres
Rx 3: spring underburn	88.6
Rx 4: hand pull	0.4
Total	89

Table 4. Treatments for Noxious Weeds under Alternative E

Noxious Weed Species	Proposed Treatments
***Centaurea solstitialis* (yellow starthistle)**	Approximately 44 acres would be treated with spring underburning. Approximately 0.3 acres would be treated with hand-pulling alone. Revegetation using native seed would be considered within treatment units at a site-specific level. Follow-up treatments would include a combination of hand pulling, cutting with a hand-held string trimmer (i.e. weed whacker), or flaming with a propane torch.
***Taeniatherum caput-medusae* (medusahead)**	Spring underburning would be used as a treatment on approximately 45 acres. Infestations that are considered to be a high risk for spread (i.e. on roads and landings) may be treated by flaming with a propane torch. Revegetation using native seed would be considered within treatment units at a site-specific level.
***Cirsium arvense* (Canada thistle)**	No treatments are proposed under this alternative due to feasibility and effectiveness constraints.
***Cardaria draba* (hoary cress)**	No treatments are proposed under this alternative due to feasibility and effectiveness constraints.
***Cytisus scoparius* (Scotch broom)**	Treatment of approximately 0.1 acres would consist of manual methods, primarily hand pulling and removal using a weed wrench.

Design Criteria Common to All Action Alternatives

This section presents a series of tables (Table 5 through Table 13) that contain the design criteria for the treatments proposed in the action alternatives. The design criteria are part of the project design, apply to the proposed treatments, and were developed to reduce or avoid adverse environmental effects of the proposed treatments.

Table 5. Design Criteria for DFPZs and Area Thinning

Criterion	Actions
Ground-based Harvesting and Yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100’) within the interior of units where slopes exceed these limits. When units have inaccessibly steep

Criterion	Actions
	inclusions of steeper ground, sawlog and biomass products may be end-lined.
Skyline Harvesting and Yarding	In units 46, 50, 54, 55, 95, and 99a: Skyline yarding would be used to remove commercial sawlogs. Trees greater than or equal to 10 inches DBH would be removed as sawlog product. Harvested trees would be limbed, topped, and this activity slash would be hand piled. Trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. In units 2, 4, 5, 21, 27, 28, 29 56, and 59: Whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as a sawlog product. Trees less than 10 inches DBH would be removed as a biomass product. Tops and limbs would be yarded to the landing and removed as a product. Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams. The corridor would not be wider than 20 feet. The width for lateral yarding to the skyline corridor would be 75 feet on either side of the mainline. Lateral yarding would not require lift. When there are short inclusions of side hill within the corridor, allow side hill yarding. The top 100 feet of the skyline corridor would be rehabilitated with weed-free straw mulch and native seed.
Residual species preference	Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees. Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain large woody debris (greater than 12 inches diameter), where they exist, at 10 to 15 tons per acre of the largest down logs. Where needed, jackpot burn, or machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
TES treatment areas and control areas	Bald Eagle: Within 12 acres immediately surrounding the nest tree (unit 75a) hand thin, pile, and burn trees less than or equal to 8 inches DBH. Clustered Lady's Slipper: (9 acres within units 51, 52, 54, 55, 66, 67, and 68): Within TES treatment areas, hand thin, pile, and burn trees less than or equal to 8 inches DBH. Within control areas, hand thinning would be allowed, but

Criterion	Actions
	piles must be located outside of the control area. Surface fuels would be manipulated within clustered lady's slipper occurrences to reduce direct impacts from prescribed fire treatments. Constance's Rock Cress: (76 acres within units 64 and 71): Within TES treatment areas, hand thin, pile, and burn trees less than or equal to 8 inches DBH. Piling would occur in designated areas away from sensitive plants.
Fireline	Construct firelines using hand crews or mechanical equipment, as needed, around areas to be underburned, and around machine piles or hand piles. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Treatment of Stumps	Pine stumps 14 inches and greater in diameter would be treated with borax within one day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease, in units 45, 46, 49, and 50.

Table 6. Design Criteria for Group Selections

Criterion	Actions
Group size	0.5 acre to 2.0 acres.
Group location	Group selections would primarily be located in CWHR size class 4 stands (average DBH of 11 to 24 inches). Locate groups outside of Riparian Habitat Conservation Areas.
Ground-based Harvesting and Yarding	Mechanical harvesting and whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as sawlog product and trees less than 10 inches DBH would be removed as biomass product. Tops and limbs would be yarded to the landing and removed as a product. Ground-based equipment would be restricted to slopes less than 35 percent. Exceptions may be made for short pitches (less than 100') within the interior of units where slopes exceed these limits. When units have inaccessibly steep inclusions of steeper ground, sawlog and biomass products may be end-lined.
Skyline Harvesting and Yarding	In units 46, 50, 54, 55, 95, and 99a: Skyline yarding would be used to remove commercial sawlogs. Trees greater than or equal to 10 inches DBH would be removed as sawlog product. Harvested trees would be limbed, topped, and this activity slash would be hand piled. Trees less than 10 inches DBH would be hand thinned, piled, and burned post-treatment. In units 2, 4, 5, 21, 27, 28, 29 56, and 59: Whole-tree yarding would be used to remove commercial sawlog and biomass trees. Trees greater than or equal to 10 inches DBH would be removed as a sawlog product. Trees less than 10 inches DBH would be removed as a biomass product. Tops and limbs would be yarded to the landing and removed as a product. Skyline yarding would require one end suspension with full suspension over intermittent and perennial streams. The corridor would not be wider than 20 feet. The width for lateral yarding to the skyline corridor would be 75 feet on either side of the mainline. Lateral yarding would not require lift. Side-hill setups would not be allowed. The top 100 feet of the skyline corridor would be rehabilitated with weed-free straw mulch and native seed.
Diameter constraints	All trees greater than or equal to 30 inches DBH would be retained, except where removal is required to allow for operability. Minimize damage to trees greater than or equal to 30 inches DBH as much as practicable.
Slash treatment / Site Preparation	Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn, to treat natural and activity generated fuels, and shrubs.
Regeneration strategy	Regenerate groups with native shade-intolerant conifers, indicative of the ecological habitat type in which the group is located, using a combination of natural and planted seedlings to achieve desired stocking levels. Plantation performance would be monitored after the 1st and 3rd years, and regeneration actions would be undertaken, if needed, to ensure successful regeneration within five years after harvest. Control competing brush and grass by grubbing or mastication, if necessary, to assure survival and growth of conifers.

Criterion	Actions
Residual species preference	Retain all sugar pine tagged as resistant to white pine blister rust. Where black oak is present, retain black oaks greater than or equal to 6 inches DBH.
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain Large Woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Snag retention	Retain two of the largest snags per acre exceeding 15 inches DBH and 20 feet tall, unless removal is required to allow for operability.
Fireline	Construct firelines using hand crews or mechanical equipment around groups to be underburned and around machine piles or hand piles, as needed. Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.
Treatment of Stumps	Under alternative A, Pine stumps 14 inches and greater in diameter would be treated with borax within a day of cutting, to prevent the introduction and spread of *Heterobasidion* root disease, in units 45, 46, 49, and 50.
Notes: a. Group selections are **not** included in alternative C (non-commercial funding alternative) and alternative D (2001 SNFPA ROD Consistent Alternative). b. Herbicide treatments are not included in alternatives C and E.	

Table 7. Design Criteria for RHCAs

Criterion	Actions
RHCA Equipment constraints	No mechanical equipment operations on slopes steeper than 25 percent. Establish equipment exclusion zones adjacent to stream channels according to Table 9 below. Allow equipment to travel into the outer RHCA zone to harvest trees and bring them to skid trails. Locate skid trails at angles to stream channels that minimize erosion into the channel, and allow skidders to back in to the outer RHCA on these skid trails. To minimize soil displacement, no equipment would be permitted to turn around while off a skid trail in RHCAs. Allow hand thinning and hand piling in areas where equipment is excluded.
Diameter constraints	Within mechanical harvest areas, implement a 20-inch upper diameter limit, except where needed for operability. Minimize damage to trees larger than 20 inches DBH as much as practicable. In equipment exclusion zones, implement an 8-inch upper diameter limit on hand thinning treatments.
Residual species preference	Where present, retain all hardwood and riparian species. Retain the largest, most vigorous dominant and codominant trees to create a residual stand that would be comprised of larger fire-resilient trees.Species preference would be determined by forest type. In general, prefer to retain shade-intolerant species including rust-resistant sugar pine, black oak, ponderosa and Jefferey pine, and Douglas-fir.
Snag retention	Retain the number of snags per acre appropriate for each forest type unless removal is required to allow for operability. In Sierra mixed conifer types and ponderosa pine forest types, retain four of the largest snags per acre. In the red fir forest type, retain six of the largest snags per acre. Snags larger than 15 inches DBH and 20 feet in height would be used to meet this guideline.
Burn constraints	Establish pile burning exclusion zones (Table 10) adjacent to stream channels. Locate burn piles away from riparian vegetation to reduce the potential for scorch where feasible. Active ignition for prescriptive underburning would be minimized within 50 feet of perennial channels and 25 feet of ephemeral and intermittent channels. Backing fires would be used to minimize scorch of riparian vegetation within these buffers.
Fireline	Construct firelines using hand crews around areas to be underburned or pile burned, as needed, Incorporate existing roads, landings, skid trails, rock fields, bare areas, and other features into containment lines where logical and feasible.

Criterion	Actions
Residual surface fuels	Maintain adequate cover of surface fuels, litter, duff, and large woody debris to maintain habitat values, reduce potential erosion, and meet soil standards for woody debris and ground cover. Retain surface fuels (less than 12 inches diameter) at a level that would result in projected flame lengths of less than 4 feet under 90th percentile weather conditions. This generally corresponds to approximately 5 tons or less of surface fuels per acre, or a fuel model 8 or 9, depending on the forest type. Fuel model 8 and 9 are representative of the desired condition for surface fuels for fir dominated and pine dominated stands, respectively. Retain Large Woody debris (greater than 12 inches diameter): Where they exist, retain 10 to 15 tons per acre of the largest down logs. Where needed, machine pile and burn extensive areas of deadfall, where feasible, in terms of equipment operability and reduced chance of excessive scorch-related mortality upon burning of these piles. Based on post treatment evaluations, underburn, jackpot burn, machine pile and burn, and/or hand pile and burn to treat natural and activity-generated fuels.
Fish passage improvement	Reclaim fish passage and habitat by improving or replacing culverts at specific locations where roads cross streams.

Table 8. Scientific Assessment Team (SAT) Guidelines for RHCA Buffer Widths Based on Stream Type (USDA 1999b, page 2-11)

Stream Type	Prescribed Stream Buffer Widths
Perennial, fish bearing[1]	300 feet
Perennial, non-fish bearing[2]	150 feet
Intermittent[3]	100 feet
Ephemeral[3]	100 feet

[1]-Perennial fish bearing streams and lakes.
[2]-Perennial non-fish bearing streams, ponds, wetlands greater than 1 acre, and lakes.
[3]-intermittent and ephemeral streams, wetlands less than 1 acre, and landslides.

Table 8 displays the Scientific Assessment Team guidelines for RHCA buffer widths based on stream type. For the Keddie Ridge Project, the above listed widths would be the maximum buffer width identified for each stream type. Table 9 below displays an additional buffer (inner buffer or equipment exclusion zone) within the RHCA and within the SAT guideline buffer identified above.

For example, there is a perennial fish bearing stream within a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 70 feet from the edge of the active channel, the slope is 22 percent; a 150 foot inner buffer is applied. From the edge of the active channel no equipment can enter the RHCA for 150 feet. Equipment can enter the remaining 150 feet of the 300 foot maximum buffer.

When the slope within the SAT guideline buffer is greater than 25 percent, no mechanical equipment is allowed to enter the RHCA. For example, there is a perennial stream with a treatment unit; a 300 foot buffer is applied. Within that 300 foot buffer, approximately 100 feet from the edge of the active channel, the slope is 32 percent; no equipment is allowed within any portion of the 300 foot buffer.

Table 9. Equipment Exclusion Zones in RHCAs

Stream Type	Slope Class		
	0–15% (feet)	15%–25% (feet)	Greater Than 25%
Perennial, fish bearing	100	150	No mechanical equipment allowed
Perennial, no fish	50	100	No mechanical equipment allowed
Intermittent	25	50	No mechanical equipment allowed
Ephemeral	25	25	No mechanical equipment allowed
Reservoirs/wetlands greater than 1 acre	50	75	No mechanical equipment allowed

Within the SAT guideline buffer, a project specific distance (feet) is applied to the placement of piles for future burning (Table 10). For example, there is an ephemeral stream with a treatment unit; a 100 foot buffer is applied. Within that 100 foot buffer, approximately 70 feet from the active stream channel, the slope is 26 percent. First, no mechanical equipment is allowed within any portion of the 100 foot buffer (Table 9). Second, piles must be placed 15 feet from the center of the stream bed (Table 10).

Table 10. Pile Burning Exclusion Zones in RHCAs

Stream Type	Slope Class	
	0–15% (feet)	Greater Than 15% (feet)
Perennial	25	40
Intermittent	15	25
Ephemeral	15	15
Reservoirs/wetlands greater than 1 acre	15	25
Note: Where feasible, burn piles would not be placed any closer to streams than the distances shown in this table.		

Table 11. Design Criteria for Noxious Weeds

Criterion	Actions
Frequency	1-2 times per season for 2-5 years.
Manual weed treatments	Includes techniques such as hand pulling, digging, cutting (i.e. with a weed whacker), or covering. Would be used to treat small infestations (i.e. less than 50 plants) and as a follow-up method to herbicide or prescribed fire treatments.
Prescribed fire and flaming treatments	Prescribed fire treatments would be conducted in the spring and early summer. Flaming with a propane torch may be used to control weed infestations in areas that are a high risk for spread (i.e. on roads or landings).
Herbicide treatments	Two herbicides would be used to treat noxious weeds: aminopyralid (i.e. Milestone® or an equivalent formulation) and glyphosate (i.e. Accord™ or an equivalent formulation).
Timing of herbicide applications	*Yellow starthistle*: Early spring through summer *Canada thistle*: Early summer and/or fall *Hoary cress*: Early spring to early summer
Aminopyralid treatments	Where: upland infestations Use limitations: aminopyralid applications would be limited to areas that are greater than 15 feet from the water's edge Application: selectively, using a backpack sprayer Rate: 0.05 to 0.11 acid equivalent (a.e.) pounds per acre (lbs/acre)
Glyphosate treatments	Where: Lowland infestations Use limitations: glyphosate applications would be limited to infestations that are between 0 - 15 feet from the water's edge; the one exception to this is the single hoary cress infestation, which will be treated in its entirety with glyphosate Application: wick applicator or backpack sprayer Rate: 1 - 3 acid equivalent (a.e.) pounds per acre (lbs/acre)
Wind speed limitations	Herbicide application using a backpack sprayer would not occur when wind speed exceeds 10 miles per hour or when drift is visually observed.
Herbicide guidelines	All applicable pesticide laws and label restrictions would be followed to ensure human health and safety.
Herbicide Additives [a]	The following additives may be added to herbicide formulations to increase efficacy of treatments: non-ionic modified vegetable oil surfactant [b] (i.e. Competitor® or an equivalent) and water soluble colorant [c] (i.e. Hi-Light™ Blue or an equivalent).

Notes:
[a]. Spray solution additives are mixed with an herbicide solution to improve performance of the spray mixture. Examples include surfactants, wetting agents, sticker-spreaders, or penetrants.
[b.] Surfactants are substances that facilitate and enhance the absorbing, emulsifying, spreading, sticking, wetting, or penetrating properties of herbicides.
[c.] Colorants are added to herbicide mixtures prior to application to help identify the treated area, prevent skips and overlaps, and to help reduce human exposure to recently treated vegetation.
Herbicide treatments are **not** included in alternatives C (non-commercial funding alternative) or E (2004 SNFPA ROD

Criterion	Actions
consistent alternative).	

Table 12. Design Criteria for Access and Transportation

Criterion	Actions
NFS road maintenance	Maintain approximately 50 miles of NFS roads.
NFS road reconstruction	Reconstruct 1.1 miles of NFS roads.
Non-system road reconstruction	Reconstruct 8.1 miles of non-system roads.
Non-system road construction	Construct approximately 6.8 miles of new temporary non-system roads. Decommission these roads upon project completion.
Harvest landings	Landings would be utilized to remove sawlog and biomass products. The Keddie Ridge Project is planned to accommodate product removal with one landing per 40 acres. Per FSH 2409.15, a project should have no more than one landing per 20 acres except when there is a need for more landings to limit resource protection problems. Existing landings shall be reconstructed and utilized considering the location and effects to resources. Would construct new landings where existing landings are not present or are inadequate due to the location and effects to resources. Number and location of landings would be subject to agreement and would conform to direction as specified in FSH 2409.15, SMRs and BMPs. For existing landings supporting cull decks, identify and relocate individual hollow log structures prior to cull deck construction. Relocate hollow logs to forest stand outside of landing disturbance area. Landing spacing for skyline units would be 150 feet. Skyline units may require more landings in order to process biomass. Removal of green trees would occur to allow for temporary non-system road and landing construction.
Notes: a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b).	

Table 13. Design Criteria for Watershed Improvements

Criterion	Actions
NFS road improvement	Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Drainage improvements may include: outsloping road segments, installing armored rolling dips, or replacing culverts. Improvements to the road drainage system and road surface prism would be considered for 100 miles of road within the watershed analysis area. Rolling dips, which would likely be one of the most commonly prescribed road improvement for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road. This estimate may vary

Criterion	Actions
	depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips would be determined by district watershed staff in order to sufficiently disconnect the road drainage system from nearby stream channels. Refer to appendix C for more details.
NFS road decommissioning	Decomission approximately 0.6 mile of NFS road 28N38A upon project completion.
Non-system road decommissioning	Decomission approximately 0.4 mile of non-system roads upon project completion.
Notes: a. Road treatments are planned and would be implemented in accordance with the PNF LRMP (USDA 1988) and the Plumas National Forest Public Motorized Travel Management FEIS (USDA 2010a) and ROD (USDA 2010b). Watershed improvements are **not** proposed under alternative C (non-commercial funding alternative).	

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purposes and needs. Some of these alternatives may have been outside the scope of the need for the proposal, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, two alternatives were considered, but dismissed from detailed consideration for reasons summarized below:

Alternative F

John Muir Project Alternative

The John Muir Project alternative, alternative F, was suggested during scoping comments. Alternative F is a non-commercial alternative (one that would not sell wood products for timber or biomass) with a 12 inch upper diameter limit and no group selection. This alternative would implement relatively more prescribed fire than thinning, and incorporate some mixed-severity effects into the desired condition for prescribed fire. In this alternative, the priority for treatment would be areas within 100-200 feet of individual homes. On the private lands portion of the 100-200 foot zone around individual homes, the Forest Service should offer to thin small trees and brush for willing homeowners, especially those who cannot afford to do it themselves.

Alternative F was eliminated from detailed study for the following reasons:

- Alternative C (non-commercial funding alternative), an alternative studied in detail, incorporates all live trees greater than or equal to 12 inches DBH being retained throughout all treatments and prescriptions, except to allow for operations.

- Alternatives C and D (2001 SNFPA ROD consistent alternative), two alternatives studied in detail, do not include group selections.
- Prescribed fire treatments in all action alternatives include low to moderate severity underburning. Desired conditions presented in the 2004 SNFPA ROD for fire and fuels management emphasize reducing fire intensity, rate of fire spread, crown fire potential, and mortality of dominant and codominant trees (page 49). The 2004 SNFPA ROD does not include the incorporation of high severity effects within prescribed fire treatments.
- In addition, one of the primary purposes of the Healthy Forest Restoration Act is to “reduce wildfire risk to communities, municipal water supplies, and other at-risk Federal land” (HR 1904, section 2 “Purposes,” page 3).
- The Keddie Ridge Project proposes to treat 5,669 acres by constructing DFPZs and AT units, plus 284 acres of group selections. There are approximately 97,376 acres within the identified Keddie Ridge Project area that would remain untreated and provide for a mixed severity effect if a wildfire were to burn these untreated areas.
- The Forest Service doesn't have the authority to conduct activities on private land, unless the Forest Service entered into a cooperative agreement with another entity (Wyden Amendment (Public Law 105-277, Section 323 as amended by Public Law 109-54, Section 434). The Plumas County Fire Safe Council (PCFSC), however, has implemented approximately 294 acres of a combination of hand thinning, piling, and burning; masticating; and some removal of commercial and non-commercial forest products on private lands surrounding homes (appendix F). PCFSC has an application, agreement, and implementation process in effect for Plumas County residents. For more information, visit their website at http://plumasfiresafe.org/.

Alternative G

Alternative G was developed in response to a request from the public that the Forest Service consider an alternative that focuses on non-herbicide treatment methods to control noxious weed infestations in the Keddie Ridge Project area. Alternatives C and E, which include only non-herbicide treatment measures, were also developed in response to this request and were analyzed in detail in Chapter 3. The treatment methods described below were excluded from Alternatives C and E and dropped from detailed analysis due to cost, infeasibility, or failure to adequately contain and control noxious weed infestations within the project area.

Manual Treatment

The manual treatment of all weed infestations was not considered in detail due to cost and feasibility constraints. Manual methods are generally only recommended for small or newly established occurrences. They are most effective on annual species and tap-rooted plants and are considered much less effective for weeds with deep underground stems and roots, such as Canada thistle or hoary cress, due to their ability to re-sprout following treatment (Tu et al. 2001). One example within the Keddie Project area is the single infestation of hoary cress, which was hand-pulled and mowed on an annual basis between 2002 and 2005; over this time period, the infestation increased from an estimated 300 plants to approximately 3,000 individuals.

The number of repeat applications required for manual methods to be effective often ranges from two to four treatments per site per season (Tu et al. 2001), which can significantly increase the estimated per acre cost of treatment. Out of the five weeds that occur within the project area, only two (yellow starthistle and Scotch broom) can be effectively treated with manual methods. Of these, only six sites are considered small (i.e. less than 0.1 acres) and isolated enough to treat with manual methods alone. Under action alternatives A, D, and E, manual methods would be utilized whenever feasible to treat small infestations and as a follow-up within larger infestations.

Biological Control

Biological control methods are used to reduce weed infestations by introducing host-specific organisms that are imported from within the native range of the target species (Holloran 2004). The success of this method is highly dependent upon the biology and ecology of both the target weed species and the biological control agent. Unfortunately, despite numerous attempts, most efforts to control weeds with biological control agents have failed (DiTomaso et al. 2006).

To date, several biological control organisms have been introduced into California in an attempt to control yellow starthistle, Canada thistle, and Scotch broom (Villegas 2009, personal communication); however, very few have established viable populations or shown effective levels of control. In Plumas County, two biological control agents, the false peacock fly and the hairy weevil, were introduced to control yellow starthistle and although they have been observed on flower heads their impact has not been considered adequate for control. At this time, biological control organisms are not considered a viable option for reducing the spread of medusahead or hoary cress (CDFA 2009a).

Plowing, Disking, or Tilling

In agricultural settings, repeated plowing, disking, or tilling can be effective at reducing weed infestations (e.g. Bayer 2000); however, this method is not often recommended in natural areas because it can exacerbate the problem by spreading seed or root fragments to new locations and can severely damage native vegetation (Willard and Lewis 1939 *in* Nuzzo 1997). Within the Keddie Ridge Project area, terrain limitations, as well as rocks, logs, and other native materials, make these treatments impractical for weed control.

Grazing

The use of grazing to control noxious weeds can produce variable results and has been shown to both promote and reduce weeds. Grazing alone will rarely, if ever, completely eradicate infestations (Tu et al. 2001). Grazing animals are not selective and if they are not properly controlled, can cause significant impacts to an ecosystem. Grazing animals can also act as vectors for weed spread as they are moved from site to site. The terrain, as well as the abundance and spatial extent of noxious weed infestations within the Keddie Ridge Project area, makes grazing an impractical option for control.

Comparison of Alternatives

The comparison of alternatives focuses on objectives and issues that provided measureable elements to the proposed action and emphasized the most important environmental effects. These are elements of the ecosystem that can be measured to indicate an increase or decrease in trends in ecosystem health. To compare these elements, measurement indicators were developed to show the differences between the alternatives and provide a clear basis for the decision to be made by the Responsible Official. The measurement indicators are used in the analysis to quantify and describe how well the proposed action and alternatives meet the project objectives.

Table 14 shows the difference between all alternatives by using measurement indicators, Table 15 compares effects of all alternatives by resource, and Table 15a displays acres of treatment for each alternative.

Table 14. Comparison of Measurement Indicators for Each Alternative.

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Reduce Hazardous Fuel Accumulation	Predicted Flame Lengths (less than 4feet)	100% of stands would meet desired conditions	0% of stands would meet desired conditions	96% of stands would meet desired conditions	96% of stands would meet desired conditions	100% of stands would meet desired conditions
	Fire Type (Surface fire)	100% of stands would meet desired conditions	4% of stands would meet desired conditions	96% of stands would meet desired conditions	96% of stands would meet desired conditions	100% of stands would meet desired conditions
	Predicted Mortality (percent basal area less than 25%)	100% of stands would meet desired conditions	0% of stands would meet desired conditions	96% of stands would meet desired conditions	86% of stands would meet desired conditions	100% of stands would meet desired conditions
Improve Forest Health and Protect and Enhance R5 Forest Service Sensitive Wildlife	Trees Per Acre (Percent retention of trees >20 inches DBH)	All stands would retain 73-100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 100% of trees > 20 inches DBH	All stands would retain 73-100% of trees > 20 inches DBH
	Basal Area Per Acre (less than or equal to 150 ft^2)	68% of stands would meet desired conditions	7% of stands would meet desired conditions	36% of stands would meet desired conditions	11% of stands would meet desired conditions	61% of stands would meet desired conditions

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Improve Forest Health and Protect and Enhance R5 Forest Service Sensitive Wildlife	**Relative Stand Density (25-40 percent post treatment)**	68% of stands would meet desired conditions	7% of stands would meet desired conditions	36% of stands would meet desired conditions	14% of stands would meet desired conditions	61% of stands would meet desired conditions
	Species Composition Relative Abundance of Shade-Intolerant Species	61% of stands would improve species composition	No improvement across any stand	35% of stands would improve species composition	21% of stands would improve species composition	61% of stands would improve species composition
	Average Stand Diameter >24 inches DBH in 30 years (Growth into late seral conditions-CWHR 5)	25% of stands would grow into CWHR 5 in 30 years	4% of stands would grow into CWHR 5 in 30 years	7% of stands would grow into CWHR 5 in 30 years	7% of stands would grow into CWHR 5 in 30 years	25% of stands would grow into CWHR 5 in 30 years
	Post-treatment Canopy Cover (Percent of Open Canopy Forest Condition Created)	50% open canopy stands, 50 % closed canopy stands	18% open canopy stands, 82% closed canopy stands	25% open canopy stands, 75% closed canopy stands	18% open canopy stands, 82% closed canopy stands	43% open canopy stands, 57% closed canopy stands
	Distribution of CWHR Size Class and Density (Increase in diversity)	Increase in diversity	No Change in diversity	Little change in diversity	Little change in diversity	Increase in diversity
Protect and enhance habitat for	**Number of Occurrences**	7	0	7	7	7

Purpose		Alternative A – Collaborative Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Region 5 Forest Service sensitive plant	**Acres of Habitat Protected and Enhanced**	85	0	85	85	85
Improve Watershed Health	**Number of Stream Crossings Improved**	4	0	0	4	4
	Miles of Road Decommissioned	1.0	0	0	1.0	1.0
	Miles of Road Drainage Disconnected From Streams	5.0	0	0	5.0	5.0
Reduce Noxious Weed Infestations	**Risk of Invasion and Spread**	Moderate	Low	High	Low	High
	Effectiveness of Proposed Weed Treatments	High	None	Variable	High	Variable
	Number of Noxious Weed Infestations Treated	87	0	53	87	53
	Approximate (maximum) Acres Treated	107	0	89	107	89

Table 15. Comparison of Effects for Each Alternative.

	Alternative A – Collaboration Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Fuels	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions. Open forest canopy conditions created	Potential for Crown fire initiation and spread under 90th percentile weather conditions exists	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions	Reduced probability of crown fire initiation and spread under 90th percentile weather conditions Open forest canopy conditions created
Forest Veg	Low stand density conditions created Promotes growth and development of large diameter trees Promotes establishment, growth and development of shade intolerant species Improves forest resiliency to drought, fire, and insects and disease Enhances landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral condtions, and promoting the development of later seral conditions	No reduction in stand density No improvement in growth and development of large diameter trees No improvement in species composition No enhancement of forest resiliency to drought, fire, insects and disease Maintains homogeneous, closed canopy mid seral conditions on landscape	Reduces stand density to moderate levels Little growth and development of large diameter trees No promotion of establishment of shade intolerant species and little improvement in growth and development of shade intolerant species Little enhancement of forest resiliency to drought, fire, insects and disease Generally maintains homogeneous, closed canopy mid seral conditions on landscape	Reduces stand density to moderate levels Little growth and development of large diameter trees No promotion of establishment of shade intolerant species and little improvement in growth and development of shade intolerant species Little enhancement of forest resiliency to drought, fire, insects and disease Generally maintains homogeneous, closed canopy mid seral conditions on landscape	Low stand density conditions created Promotes growth and development of large diameter trees Promotes establishment, growth and development of shade intolerant species Improves forest resiliency to drought, fire, and insects and disease Enhances landscape diversity and forest heterogeneity by creating open forest canopy conditions, early seral condtions, and promoting the development of later seral conditions

	Alternative A – Collaboration Alternative (Proposed Action)	Alternative B – No Action	Alternative C– Non-Commercial Funding	Alternative D– 2001 SNFPA Alternative	Alternative E – HFQLG Economic Alternative
Wildlife	Reduces 25% of stands suitable to old-forest dependent species (CWHR size-density classes 4M4D/5M5D) to an unsuitable condition (open forest canopy or early seral) High risk reduction of potential habitat loss due to wildfire	No change in wildlife habitat conditions High risk of potential habitat loss due to wildfire	Reduces 5% of CWHR size-density class 4M stands suitable to old-forest dependent species to an unsuitable condition (open forest canopy) Moderate risk reduction of potential habitat loss due to wildfire	Retention of all stands considered suitable to old-forest dependent species (i.e. no open forest canopy or early seral conditions created) Moderate risk reduction of potential habitat loss due to wildfire	Reduces 32% of stands suitable to old-forest dependent species (CWHR size-density classes 4M4D/5M5D) to an unsuitable condition (open forest canopy or early seral) Greatest risk reduction of potential habitat loss due to wildfire
Noxious Weeds	High amount of project-related disturbance; highly effective weed treatments; moderate risk of weed introduction and spread	No project-related disturbance; no weed treatments proposed; low risk of weed introduction and spread	Moderate amount of project-related disturbance; weed treatment effectiveness variable; high risk of weed introduction and spread	Moderate amount of project-related disturbance; highly effective weed treatments; low risk of weed introduction and spread	High amount of project-related disturbance; weed treatment effectiveness variable; high risk of weed introduction and spread
Visual Quality	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	No direct effects to visual quality. However, the lack of treatments would perpetuate existing dense forest canopy.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.	Scenic quality would be improved. Short-term negative effect. Scenic quality improved over time.
Watershed Cumulative Effects	Upper Wolf Cr-Hauns Cr—87% of TOC, Upper Cooks Cr—98% of TOC	Upper Wolf Cr-Hauns Cr—81% of TOC, Upper Cooks Cr—90% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—97% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—96% of TOC	Upper Wolf Cr-Hauns Cr—85% of TOC, Upper Cooks Cr—98% of TOC

Table 15a. Comparison of Economic Effects by Action Alternative

Revenue/Cost Employment	Alternatives			
	Alternative A	Alternative C	Alternative D	Alternative E
Sawlog Volume	10.37 mmbf	231 mbf	1.9 mmbf	15.48 mmbf
Biomass Volume	21,000 gt	24, 000 gt	13,000 gt	18,000 gt
Sawlog and Biomass Value (cost deducted)	$2,127,902	$556,180	$580,450	$3.001,415
Additional Operation Cost	$2,186,298	$1,442,220	$1,184,091	$2,453,130
Potential Advertised Value to the Government	$130,301	$2,772	$22,800	$202,488
Percent Above Value	-3%	-160%	-104%	18%
Fuels Reduction Project Costs	$5,496,675	$5,496,675	$5,334,351	$5,496,675
Potential Direct and Indirect Jobs	189	60	66	252
Potential Employee Income	$6,799,620	$2,161,134	$2,374,303	$9,082,986
Receipt Act Plumas County Estimate Collections	$32,575	$693	$5,700	$50,622

Table 15b. Summary of Acres by Treatment.

Alternative	Acres of Treatment				
	DFPZ	Area Thinning	Group Selection	Watershed Improvements	Noxious Weed Treatment
Alternative A – Collaboration Alternative (Preferred Alternative)	5,175 acres	494 acres	284 Acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	107 acres
Alternative B – No Action Alternative	0 acres	0 acres	0 acres	No improvements	0 acres
Alternative C – Non-Commercial Funding Alternative	5,431 acres	522 acres	0 acres	No improvements.	0 acres
Alternative D – 2001 SNFPA ROD Consistent Alternative	4,976 acres	467 acres	0 acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	107 acres
Alternative E – 2004 SNFPA ROD Consistent Alternative	5,134 acres	493 acres	326 acres	Decomission 0.6 miles system road and 0.4 miles non-system road. Up to 100 miles of road improvement.	89 acres

Chapter 3. Affected Environment and Environmental Consequences

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or alternative. Together, these descriptions form the scientific and analytical basis for the comparison of effects in Chapter 2.

The following resource specialist analyses are incorporated by reference: Keddie Ridge Hazardous Fuels Reduction Project Forest Vegetation, Fire, Fuels, and Air Quality Report (Ryan Tompkins and Ryan Bauer)(USDA 2011a); Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment/Biological Evaluation (Chris Collins)(USDA 2011b); Management Indicator Species Report for the Keddie Ridge Hazardous Fuels Reduction Project (Chris Collins)(USDA 2011c); Keddie Ridge Hazardous Fuels Reduction Project Wildlife Supplemental Information Migratory Birds Report (Chris Collins)(USDA 2001d); Keddie Ridge Hazardous Fuels Reduction Project Watershed Report (Kelby Gardiner)(USDA 2011e); Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (Michelle Coppoletta)(USDA 2011f); Keddie Ridge Hazardous Fuels Reduction Project Heritage Resource Inventory Report ARR# 02-28-2011 (Cristina Weinberg, January 2011)(USDA 2011g).

Past, Present and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR §1508.7).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions."

The cumulative effects analysis in this EIS is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR §220.4(f)) (July 24, 2008), which state, in part:

> "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives will add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision making. (40 CFR §1508.7)"

In determining cumulative effects, the past, present, and future actions displayed in appendix F were added to the direct and indirect effects of the proposed action and alternatives.

Affected environment sections have been divided by resource areas, where as environmental consequence sections have been divided by resource areas and then by alternative, where is some cases, action alternatives are grouped.. Further, effects analyses that are required by law are discussed per alternative.

Forest Vegetation, Fuels, Fire, and Air Quality

Introduction

Ecologically, the dynamics between vegetation and fire and fuels are inherently linked because vegetation type, structure, and development have a profound effect on fuel accumulations and fire behavior, and conversely, fuel accumulations and fire behavior can have a profound effect on vegetation establishment, development, and structure. Consequently, forest vegetation, and fuels and potential fire behavior are examined with an integrated approach for the purposes of this analysis. This section includes complete discussions of possible effects of the proposed project and alternatives and presents a summary of the Forest Vegetation, Fuels, Fire, and Air Quality Specialist Report for the Keddie Ridge Hazardous Fuels Reduction Project which is on file at the Mt. Hough Ranger District office and available upon request.

The forested landscape in the Keddie Ridge Project area consists primarily of pine-dominated Sierra mixed conifer forests with some ponderosa pine, true fir forests, and plantations established over the last 40 years in burned areas and clear-cut timber harvest units. Forests in the project area range from 3,000 feet to 7,500 feet in elevation with an annual precipitation ranging from 30 to 50 inches.

The Keddie Ridge Project area lies along the crest of the Northern reach of the Sierra Nevada range. These forests are within the transition zone—an ecological zone used to describe the transition between the wet productive westside forests of the Sierra Nevada and the relatively dry, less productive eastside forests of the Sierra Nevada (USDA 1999a, b). Consequently, the forests in the project area tend to be drier and occur on less productive sites. The Forest Survey Site Class (FSSC) in the project area ranges from 4 to 7 (based on an index where FSSC 7 represents the least productive site class); however more than half of the project area is classified as Forest Survey Site Class 6 which represents a mean annual increment – growth rate – of 20 to 46 cubic feet per acre per year (USDA SCS 1988).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

The Keddie Ridge Hazardous Fuels Reduction Project is designed to fulfill the management direction specified in the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988), as amended by the Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental environmental impact statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, b; USDA 2003a, b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, b). Fuel and vegetation management activities are designed to comply with the standards and guidelines as described in the SNFPA FSEIS and ROD (USDA 2004a, b).

National Forest Management Act

The National Forest Management Act (NFMA) of 1976, including its amendments to the Forest and Rangeland Renewable Resources Planning Act of 1974 state that it is the policy of the Congress that all forested lands in the National Forest System be maintained in appropriate forest cover with species of trees, degree of stocking, rate of growth, and conditions of stand designed to secure the maximum benefits of multiple use sustained yield management in accordance with land management plans. Both acts also state “insure that timber will be harvested from National Forest System land only where – (ii) there is assurance that such lands can be adequately restocked within five years of harvest.”

Plumas National Forest Land Management Plan (1988) as Amended by the Herger-Feinsten Quincy Library Group FSEIS and ROD (1999, 2003) and the Sierra Nevada Forest Plan Amendment FSEIS and ROD (2004)

The desired condition as described in Alternative 2 of the HFQLG Final Environmental Impact Statement (USDA 1999a) is an “all-aged, multistory, fire-resistant forest,” of open forest stands dominated by large, fire tolerant trees with crowns sufficiently spaced to limit the spread of crown fire. Riparian ecosystems would be resilient to impacts caused by naturally occurring disturbance processes such as wildfire, flood, and drought.

The 2004 SNFPA provides management direction for the HFQLG pilot project area in appendix E of the Record of Decision (USDA 2004b). Appendix E directs the Plumas National Forest to “implement the HFQLG Forest Recovery Act Pilot Project, consistent with the HFQLG Forest Recovery Act and Alternative 2 of the HFQLG EIS. The HFQLG Forest Recovery Act Pilot Project is designed to test and demonstrate the effectiveness of certain fuels and vegetation management activities in meeting ecologic, economic, and fuel reduction objectives. Fuels and vegetation management activities include constructing a strategic system of defensible fuel profile zones (DFPZs), group selection, and individual tree selection. A management program for riparian areas is also included in the pilot project.”

Sierra Nevada Forest Plan Amendment: Final Supplemental Environmental Impact Statement Record of Decision: Forest-wide Standards and Guidelines (2004)

The standards and guidelines for fuels and vegetation management projects for the HFQLG Pilot Project are shown in Table 2 of the 2004 SNFPA Record of Decision (USDA 2004b). This table includes direction for designing and implementing fuels and vegetation management activities within the various land allocations of the HFQLG pilot project area for the life of the pilot project.

Effects Analysis Methodology

Geographic and Temporal Bounds

The approximate 106,000-acre boundary of the watersheds in the Keddie Ridge Project area forms the geographic boundary of the analysis area used to analyze the direct, indirect, and cumulative effects on forest vegetation and fuels and fire. The analysis area is comprised of twelve watersheds: Taylorsville, Mt. Jura, Peters Creek, Upper Cooks Creek, Lower Cooks Creek, Upper Wolf Creek, Upper Wolf Creek-Haun’s Creek, Lower Wolf Creek, Lower Wolf Creek-Greenville, Round Valley, Crescent Mills, and Indian Falls. The analysis area includes the vegetation occurring within the treatment areas as well as the vegetation outside of the treatment areas within the affected watersheds. The analysis considers the twelve watersheds because, when combined, they represent the furthest measurable extent that effects on forest vegetation would occur as a result of implementing any of the proposed alternatives. With respect to fire, these watersheds, as a group, are geographically bounded by high-elevation ridgelines that are sparsely vegetated in places. Because of this, most of the fires that have occurred in these watersheds have been managed at the watershed level or smaller. Ecologically, the dynamics between vegetation and fire and fuels are inherently linked; vegetation treatments (and absence thereof) have a profound effect on fuels accumulations and fire behavior, and conversely, fire has a profound effect on vegetation establishment and development.

The analysis area considers this relationship on the landscape level by including the vegetation and past large wildfires and contains all National Forest System lands available for and subject to proposed treatments under the Keddie Ridge Project, as well as the vegetation within the watersheds outside treatment areas. This allows for a congruent analysis of forest vegetation, fuels, and fire at the stand and landscape levels.

The direct, indirect, and cumulative effects analyses are based on a temporal scale. Documented past projects including timber harvesting, wildfires, watershed improvements, and other activities described in appendix F ranging as far back as 1980 were considered past actions within the analysis area. In a broader sense, current vegetation structure and composition reflects the historical management regimes prior to 1980. This vegetation structure and composition includes attributes of the current landscape including existing vegetation types, fuel treatments, burned areas, past sanitation harvest, and plantations.

For the purpose of the vegetation analysis, the temporal bounds include a 30-year horizon for future effects. Within 30 years, the treated stands would approach current levels of stocking and would approach the typical entry cycle for managed stands. This timeframe allows for examining general trends and trajectories of stand development under no further management beyond those documented in “Appendix F: Past, Present, and Reasonably Foreseeable Future Actions,” which is located in this EIS.

The potential fire behavior and effects of alternatives were modeled pre treatment and post-treatment, with the latter reflecting treatments after completion. Fuel treatments are expected to remain effective for at least 10 years—this is based on experience with existing fuel treatments on the Mt. Hough Ranger District. Fuel treatments would likely require entry for burning and other maintenance prior to the 30-year horizon modeled for tree stand growth (USDA 2004a). Future maintenance activities are discussed in appendix F (Past, Present, and Reasonably Foreseeable Future Projects of this document).

With respect to air quality; the towns, communities, and national parks within 20 miles of the project area boundary are listed in Table 22. It is important to note that unknown or unanticipated future wildfires, disease outbreaks, or mortality may occur in the analysis area prior to completion of implementation of this project—these potential future disturbance events are not included as part of this analysis.

Analysis Methodology

Field inventories were conducted to measure attributes of existing vegetation in the analysis area. Stands in the analysis area were inventoried using the Common Stand Exam protocols for the Pacific Southwest Region (U.S. Department of Agriculture [USDA] Forest Service Region 5). These stands are representative of the analysis area and the areas to be treated in all action alternatives. Data was collected on live and dead trees and fuels.

For analysis purposes, the stand data was loaded into the Forest Vegetation Simulator, a forest growth model that predicts forest stand development (Dixon 2002). The model was used to quantify existing stand conditions and to predict the effect of alternative treatments on forest development. Stand growth, mortality, regeneration, and development by stand were simulated to predict the effects of treatments over time. The FVS model output predicts average stand conditions and attributes by stand. The stand attributes analyzed include trees per acre, basal area, quadratic mean diameter, stand density index, canopy cover, and species composition. Model outputs by stand were utilized to examine the effects of treatment over the larger landscape scale. Model outputs have unknown variances that may sometimes be large; however, this is normal for modeling efforts, and model outputs are best evaluated in a relative rather than an absolute sense. In addition, model simulations have limited capacity to predict mortality due to drought or insect and disease outbreaks. Considering this, model outputs such as stand density and basal area provide useful metrics for determining relative risk of these effects. This further underscores that interpretation of model outputs are best evaluated in a relative sense in conjunction with professional judgement, firsthand knowledge of stand conditions, forest health evaluations, and pertinent scientific research, studies, and literature. For more information regarding FVS modeling by alternative, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

A Geographic Information System (GIS) was used to analyze forest vegetation on the landscape scale for the analysis area. Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after the Moonlight Fire of 2007, which affected a small portion of the analysis area. The Vestra vegetation data also did not include a portion of the analysis area. The HFQLG 2005 Vegetation Mapping Project mapped areas on the Plumas National Forest not covered by Vestra. These data were combined in a GIS to provide a complete map of the existing vegetation within the analysis area. All vegetation information is displayed using CWHR vegetation typing and serves as the baseline acres for analysis. The distribution of CWHR size class and density was analyzed relative to the stand-level effects modeled by CWHR size class. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

Fire Behavior and Effects

The effects of all alternatives were analyzed at the stand and landscape level using widely accepted models: 1) Fire Family Plus and 2) Fire and Fuels Extension of the Forest Vegetation Simulator (FFE). The output data reflects fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the common stand exam plots. These models are extensively described and documented in their accompanying user manuals; general assumptions and outputs of these models are summarized below:

1. Fire Family Plus (Main et al. 1990): Fire Family Plus is a widely used software program for summarizing and analyzing historical daily fire weather observations and computing fire danger indices based on the National Fire Danger Rating System (NFDRS). For this analysis, the modeling of potential fire behavior was done under 90th percentile weather conditions (Table 16) that were calculated using Fire Family Plus (Main et al. 1990). The 90th percentile weather is defined as the severest 10 percent of the historical fire weather conditions occurring during the fire season. Ninetieth percentile weather conditions are the specified weather standard for fuel treatment design (USDA 2004b). Weather data used in fire modeling were obtained from the Quincy, Pierce, and Cashman Weather Stations, which are the closest and most representative weather stations to the analysis area.

The Pierce and Cashman Weather Stations are located on south-facing open slopes in areas that typically reflect the hottest, driest, and windiest weather conditions.

2. Fire and Fuels Extension (Reinhardt and Crookston 2003): The Fire and Fuels Extension (FFE) of the Forest Vegetation Simulator (FVS) were used to model predicted fuel loading and potential fire behavior. Modeling was done using the 90th percentile weather calculated using Fire Family Plus and displayed in Table 16. The Fire and Fuels Extension utilizes stand specific surface fuel and stand inventory data and was used to model and assess the effects of different treatments on potential flame length, probability of torching, potential fire type, and predicted tree mortality at the stand level. The output data reflect fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the Common Stand Exam plots. Model outputs have unknown variances that may sometimes be large; however, this is normal for modeling efforts, and model outputs are best evaluated in a relative rather than an absolute sense. Fuel model selection logic based on expert opinion (Duncan, pers. comm., 2010) and time-since-disturbance was developed similar to Collins et al (In press) to determine fuel model succession post-treatment. For more information regarding FVS modeling by alternative, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

Table 16. Fire Weather Parameters Used in Fire Modeling

Weather Variable	Value	Weather Variable	Value
Weather Station Names and Numbers Years 2000-2010	Quincy (#040910) , Pierce (#040915), and Cashman (#040916)	1-hour fuel moisture	1.0%
		10-hour fuel moisture	2.0%
Time of Year	June 1 to September 15	100-hour fuel moisture	5.5%
Temperature (Fahrenheit)	93°	1,000-hour fuel moisture	6.0%
Relative Humidity	10%	Herbaceous fuel moisture	29%
Probable maximum 1 minute 20-foot wind speed[a]	9 mph	Woody fuel moisture	69%

Sources:
a. Crosby and Chandler 1966

Measurement Indicators

Forest Vegetation: Stand Structure and Composition and Landscape Heterogeneity

The effects of treatment on stand structure, compositional structure, and landscape structure of forest vegetation are evaluated for each alternative. These measurement indicators focus on residual post-treatment attributes of forest vegetation structure, density, species composition, and landscape diversity and heterogeneity as residual post-treatment conditions are the best indicator of how well desired conditions as described in Chapter 1 would be met for the project purposes and needs.

Stand Structure—Stand structure is analyzed using three measures of stocking and density: (1) trees per acre and their distribution by diameter class, (2) basal area per acre, and (3) relative stand density.

Table 17. Diameter Class and Tree Size by Forest Product

CWHR Tree Size	Sapling to Pole Size Trees	Small-sized trees	Intermediate-sized trees (small to medium)	Medium to Large-sized trees
Forest Product	Biomass Trees	Sawlog Trees		Reserve Trees
Diameter Class	0-10 inches DBH	10-20 inches	20-30 inches	+30 inches
Note: DBH = diameter at breast height				

*Trees per Acre and Their Distribution by Diameter Class***:** The number and distribution of trees per acre by diameter class (Table 17) is an important unit of measure because it shows the effect of treatments on different size trees. High density stands also slow the rate of fire line construction by hand crews and mechanical equipment. The four diameter classes are based on diameter classes for forest products (biomass and sawlog products), ecological importance for fire behavior and wildlife habitat, and guidelines for reserve trees upon which silvicultural prescriptions are based. The sawlog-sized trees are split into two 10-inch diameter classes to track the effect of treatments on the intermediate-sized tree class as described in the GTR 220 (North et al. 2009). The percent reduction of trees per acre is used to show the effects of treatments on reducing stocking and the percent retention of trees greater than 20 inches in diameter is used to show the effects of treatments on the intermediate and large tree size classes which are valued for ecological structure and function for wildlife habitat.

Basal area per acre: Basal area per acre is "the cross-sectional area of all stems in a stand measured at breast height and expressed per unit land area" (in this case, per acre) (Helms 1998). Basal area per acre is commonly used as a measure of stand density. This measure has been used by Oliver (1995) to describe the threshold for ponderosa pine (150 square feet per acre), above which bark beetle related mortality is expected to occur. This threshold is related to Sartwell's work (Sartwell 1971, Sartwell and Steven 1975, Sartwell and Dolph 1976) with mountain pine beetle outbreaks as described by Powell (1999) where these "outbreaks could be attributed to two primary factors: second-growth ponderosa pine stands were even-aged and ecologically simplified when compared with the uneven "virgin" forest; and man's intentional suppression of wildfire effectively removed an important landscape-level thinning agent, which in turn caused an unnatural accumulation of stand density (basal area) as compared to virgin conditions." Both of these conditions occur within the Keddie Ridge Project landscape as described in the affected environment

For true fir stands, Oliver's research (1988) found that "plots with 200 square feet per acre or more basal area suffered the bulk of the mortality." This may allow for leaving slightly higher densities in pure true fir stands, however, Powell (1999) recommends for mixed species stands (which are prevalent in the analysis area) that the "lowest stocking-level recommendations could be selected" because other species (such true fir species) would develop acceptably under the lower densities established for the limiting species (pine species). "This is the strategy recommended by Cochran and others (1994)."(Powell 1999)

In addition, basal area per acre has also been used by Landram (2004) to develop insect risk thinning guidelines for the eastside, transition, and westside zones of the Plumas National Forest. For the transition zone (where the Keddie Ridge Project is primarily located), the insect risk thinning guides for the Plumas suggest thinning to 150 square feet per acre. For more information regarding basal area and forest health, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Relative stand density: The concept of stand density index was first developed for even-aged stands by Reinecke (1933) to compare "the density of stocking of various stands." The relative density concept describes a stand's density relative to the maximum possible density and may serve as a proxy for a stand density relative to its carrying capacity. In general, the concept of stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Curtis 1970; Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Helms and Tappeiner 1996; Jack and Long 1996; Powell 1999; Woodall et al. 2002).

A relative density between 55 and 60 percent has been described as the lower limit of the "Zone of Imminent Competition Mortality" above which trees begin to die due to competition related stress (Drew and Flewelling 1977, 1979; Long 1985; Long and Daniel 1990; Smith et al. 1997; Powell 1999; Long and Shaw 2005). For the purpose of this analysis, 60 percent was used as a measure of the onset of competition-related mortality because stress induced by competition increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health because stands managed below this threshold are less likely to incur mortality due to the agents mentioned above.

The desired relative densities immediately post-treatment are between 25 and 40 percent, the lower bounds of which correspond with the onset of competition and crown closure. These levels are substantially below the threshold of imminent competition mortality, and treatments within the desired range should have a reasonable "lifetime" before reaching densities at which mortality is expected to occur. Desired relative densities within 20 to 30 years would be below the 60 percent threshold of imminent competition mortality (Blackwell 2004) as this longer time frame would be representative of a reasonable cutting or entry cycle.

Reinecke (1933) described a maximum stand density of 750 for mixed conifer stands in California. The calculation of this maximum stand density is largely dependent on the mix of species. A more site-specific maximum stand density was calculated for each stand using the Forest Vegetation Simulator (FVS), which calculates maximum stand density weighted by the "proportion of basal area each individual species represents in the stand" (Dixon 2002). This may be a more appropriate measure of maximum stand density as it considers site-specific species composition reflected in the existing condition. For the purpose of this analysis, relative density based on the maximum stand density index as calculated by FVS is used. For more information regarding relative stand density, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Compositional Structure—Compositional structure is measured by calculating the percent of species composition pre and post-treatment. Species composition is analyzed because silvicultural prescriptions, particularly group selection treatments, may have an effect at the stand level on differing species dependent on shade tolerance and species biology. Residual species composition post-treatment is an important measure because these trees represent the seed bank of the future, which is one factor that affects species diversity over time. The shift in species composition in the northern Sierra Nevada forests from shade-intolerant species, such as ponderosa pine, to shade-tolerant species, such as white fir, has been well documented in scientific literature (McKelvey and Johnston 1992, Skinner and Chang 1996, Ansley and Battles 1998). Therefore, treatments that improve the percentage of pine species in forested stands would be beneficial. Percent change in pine species composition is used to show the effects that treatments within the alternatives would have on species composition. For more information regarding desired species composition, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Landscape Structure— For the purposes of this analysis, landscape structure refers to the distribution of relative successional (seral) stages on the landscape, and the relative distribution of closed-canopy and open canopy stands. This is an important indicator because it may be used as a measure of landscape heterogeneity and diversity, and as a measure of cumulative effects to forest vegetation on the landscape scale. Landscape structure is measured by calculating the distribution of these seral stages within the vegetation analysis area. The relative distribution of seral stages within the landscape is measured by using CWHR size class as a proxy for seral stage. Table 18 displays the CWHR tree size and density class categories. CWHR size class serves as an effective proxy for seral stage because it classifies forest vegetation by ranges of average tree size which represent discrete developmental stages of tree growth. CWHR density class serves an effective proxy for open and closed-canopy conditions because it classifies canopy cover. In addition, this allows for a congruent analysis of effects on forest vegetation and wildlife habitat. Forest stands were aggregated by CWHR size class because the proposed treatments, stand structure, and effects of treatments on stand structure would not substantially vary by forest vegetation type (as classified by CWHR habitat type). For more information regarding desired landscape structure and heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and Appendix C.

Table 18. CWHR Tree Size and Density Class Crosswalk with Seral Stage and Canopy Closure Condition

CWHR Tree Size Categories				CWHR Density Class Categories			
CWHR Size Class	**Tree Sizes (average)**	**Description**	**Seral Stage**	**CWHR Density Class**	**Tree Canopy cover**	**Description**	**Canopy Conditions**
1	< 1” DBH	Seedlings, but definite forest habitat	Early Seral	n/a	< 10%		Open canopy Stands
2	1 -6 “ DBH	Sapling		S	10 - 24%	Sparse	
3	6 -11” DBH	Pole-sized tree		P	25 - 39%	Open	
4	11 – 24” DBH	Small Tree	Mid-seral	M	40 - 60%	Moderate	Closed-canopy Stands
5	> 24” DBH	Medium/Large tree	Later Seral	D	> 60%	Dense	
6	> 24” DBH	Multilayered canopy with dense cover		n/a	> 60%		

Fuels and Potential Fire Behavior and Effects

The measurement indicators for potential treatment effects on fuels, potential fire behavior, and severity include: (1) flame length, (2) probability of torching, (3) fire type, and (4) predicted percent mortality. These indicators are described below. For more information regarding fuels reduction, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix B.

Flame Length (feet): The predicted length of flame measured in feet. Flame length is influenced in part by fuel type, fire type (surface or crown fire), and weather conditions. Together, flame length and fuel type influence the rates at which firelines can be safely and effectively constructed by different fire resources, including fire fighters, bull dozers, and aerially delivered fire retardant (Table 19). Increased flame lengths can increase the likelihood of crown fire and the amount of suppression resources (fire fighters, fire engines, and aircraft) needed to contain a wildfire. Flame lengths above 4 feet may present serious control problems—they are too dangerous to be directly contained by fire crews (Schlobohm and Brain 2002; Andrews and Rothermel 1982). Flame lengths over 8 feet are generally not controllable by ground-based equipment or aerial retardant and present serious control problems including ignition of multiple spot fires and uncontrollable crown fire activity. The 2004 SNFPA ROD provides direction that the desired condition for fuel treatments include flame lengths at the head of the fire less than 4 feet (USDA 2004b).

Table 19. Relationship between Flame Length and Potential Success of Active Suppression

Flame Length	Description
Less than 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. A hand line should hold the fire.
4 to 8 feet	Fires are too intense for direct attack at the head with hand tools. A hand line cannot be relied on to hold the fire. Bulldozers, engines, and retardant drops can be effective.
8 to 11 feet	Fire may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
Greater than 11 feet	Crowning, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.
Source: NWCG 2004	

Probability of Torching : The potential probability of torching occurring under 90th percentile weather conditions as predicted by FFE. This is the probability of finding an area of the stand where torching can occur. A torching situation is generally defined as one where tree crowns of large trees can be ignited by a surface fire or flames from burning crowns of small trees that reach the larger trees. Probability of torching is the proportion of areas where trees are present and torching is possible (Rebain et al. 2010).

Fire Type (Surface or Crown Fire): The predicted fire type (surface or crown fire) occurring under 90th percentile weather conditions as predicted by FFE. Crown fire includes both active and passive crown fire (Stratton 2004). Fire type will affect the difficulty of controlling a fire, fire fighter and public safety, and fire-related tree damage and mortality. Generally speaking, it is more difficult and more expensive to safely contain crown fires because they burn with high heat intensity and move extremely quickly. Crown fires typically lead to more tree damage than surface fires. Surface fires, with flame lengths less than 4-feet, are easier to safely contain and result in less tree damage than a crown fire (Table 19). For this reason, surface fires with flame lengths less than 4 feet within treated stands are the desired post-treatment condition.

Predicted Percent Mortality: The potential tree mortality as measured by the percent of basal area that would be killed in a fire event occurring under 90th percentile weather conditions as predicted by FFE (Reinhardt and Crookston 2003, Rebain et al. 2010). “The probability of mortality is based on bark thickness and percent crown volume scorched, which are derived from scorch height, tree height, crown ratio, species, and tree diameter” (Carlton 2004) . The mortality calculation uses established calculation methods (Reinhart et al. 1997).

Air Quality

The measurement indicator for alternatives effects on air quality include smoke and dust emissions from proposed treatments.

Predicted Particulate Matter (PM) in Tons: Predicted amounts of particulate matter emitted from the project is measured by PM10 (county wide) and PM 2.5 (Portola Valley only) as forest management activities such as pile burning and underburning contribute to these levels.

Types and Duration of Effects

Direct Effects

These are effects on forest vegetation, fuels, and air quality that are directly caused by treatment implementation or, as with Alternative B (no action), a lack of treatment.

Indirect Effects

These would be effects on forest vegetation and fuels, potential fire behavior, and air quality that are in response to the direct effects of treatment implementation or, as with Alternative B (no action), a lack of treatment.

Duration of Effects

Direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis described above in "Geographic and Temporal bounds".

Cumulative Effects Analysis

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions.

Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

Forest Structure, Composition, Fuels, and Fire

As with many areas in the Sierra Nevada, the landscape in the analysis area has been heavily influenced over the last 150 years by past management activities that include mining, grazing, timber harvesting, fire exclusion, large high-severity fires (Young 2003; Beesley 1996; McKelvey and Johnston 1992), and more recent drought-related mortality during the late 1980s and early 1990s (Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994).

Past harvest activities on the Keddie Ridge Project landscape were primarily focused on overstory removal and sanitation or salvage harvest, with a shift toward even-aged systems in the 1980s. Past use of these harvest systems is consistent with well-documented overall management practices that occurred over vast areas of the Sierra Nevada during the 20th century (UC 1996; Leiberg 1902). With respect to the removal of ponderosa and Jeffrey pine, and the resulting increase in the occurrence of white fir in the watershed of the North Fork of the Feather River, John Leiberg (1902) noted:

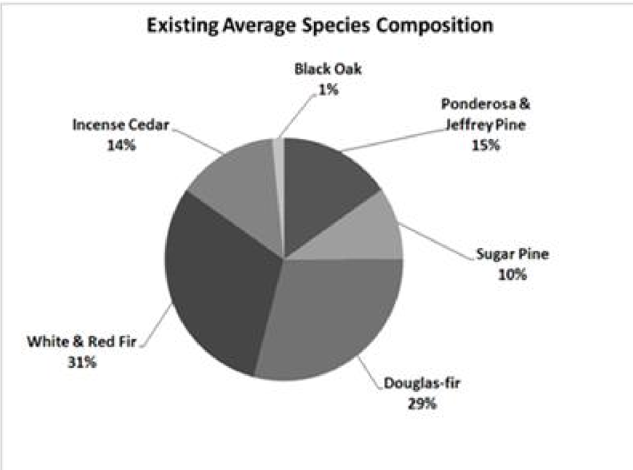


Figure 1. Existing Average Species Composition

> *"It [yellow pine] has been more exhaustively logged than any other species in the type except the sugar pine, and the restocking has not kept pace with the cutting," (page 29)* and
>
> *"White fir is increasing its ratio in the restocking, partly at the expense of the yellow pine, partly as an offset to a lessened percentage of sugar pine. On the Pacific side of the main range there is a steady increase of the species, both in reforestation on the logged areas and on the tracts denuded by fire. Its [white fir] increase throughout the region examined is due to exhaustive logging of yellow and sugar pine and sparing of white fir" (page 50).*

Currently, shade-tolerant species dominate most of the analysis area stands; however conditions range stand by stand which have varying levels of shade-tolerant versus shade-intolerant species. Those stands on lower elevation south and west facing slopes have greater amounts of shade-intolerant species, yet many mixed species stands have very high proportions of shade-tolerant species. Figure 1 displays the existing average species composition for all stands. Currently, shade-tolerant species including white fir, incidental amounts of red fir, Douglas-fir, and incense cedar account for 74 percent of tree species present in project area stands. Desired shade-intolerant tree species such as black oak, ponderosa pine, Jeffrey pine, and sugar pine only account for 26 percent of the trees species present in project area stands.

Past harvest activities described above have resulted in 1) the reduction of large dominant and codominant overstory trees, 2) the retention of smaller diameter intermediate and suppressed trees and 3) a shift in species composition from shade-intolerant pine dominated stands to shade-tolerant, white fir dominated stands; all of which have largely decreased landscape level forest heterogeneity (diversity) (McKelvey and Johnston 1992). In addition, a near absence of landscape level, low-intensity surface fires has contributed to increased stand densities in smaller diameter classes, particularly in shade-tolerant species (Skinner and Chang 1996).

At the stand level, similar to what has occurred at the landscape level, the combination of past management activities, fire exclusion, and extensive drought-related mortality has created relatively homogeneous areas typified by small even-aged trees existing at high densities (Oliver et al. 1996). High-density stands are also more susceptible to density-dependent mortality driven by drought and insect and disease infestations (Cochran et al.1994; Guarin and Taylor 2005; Macomber and Woodcock 1994, Powell 1999). Extensive drought in the late 1980s and early 1990s, combined with high stand density, resulted in extensive mortality of white fir (Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994). Much of this material has fallen over in the last 20 years and become dead and down fuel. The high densities of small trees and high fuel loads contribute to:

- overstocked stand conditions in which trees become stressed due to competition for water, light, and nutrients; this can lead to a higher potential for mortality due to drought, insects, or disease (Powell 1999; Ferrell 1996; Guarin and Taylor 2005; Fettig 2007);
- Conditions that favor the recruitment of shade-tolerant species such as white fir, which promotes a shift in species composition from pine-dominated to fir-dominated forests (Oliver et al. 1996; McKelvey and Johnston 1992); and
- large accumulations of ground fuels, ladder fuels, and canopy fuels which increase the potential for stand-replacing, high-severity fire events (Weatherspoon and Skinner 1996).

As a result of past management activities described above, conditions across the Sierra Nevada have been described as “generally younger, denser, smaller in diameter, and more homogeneous” (McKelvey et al. 1996); this condition is typical of forests in the analysis area. Such conditions are best characterized by California Wildlife Habitat Relationship (CWHR) size class 4 where diameter at breast height (DBH) ranges between 11 and 24 inches. Analysis of CWHR size class distribution for forest types in the analysis area shows a relative overabundance of CWHR size class 4, indicating a departure from desired distributions of seral stages (Figure 2). Taylor (2004) observed in his study of the Lake Tahoe Basin that “pre-settlement forests were more structurally diverse than contemporary forests” and consisted of larger trees at lower densities — the would be more characteristic of open canopy, later seral stands such as

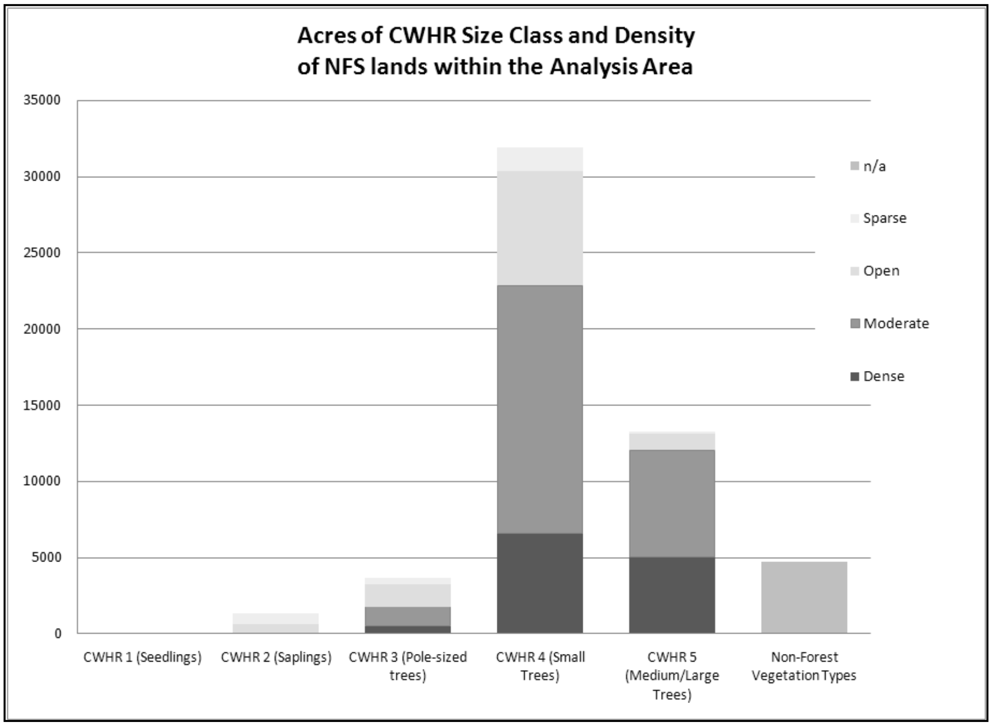


Figure 2. Existing Size Class and Density Distribution of Forest Vegetation Occurring on NFS Lands within the Analysis Area

CWHR5P. In contrast, the relative dominance of CWHR size class 4 likely developed as a result of overstory removal and salvage harvest systems in concert with fire suppression policies.

Because such stand structure has increased vulnerability to high-severity fires, insect outbreaks, and landscape level drought-induced mortality, a homogenous (same species or structure) occurrence of this seral stage across the landscape is unstable (McKelvey and Johnston 1992, Millar et al. 2007). A more diverse distribution of seral stages, characterized by heterogeneous stand structures, may be more resilient to disturbance events such as fire, drought, and insect and disease infestations and more characteristic of desired conditions (Stephens and Fule 2005, Millar et al. 2007, Collins and Stephens 2010). For more information regarding desired conditions for forest and landscape structure, density, and heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Fire Regimes and Condition Class

Historically, the average number of years between fires in the mixed conifer forests adjacent to the analysis area has been reported as 8 to 14 years (the range is 1 to 46 years) in the Antelope Lake watershed (Moody and Stephens 2002). In higher elevation red and white fir-dominated forests (up to approximately 6,400 feet in elevation), the average number of years between fires has been reported as 33.8 years (the range is 18 to 54 years) (Beatty and Taylor 2001). Prior to fire exclusion and intensive timber harvest of the early to mid-20th century, the relative frequent occurrence of fires generally contributed to open stands dominated by large-diameter fire-resistant trees with relatively low surface fuel loads with interspersed areas of young seral stands (Weatherspoon 1996). Prior to fire suppression policy in 1902, John Leiberg (1902) described the surface fuels in similar unharvested forests on the Plumas National Forest types as follows:

> *"There is no humus; the forest floor is bare, or at the most is covered with a layer of pine needles rarely exceeding 2 inches in depth, most commonly an inch or less."*

Given the spatial and temporal extent of past fires well documented in scientific literature (Taylor 2000; Moody and Stephens 2002; Skinner and Chang 1996), this type of surface fuel loading would have been much more common prior to fire exclusion than the ubiquitous high surface fuel loading found today. Overall, the historical vegetation structure, species composition, and surface fuels reflected, in part, past fire regimes as well as land management practices of both the Northern Maidu (Anderson 2005; Stewart 2003) and land uses of the thousands of settlers who moved to the Plumas County region after the gold rush (Young 2003).

The overall conditions in the analysis area are, in part, also described by the Fire Regime Condition Class (Table 20). The current conditions in the analysis area as described above are similar to those conditions which have led to high-severity fires within the vicinity of the analysis area, such as the Moonlight and Antelope Complex Fires of 2007, the Rich Fire of 2008, and the Stream Fire of 2001 (Duncan, personal communication 2010; Raley 2001). Of particular note, 71 percent of the NFS lands within the analysis area are in condition class 3 where "vegetation composition, structure, and fuels have a high departure from the natural fire regime and predispose the system to high risk of loss of key ecosystem components." (Hann and Strohm 2003).

Table 20. Fire Regime Condition Classes within the Keddie Ridge Analysis Area

Fire Regime Condition Class	Acres in the Analysis Area	Acres of NFS lands within the Analysis Area	Description
1	8,124 (8%)	4,132 (8%)	Vegetation composition, structure, and fuels are similar to those of the natural regime and do not predispose the system to risk of loss of key ecosystem components. Wildland fires are characteristic of the natural fire regime behavior, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are within the natural range of variability.
2	24,898 (23%)	10,445 (19%)	Vegetation composition, structure, and fuels have moderate departure from the natural regime and predispose the system to risk of loss of key ecosystem components. Wildland fires are moderately uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
3	61,342 (58%)	39,020 (71%)	Vegetation composition, structure, and fuels have high departure from the natural regime and predispose the system to high risk of loss of key ecosystem components. Wildland fires are highly uncharacteristic compared to the natural fire regime behaviors, severity, and patterns. Disturbance agents, native species habitats, and hydrologic functions are outside the natural range of variability.
9	11,537 (11%)	1,227 (2%)	Agriculture, Barren, Water, or Urban vegetation types.

Source: Hann and Strohm (2003)

Extensive development of residential homes in the Wildland Urban Interface (WUI) surrounding Indian Valley poses a continued risk of human-caused ignitions throughout dry summer months. The ignition risk puts residences on private lands in the analysis area at risk of wildfires that may occur on adjacent NFS lands; likewise, NFS lands are at risk from fires ignited on these private lands. In addition, large undeveloped areas of the forested wildlife habitat in the analysis area are at continued risk of high-severity fire and drought-related mortality. For more information regarding fuels within the project area, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

Forest Insect and Disease

Forest insects and disease currently occur in many stands in the analysis area and is well documented in the Forest Health Evaluation performed for the project (Cluck and Woodruff 2010). With the exception of white pine blister rust (*Cronartium ribicola*), an introduced disease, forest pathogens are endemic to forests as part of the natural disturbance regime. However, due to the interaction of past management activities (such as fire exclusion, unnaturally high stocking levels of shade-tolerant species, and drought) as well as climate change trends, populations of insects and disease may increase beyond endemic levels associated with forest health.

Bark beetles are the primary insects of concern found in the analysis area and are associated primarily with ponderosa and Jeffrey pines and true fir. Ponderosa and Jeffrey pines are susceptible to the western pine beetle, *Dendroctonus brevicomis,* and *Ips* species. The western pine beetle is the most aggressive and contributes to direct tree mortality, particularly in moisture-stressed trees within high-density stands where density driven competition is greatest. The primary prevention measure for this species is to maintain healthy vigorous trees in low stand densities where competition for water, light, and nutrients is minimized. The *Ips* species breed in activity slash and may grow beyond endemic levels in areas where logging slash is not properly treated. When populations build to sufficient numbers, the *Ips* beetle can attack mature trees.

The fir engraver bark beetle also occurs within the analysis area. The fir engraver bark beetle attacks true fir species and is associated with direct and indirect tree mortality, in combination with drought and disease occurrences in high-density stands (Ferrell 1996).

The primary pathogen of concern found in the analysis area is *Heterobasidion* root disease, caused by *Heterobasidion occidentale* and *Heterobasidion irregulare*. *Heterobasidion* root disease is known to occur throughout the forests of northern California and southern Oregon (Schmitt et al. 2000) and there are well-documented occurrences in both pine and fir species on the Plumas National Forest and neighboring Lassen National Forest (Kliejunas 1989; Woodruff 2006). The occurrence of *Heterobasidion* root disease has been confirmed in true fir and is suspected to occur in pine stands in the analysis area (Woodruff and Kliejunas 2005). There is the potential for new infection in any harvest area because spores can travel up to 100 miles (Goheen and Otrosina 1998).

While all western conifers are susceptible to this pathogen, ponderosa and Jeffrey pines and true fir tend to be most susceptible to adverse effects from the disease. This root disease is spread via spores infecting fresh wounds or stumps and from root-to-root contact (Sinclair et al. 1987). Stands with repeated entry in the analysis area have a higher incidence of the disease than un-entered stands. The effects of this disease range from reduced individual tree vigor, root and bole decay, windthrow, root mortality, and in the worst-case scenario, tree mortality.

Existing Conditions

Existing conditions of forested stands within the analysis area range depending on factors such as ownership, past management activities, and CWHR size class and density. In general, forested stands proposed for thinning treatments within the Keddie Ridge Project are primarily CWHR 4 and CWHR 5 size class stands. The average existing conditions and the range for each attribute are shown in Table 21.

Table 21. Existing Conditions of Forested Stands

Stand Attributes and Predicted Fire Behavior	CWHR 4 Stands				CWHR 5 Stands			
	Average	Range			Average	Range		
		Min	-	Max		Min	-	Max
Total Trees per acre	**479**	72	-	1475	**418**	135	-	741
Trees per acre 1-10 inches DBH	**395**	20	-	1300	**328**	56	-	621
Trees per acre10-20 inches DBH	**63**	0	-	167	**67**	15	-	107
Trees per acre 20-30 inches DBH	**14**	5	-	31	**16**	2	-	31
Trees per acre >30 inches DBH	**5**	0	-	16	**6**	1	-	17
Snags per acre >15 inches DBH	**3**	0	-	9	**3**	0	-	12
Snags per acre > 30 inches DBH	**0.3**	0	-	1.1	**0.4**	0	-	2.8
Basal area per acre (ft^2 per acre)	**190**	93	-	313	**208**	132	-	291
Relative Density (%)	**57**	29%	-	85%	**61%**	33%	-	80%
Quadratic Mean Diameter (inches)	**14.7**	10.5	-	22.6	**15.0**	11.6	-	22.6
Total Canopy Cover	**48**	31	-	73	**51**	35	-	66
Surface Fuel Load (tons per acre)	**26**	2	-	46	**33**	12	-	52
Predicted Total Flame Length (feet)	**21.6**	5.4	-	70.9	**20.4**	11.4	-	45.0
Predicted Probability of Torching	**80%**	30%	-	100%	**80%**	20%	-	100%
Predicted Fire Type	**Passive Crown Fire**	Surface Fire	-	Active Crown Fire	**Passive Crown Fire**	Passive Crown Fire	-	Passive Crown Fire
Predicted Percent Basal Area Mortality	**84%**	33%	-	93%	**85%**	67%	-	90%

These stands have high densities of trees, particularly in the 1-10 inch diameter class range, and some stands have high densities in the 10-20 inch range. These stands have high accumulations of ladder fuels and vertical continuity with canopy fuels, which in combination with the high surface fuel loads, are predicted to have large flame lengths, high amounts of tree torching, and primarily passive crown fire behavior resulting in large amounts of mortality under 90th percentile weather conditions. These high stand densities also increase stresses on larger more desirable retention trees due to increased inter-tree competition for finite site resources – particularly water during extended drought periods – which is interconnected to increases in bark beetle populations and subsequent tree mortality. For more information regarding forest health, existing conditions, and desired conditions, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

Air Quality

The analysis area is located in Plumas County, California. Nearby towns and communities are shown in Table 22. The entire project area is contained in the Northern Sierra Air Quality Management District (NSAQMD) within the Mountain Counties Air Basin.

Table 22. Communities Within the Vicinity of the Keddie Ridge Project Area

Community	Distance and Direction from Keddie Ridge Project Boundary
Greenville, Taylorsville, Crescent Mills, and Canyon Dam	Within the Keddie Ridge Project
Lake Almanor Basin communities (Chester, Prattville, Hamilton Branch)	~ 1 - 10 miles northwest
Susanville	~ 15 miles northeast
Genesee Valley	~ 1 - 3 miles east
Quincy	~ 7 miles south
Lassen National Park	~ 20 miles northwest

The air quality attainment status for ozone, carbon monoxide, sulfur dioxide, and other compounds is listed in Table 23. The attainment status was derived directly from the NSAQMD “2004 Annual Air Monitoring Report.”

Table 23. Attainment Designations for Plumas County

Compound	National Attainment Status	State Attainment Status
Ozone (1 hour)	Attainment	Unclassified
Ozone (8 hour)	Attainment	Not applicable
Carbon monoxide	Attainment	Attainment
Nitrogen dioxide	Attainment	Attainment
Sulfur dioxide	Attainment	Attainment
PM_{10}	Unclassified	Nonattainment
$PM_{2.5}$	Unclassified	Nonattainment – only the Portola Valley is in nonattainment for the state $PM_{2.5}$ annual standard

Source: NSAQMD (2004 Annual Air Quality Report)

Currently, Plumas County is in nonattainment status for particulate matter (PM)10 (county wide) and $PM_{2.5}$ (Portola Valley only). The project area is approximately 26 miles northwest of Portola Valley at its closest point. According to the NSAQMD 2004 report, the major contributors to both PM_{10} and $PM_{2.5}$ levels include forestry management burns, residential woodstoves, residential open burning, vehicle traffic, and windblown dust. These problems can be relieved or made worse by local meteorology, winds, and temperature inversions. In addition, large areas in and adjacent to local communities can be heavily impacted by smoke for extensive summer periods (several weeks to months) due to wildfires such as in the 2007 Moonlight fire which occurred in the project area, and the 2008 Canyon Complex and Rich Fires, which occurred west of the project area.

The community of Quincy is subject to strong inversions and stagnant conditions in the wintertime. Those conditions, coupled with intensive residential wood burning, can result in very high episodic $PM_{2.5}$ levels. Levels of PM_{10} have been greatly decreased due to a reduction of non-EPA (Environmental Protection Agency) approved woodstoves in existing residences. The NSAQMD report noted four key points relating to current air quality within the NSAQMD:

1. The NSAQMD's state and federal nonattainment status for ozone is due to overwhelming air pollution transport from upwind urban areas, such as the Sacramento and Bay areas.
2. Improvements in air quality, with respect to ozone, will depend largely on the success of air quality programs in upwind areas.
3. Anticipated growth in local population will add to locally generated pollution levels. Therefore, local mitigations are needed to prevent further long-term air quality degradations. Otherwise, the local contribution may increase to the point where the transport excuse will become less viable, and more emphasis will then be placed on mandated local controls.
4. State and federal land managers anticipate a marked increase in prescribed burning within the next 5 years. This may have a tremendous impact on local PM_{10} and $PM_{2.5}$ levels, unless appropriate mitigations are employed.

Current sources of particulate matter from the analysis area include smoke from residential wood burning, large wildfires, smoke from underburning and pile burning, emissions and dust from standard and off-highway vehicles, dust and emissions from harvest activities occurring on private lands, smoke from campfires, and wind-generated dust from exposed soil surfaces. The amount and duration of these emissions vary by season, with most emissions from residential wood burning occurring from October to April, emissions from wildfires, timber harvest, and recreational activities occurring between May and September, and emissions from prescribed burning occurring from October through mid-November.

Environmental Consequences

Alternative B – No Action

Under alternative B, no actions would be implemented to address the areas of concern identified in the 2006 Keddie Ridge Project area Landscape Assessment (located in the project record) or objectives and desired conditions identified in the purpose and need sections in chapter 1.

Direct and Indirect Effects

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Existing stand conditions would persist and develop unaltered by active management, with the exception of continued fire suppression activities. Wildfire, drought, disease, and insect-related mortality and recruitment would continue to occur. Table 24 displays average stand attributes under the No action Alternative. *Under alternative B, there would be no reduction in trees per acre, basal area per acre or relative stand density*. *Under alternative B, stands would have, on average, 218 square feet of basal area and a relative stand density of 64 percent.* Stands would remain dense, particularly in the smaller diameter classes in terms of trees per acre and basal area.

Table 24. Average Stand Attributes under Alternative B.

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-Treatment Relative Stand Density	Post-Treatment QMD	Average Increase in Diameter
No Action	446	0%	100%	192	0%	57	14.9	0%

Oliver (1995) observed that northern California even-aged ponderosa pine stands whose densities exceeded Sartwell's (1971) basal area threshold of 150 square feet per acre were susceptible to *Dendroctonus* bark beetle attack. *Under alternative B, 74 percent of the stands are over this basal area threshold and pine species within these stands are at elevated risk of bark beetle mortality* (Fiddler et al. 1989; Oliver 1995). True fir species (white and red fir) may exist at higher stand densities. However, at high stand densities, root disease and drought increase the susceptibility of true fir species to mortality caused by the Scolytus fir-engraver beetle (Oliver et al. 1996; Guarin and Taylor 2005; Ferrell 1996; Macomber and Woodcock 1994).

These high tree densities would persist under alternative B, thereby reducing growth rates and tree vigor, and increasing risk of mortality due to inter-tree competition and increased incidence of insect activity (Ferrell 1996; Oliver et al. 1996; Oliver 1995). High densities of small trees may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees (Dolph et al. 1995). *Under alternative B, 51 percent of the stands have relative stand densities that are at or greater than the "lower limit of the zone of imminent competition mortality"* (Drew and Flewelling 1977; Drew and Flewelling 1979; Smith et al. 1977). Within 10 years, approximately 69 percent of stands would have relative stand densities that exceed this threshold, within 20 years, approximately 77 percent of the stands would exceed this threshold, and within 30 years approximately 89 percent of the stands would exceed this threshold.

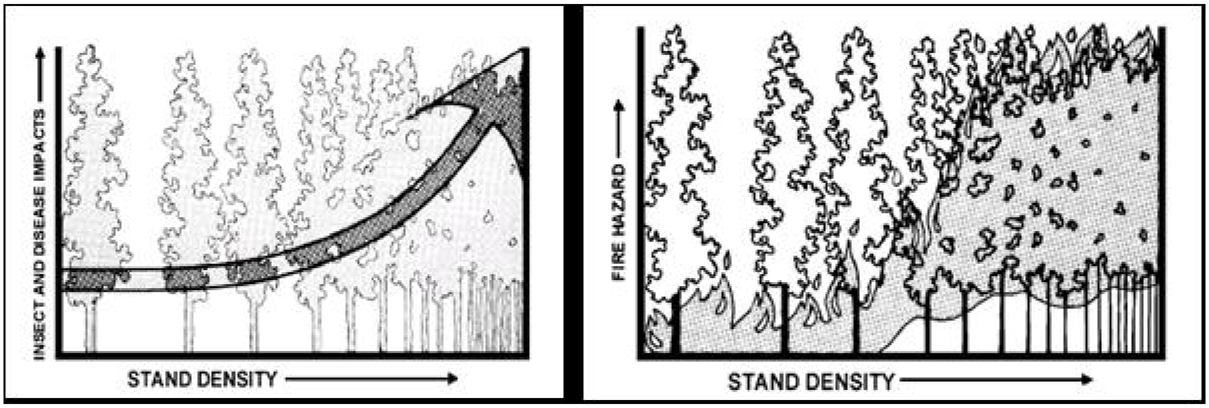


Figure 3. General Effects of Increasing Stand Density on (a) Insect and Disease Impacts, and (b) Fire Hazard as Described by Powell (1999)

The increasing stand density and consequent mortality due to inter-tree competition and increased incidence of insect activity may have a major adverse effect on forest health by decreasing tree vigor and growth; increasing susceptibility to insects, disease, and drought; and increasing susceptibility to intense fire behavior. The resulting stand structure would be characterized by a dense understory and midstory with interlocking crowns. These general trends, in relation to forest health and fire hazard, have been described by Powell (1999) and are shown in Figure 3.

Compositional Structure: Species Composition

Under alternative B there would be no change in species composition. The existing stand structure promotes a low light environment, which strongly influences species composition by favoring the regeneration, growth, and development of shade-tolerant species such as white fir, incense-cedar, and, to a lesser degree, Douglas fir. Overall, shade-tolerant species collectively account for 74 percent of trees and shade-intolerant tree species such as ponderosa pine, sugar pine, and black oak, account for only 26 percent, on average; however, this varies by stand, aspect, and elevation. Shade-tolerant species currently exist at high densities, particularly in trees less than 20 inches DBH while pine species (Ponderosa and sugar pines) generally occur as overstory trees (greater than 20 inches DBH); the number of pine regeneration in the understory is much lower relative to shade-tolerant species. These large dominant overstory pines are “legacy” trees that may be indicative of species composition in historical reference conditions. However, existing stand structure and high densities clearly favor the regeneration, growth, and development of shade-tolerant species. Currently, most mixed species stands in the analysis area are becoming more occupied by the shade-tolerant species mentioned above, and this trend would be expected to continue.

Such high densities of shade-tolerant species compete with shade-intolerant species for resources (nutrients, light, and water), increase shade in the understory, and discourage the regeneration of shade-intolerant pine species (Oliver et al. 1996). Consequently, over the longer temporal scale, a shift in species composition would be expected to occur, giving preference to regeneration of shade-tolerant species over shade-intolerant species (Minnich et al. 1995; Ansley and Battles 1998; Oliver et al. 1996;

McKelvey and Johnston 1992). Shade-tolerant species, white fir in particular, can be more susceptible to fire-related scorch mortality than shade-intolerant species such as ponderosa pine and Jeffrey pine (Skinner 2005; Stephens and Finney 2002; Mutch and Parsons 1998; Leiberg 1902). This susceptibility to mortality can lead to more trees being killed by wildfire-related scorch and damage to the cambium.

Landscape Structure and Heterogeneity: Tree Size and Canopy Cover

Currently, relative stand density in CWHR size classes 4 and 5 is at or just below the 60 percent threshold thereby increasing the risk for competition-related mortality. Over time, diameter growth and an increase in trees per acre due to ingrowth would contribute to an increase in stand density. In the absence of treatment or naturally occurring disturbance, such as fire, stand density would continue to increase beyond the threshold of 60 percent relative stand density into the “zone of imminent mortality”. This would have an adverse effect on tree growth and vigor and resistance to insects, disease, drought, fire behavior, and fire-related tree mortality.

The analysis area would continue to be dominated by closed-canopy mid-seral forested stands. These stands, best characterized by CWHR size class 4 and canopy density classes of Moderate (M) and Dense (D), contribute to landscape homogeneity due to its ubiquitous abundance and connected arrangement. Because such stand structure has increased vulnerability to high-severity fires, insect outbreaks, and landscape level drought-induced mortality, a homogenous (same species or structure) occurrence of these closed-canopy, mid-seral stages across the landscape is unstable and less resilient to the aforementioned forest disturbances (McKelvey and Johnston 1992).

Fuels and Potential Fire Behavior: Fuel Load and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Surface, ladder, and canopy fuels would remain untreated under the no action alternative, and, as a result, potential fire behavior including predicted flame length, probability of torching, fire type, and basal area mortality would remain unchanged. Table 25 displays the average fuel and potential fire behavior attributes under Alternative B.

Table 25. Average Fuel and Potential Fire Behavior Attributes under Alternative B

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
No Action	28	18	5	74%	22	Passive Crown Fire	85

Surface fuel loading would be 28 tons per acre, on average, and would range from 5 to 52 tons per acre, depending on individual stand conditions. Approximately 74 percent of stands would have surface fuel loading greater than 20 tons per acre. In addition, ladder fuels would not be removed so there would be continuity between surface, ladder, and crown fuels.

These conditions would result in flame lengths that would be 6 feet and greater under 90th percentile weather conditions. Over 91 percent of the stands would have flame lengths greater than 11 feet where crowning, spotting, and major fire runs are probable, and control efforts at the head of the fire are ineffective. These flame lengths, when combined with current stand structure, would result in a probability of torching of 74 percent, on average, and which would sustain passive crown fire activity. This potential fire behavior would result in high severity fire characterized by high basal area mortality. On average, stands would have 85 percent basal area mortality, and over 90 percent of the stands would have greater than two thirds of tree basal area mortality as a result of a fire under 90th percentile weather conditions. The predicted direct mortality from scorch and cambial damage does not account for post-fire mortality to fire-damaged trees due to insect and disease activity.

Continued high density, high fuel load, and high flame length conditions would (a) reduce the production rates for fire-line construction by hand crews and mechanical equipment, (b) compromise the safety of fire fighters and the public, and (c) decrease the effectiveness of aerially applied retardant. In addition, burning embers from burning trees and standing dead trees could be blown to unburned areas outside the main fire—this could potentially increase the fire size. These direct and indirect effects do not reflect the influence of the fire itself on local weather conditions (Colson 1956; Cramer 1954). At the landscape level, increased spotting tends to increase erratic fire behavior, resulting in increased fire size with higher tree mortality, (Schroeder and Buck 1970). The above factors would decrease the effectiveness of initial attack and extended fire suppression operations, leading to a greater potential for large, high-severity fires. Fires with this expected fire behavior and difficulty of suppression have already occurred within and adjacent to the analysis area. In 2007 the Moonlight Fire and the Antelope Complex Fires burned over 87,000 acres both within, adjacent, and within reasonable proximity to the analysis area, with over 62 percent of these acres burning under high severity (greater than 75 percent basal area mortality).

Under the no action alternative, fire management’s ability to safely suppress and contain fires, both in initial attack and extended fire suppression operations, would not be improved and would continue to decline over time from current conditions due to continued stand densification and surface fuel buildup. Under 90th percentile weather conditions, over 91 percent of the stands would have flame lengths greater than 11 feet where crowning, spotting, and major fire runs are probable, and control efforts at the head of the fire are ineffective (Table 19). Under current surface fuel loadings and high stand densities, as represented by a Fuel Model TU-5 (Scott and Burgan 2005), the rates of fire-line construction are relatively slow for both hand crews and tractors when compared with the post-treatment desired conditions.

The above factors result in a major negative effect on the overall ability of fire managers to safely suppress and contain fires, leading to increased suppression intensity and cost. This increased suppression intensity can lead to a greater potential for resource damage during the fire and higher Burned Area Emergency Rehabilitation (BAER) costs after the fire is out. Implementation of alternative B would not establish a network of fuel treatments. Overall, the current predicted fire behavior for this alternative could lead to a greater potential for large, high-severity fires in forested areas, including the wildland urban interface, riparian habitat conservation areas, protected activity centers, and home range core areas in the analysis area during a wildfire under 90th percentile or worse weather conditions.

Direct and Indirect Effects: Air Quality

Under alternative B, treatments proposed under action alternatives would not occur; however, related uncontrollable emissions as described by the U.S. Environmental Protection Agency (2006) could occur from wildfires within the analysis area. This reality is supported by past fire events such as the Moonlight fire of 2007 and the Canyon Complex and Rich Fires of 2008 in which smoke impacted communities in and around the analysis area ranging temporally from a week to over a month of impacted air quality. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects Common to All Alternatives

The cumulative effects of past management practices, fire exclusion, and high-mortality fires (as detailed in appendix F) have largely shaped the forest that exists in the analysis area today. These factors have influenced vast areas of the Sierra Nevada mountain range and are well documented in the scientific literature as noted in Chapter 3. These past projects and events are reflected in the vegetation layer used to characterize the existing conditions (the baselines for analysis) in the analysis area. Changes in vegetation structure as a result of recent fires and past projects since the baseline data were collected have been incorporated into the Keddie Ridge Project’s existing conditions. Such activities have had major impacts at the stand level by converting mid to later seral forest to early seral structure; however, on the landscape scale, this has had a negligible impact due to the dispersed nature of these projects and their size relative to the analysis area.

On National Forest System lands and private lands, past harvest activities focused on selection and sanitation harvests resulting in overstory removal of dominant and codominant trees, and retention of midstory and understory trees. These harvest systems often used lop and scatter techniques for limb wood and tree tops. These practices resulted in promoting closed-canopy, high-density stands of small trees with relatively high fuel loads. Many of these stands continue to be conducive to high-mortality fire today.

Since the mid to late 1990’s, commercial and non-commercial thinning from below, with and without prescribed fire, has been the principal silvicultural treatment implemented on NFS and private lands in the analysis area. This silvicultural treatment has been used to establish several fuel treatments on NFS and private lands both within and adjacent to the analysis area (Green Flat and Lucky S Projects). These treated areas currently meet desired conditions in terms of potential fire behavior and tree mortality.

Herbicides have been used to control competing brush in conifer plantations and noxious weeds on private lands within the analysis area. A reduction of competing brush generally reduces stand-level flammability in plantations and increases rates of tree growth. These factors can shorten the length of time that planted trees remain vulnerable to scorch-related mortality. Past high-mortality fires in the Analysis area were typically replanted, and many of these areas are now dominated by young trees characteristic of CWHR size class 3.

Watershed and wildlife projects are not generally implemented at a scale or location to have an influence on landscape level vegetation or fire behavior and related tree mortality. In general, wildlife and watershed projects listed in “Appendix F: Past, Present, and Reasonably Foreseeable Future Actions,” have a negligible effect on stand development and landscape level fire behavior and related tree mortality. These small projects that improve riparian areas or improve wildlife habitat have a minor beneficial effect by enhancing vegetation diversity and decreasing fire behavior. In general, current road conditions and past road closures to benefit wildlife have had a negligible impact on the vegetation or fire management within the analysis area.

Other present and proposed future projects in the analysis area include wildlife, botanical, watershed, grazing, recreation, lands, minerals, and special use projects. These projects would not be expected to have a measurable effect on forest structure in the analysis area due to the localized and dispersed nature of scale and intensity of such projects. However, the primary minor adverse effect of these projects, particularly recreation activities, with respect to fire, is increased ignition sources from campfires, vehicles, and other intentional or unintentional ignitions from forest users during summer months.

Christmas tree cutting and firewood collection would likely have an adverse effect on regeneration and snag levels, particularly within localized areas around main roads. Christmas trees and firewood cutting have a negligible effect on stand- and landscape-level fire behavior. Levels of regeneration and snags outside of the main road corridors are unlikely to be affected due to recruitment in untreated areas and lack of access. Due to the seasonal and dispersed nature of these activities, there would be a negligible effect across the analysis area.

Present and proposed future fuels and vegetation management projects in the analysis area include the Moonlight Fire Recovery Project, Keddie Ridge Roadside salvage project, the proposed North Arm salvage project, the Maidu Stewardship Project, the Canyon Dam Fuel Reduction and Forest Health Project, the Empire Vegetation Management project, Plumas Fire Safe Council Projects, and Natural Resource Conservation Service Projects. Collectively, these projects represent less than 5 percent of the analysis area, and Forest Service projects represent less than 5 percent of National Forest System Lands.

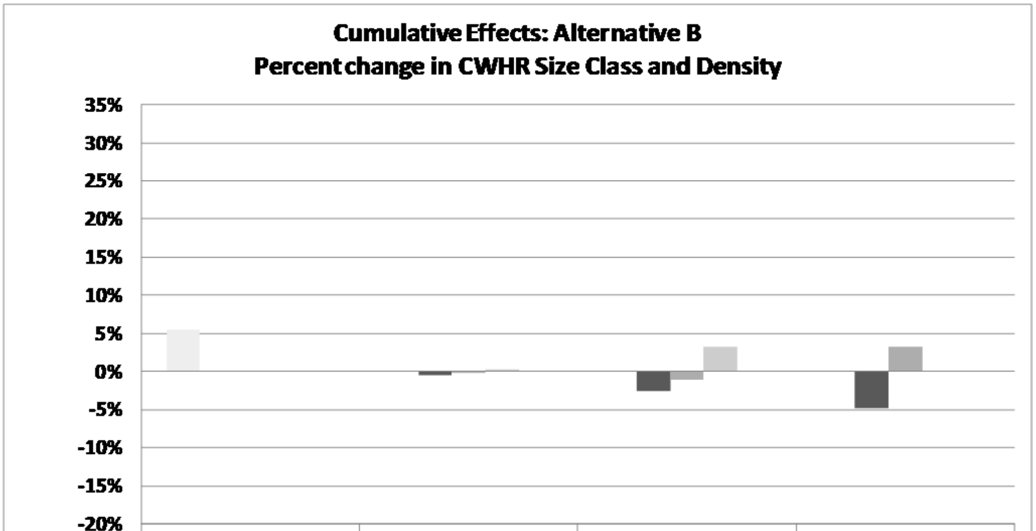
Post-fire and insect salvage projects such as the Moonlight Recovery Project, the Keddie Ridge Roadside Salvage Project, and the North Arm Salvage remove dead trees and would result in the localized reduction of snags; however, snag retention guidelines would be incorporated into these projects. These effects would be highly localized and limited in scale to these project areas. Snags would be retained in the untreated portions of the Moonlight Fire which are large in extent, and snag recruitment would continue through insect related mortality. The North Arm Salvage project would remove dead and live trees to recover the value of dead trees and reduce stand densities to improve resistance to bark beetle related mortality of residual trees. This would result in creating an open canopy stand characterized by CWHR 4P.

Small hazardous fuels projects occurring on private lands such as the Plumas Fire Safe Council Projects, and Natural Resource Conservation Service Projects, include hazardous fuels reduction in the form of commercial and non-commercial mechanical thinning, hand thinning, piling and burning, or underburning. These activities would have a beneficial effect on the stand level by maintaining an open understory in these stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. These projects are generally smaller in scale and highly dispersed through the analysis area. In addition, the treatments employed in these projects would not notably affect the overstory trees. Consequently these projects would result in a negligible impact on overall landscape structure because they are not likely to affect seral stage (as represented by CWHR size class) or overstory canopy (as represented by CWHR density class).

Larger hazardous fuels reduction projects occurring on National Forest System lands such as the Maidu Stewardship project, the Canyon Dam Fuel Reduction and Forest Health Project, and the Empire Vegetation Management Project also employ hazardous fuels reduction in the form of commercial and non-commercial mechanical thinning, hand thinning, piling and burning, or underburning. These activities would also have a beneficial effect on the stand level by maintaining an open understory in these stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. These projects are typically larger in scale and have greater capacity to affect overstory tree density. The Maidu Stewardship project implements prescriptions which prohibit harvest of trees greater than 20 inches DBH and maintain canopy covers greater than 50 percent. These activities would not notably affect the overstory trees and would result in a negligible impact on overall landscape structure because they are not likely to affect seral stage (as represented by CWHR size class) or overstory canopy (as represented by CWHR density class).

The Canyon Dam Fuel Reduction Project and the Empire Vegetation Management project include prescriptions and treatments that would have a greater capacity to affect overstory trees and canopy cover. Within these projects, stands typed as CWHR 4 would allow for greater removal of canopy cover and trees less than 30 inches DBH. These activities would also have a beneficial effect on the stand level by creating open canopy stands, thereby reducing high stand densities of small trees, ladder fuels, and fuel loading, fire risk, and potential fire behavior and effects. This would result in the modification of mid-seral closed-canopy stands characterized by CWHR 4M and 4D to mid-seral open canopy stands characterized by CWHR 4P across 250 acres within the analysis area. Prescriptions for fuel treatments within CWHR 5 stands, however, would maintain greater than 40 percent canopy cover and would maintain both size class and closed-canopy conditions.

In addition, the Empire Vegetation Management project also includes mastication, area thinning and group selection treatments. Mastication treatments would primarily treat brush and small trees and would not affect CWHR size class or canopy cover. Area thinning treatments would primarily treat smaller trees and would maintain canopy cover greater than 50 percent, and consequently, would not affect CWHR size class or canopy cover. Group Selection treatments, however, would affect CWHR size class and canopy cover through removal of the majority of trees less than 30 inches DBH. This would result in converting approximately 58 acres of CWHR 4 and 15 acres of CWHR 5M into CWHR 1. Such small changes in CWHR size class would be very minor with relation to CWHR size and density distribution across NFS lands within the analysis area. The 5.5 percent increase in early seral conditions represented by CWHR size classes 1 and 2 are the result of group selection implemented under the Empire Vegetation Management project which fall into the analysis area. Figure 4 displays the cumulative effect of percent change in CWHR size class and density of other vegetation management projects within the analysis area under alternative B - the no action alternative.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-0.5%	-2.5%	-4.8%
Moderate		-0.2%	-1.1%	3.2%
Open		0.3%	3.2%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 4. Percent Change in CWHR Size Class and Density of Other Vegetation Management Projects within the Analysis Area under Alternative B

Future DFPZ maintenance is not proposed in the analysis area at this time but is included in the cumulative effects analysis as a possible future event. The 2003 HFQLG Final Supplemental EIS and Record of Decision, in combination with the original HFQLG Act final EIS and Record of Decision, provide programmatic guidance for DFPZ construction and maintenance in the HFQLG pilot project area. The predicted maintenance treatments are described in "Appendix F: Past, Present, and Reasonably Foreseeable Future Actions." These maintenance activities could occur at least 10 years after implementation. The direct and indirect effect of such maintenance activities would maintain an open understory with reduced amounts of brush, tree regeneration, and naturally accumulating slash. These activities may reduce incidental numbers of snags, but may also induce snag recruitment through incidental tree mortality, particularly in prescribed fire treatments. The cumulative effect of DFPZ maintenance would be a reduction in tree regeneration and decreased recruitment of another age class of trees at the stand level; however, these treatments would maintain forest canopy and residual tree size. This, in turn, would retain stand structure and composition and would have a moderate beneficial effect on the long-term effectiveness of fuel treatments in terms of reducing fuel loading and potential fire behavior and effects.

Cumulative Effects of Alternative B

Alternative B would not meet the purpose and needs discussed in Chapter 1. With regards to Forest Vegetation, Fuels, Fire, and Air Quality, alternative B would not reduce hazardous fuel accumulations to improve forest health. Forest structure, species composition, landscape heterogeneity, fuel loadings, and potential fire behavior would remain unchanged. Overall, the existing forest and landscape structure and predicted fire behavior for this alternative could lead to a greater potential for large, high-severity fires in forested areas, including Wildland Urban Interface, riparian habitat conservation areas, protected activity centers, and home range core areas in the analysis area during a wildfire under 90th percentile or worse weather conditions.

The no action alternative would rely on density-dependent mortality, wildfires, and continued fire exclusion, to shape overall landscape structure. The maintenance of early seral stand structure would rely on areas of disturbance. The current landscape is dominated by mid-seral closed forests as represented by CWHR size classes 4M and 4D. No treatments would occur to enhance the development of mid-seral open-canopy forests. Stand densities would be expected to increase with time and would result in overall landscape homogeneity.

The maintenance of high stand densities across the landscape would result in the potential for adverse major impacts such as beetle outbreaks beyond endemic levels, widespread susceptibility to drought, and increased risk for high-mortality fire. These high stand densities and closed-canopy forests would favor a gradual shift in species composition toward shade-tolerant species, which would have an adverse effect on species diversity across the landscape. Such high-density stand structure is susceptible to forest health and fire hazard issues, and a homogeneous occurrence of these mid-seral closed-canopy forests across the landscape would be unstable (McKelvey and Johnston 1992). Alternative B would not provide for spatially variable, diverse stand structures across the landscape as described by Skinner (2005), Skinner and Chang (1996), Weatherspoon (1996), and the HFQLG final EIS (USDA 1999a), and it would not meet the desired conditions identified in the purpose and need sections in chapter 1 of this document.

Over the long-term, mortality occurring in high-density stands would continue to increase surface fuel load through deadfall of standing dead trees. This increase in mortality and related deadfall has been witnessed in the analysis area and other parts of the Sierra Nevada range as a result of region-wide drought in the late 1980s (Guarin and Taylor 2005). These increased surface fuels, combined with continuous ladder and canopy fuels, would continue to hinder suppression effectiveness, and would likely maintain stands susceptible to high-mortality fires such as the Moonlight and Antelope Complex Fires of 2007. The Moonlight and Antelope Complex Fires burned over 87,000 acres, with high severity (basal area mortality exceeding 75 percent) on 54,000 acres - the equivalent of over 84 square miles (USDA 2009c). Increased flame lengths during a wildfire could lead to high mortality in forested areas, including the Wildland Urban Interface, RHCAs, PACs, and HRCAs in the analysis area. In turn, this may result in large-scale adverse impacts to air quality and continued high fire suppression and rehabilitation costs for the indefinite future in the analysis area.

The no action alternative would not improve firefighter and public safety, which could lead to potential future injuries or fatalities during wildfire events. The no action alternative would also not reduce potential tree mortality or protect rare species and associated habitat from the major adverse effects of severe wildfire (Stephens and Moghaddas 2005a; Agee 2002). Reasonably foreseeable fuel treatment projects (appendix F) would be implemented at the stand level although they would mostly remain geographically separated. Alternative B would not provide continuity between existing and future fuel treatments, thereby decreasing their overall effectiveness at the landscape level. At the landscape level, the current Fire Regime Condition Class would not be modified over the short-term. Modifications over the long-term would be primarily caused by high-mortality fires and drought and insect-related mortality, none of which would trend the landscape-level Fire Regime Condition Class towards Condition Class I (refer to the "Glossary" for a definition of Fire Regime Condition Class). The no action alternative would allow stands to continue to develop under the influence of the legacy of past management practices and fire suppression (Skinner 2005; Agee 2002). Overall, the no action alternative would trend conditions for fire behavior and predicted mortality away from the desired conditions described in chapter 1.

Effects Common to All Action Alternatives (Alternatives A, C, D, and E)

Design Criteria

Chapters 1 and 2 provide detailed information about the Design Criteria used for each alternative**.** The harvest systems were determined by evaluating topography, slope, and access for each unit. Ground-based mechanical and skyline harvest systems are proposed (chapter 2). All mechanical harvest operations would adhere to the standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15, including Region 5 supplements) and the best management practices as delineated in the "Water Quality Management for Forest System Lands in California: Best Management Practices" (USDA 2000c).

Direct and Indirect Effects of Timber Harvest

In general, the direct and indirect effects described below would be common to all action alternatives that propose mechanical harvesting as a treatment regardless of silvicultural prescription. The effects of the specific silvicultural prescriptions proposed under the action alternatives are described in the subsequent subsections. However, all treatments involving mechanical harvesting using ground-based and skyline logging systems would share similar effects that include the potential for damage to residual trees; incidental removal of snags and trees greater than 30 inches in diameter; the construction of skid trails, landings, and temporary roads to facilitate logging operations; and the creation of activity-generated slash. Implementation of mechanical treatments is expected to maintain near-current total volume of snags and woody debris greater than 10 inches in diameter (Stephens and Moghaddas 2005c).

Throughout all treatments, regardless of silvicultural prescription, trees greater than 30 inches in diameter would be retained in accordance with the 2004 Record of Decision on the SNFPA Final Supplemental EIS (table 2)(USDA 2004b). In general, trees in the 20- to 30-inch diameter classes and the greater than 30-inch diameter classes would be the favored tree sizes to retain. These larger trees have favorable attributes in terms of fire resistance, desired stand structure, and wildlife habitat. In pine-dominated mixed conifer forest types, shade-tolerant species (such as white fir, incense-cedar, and to a lesser degree, Douglas-fir) would be targeted for removal, particularly in the smaller diameter classes. Shade-intolerant species such as Jeffery pine, ponderosa pine, and sugar pine would be retained. In true fir-dominated forest types, species preference would be weighted towards maintaining naturally occurring shade-intolerant species such as Jeffery pine; however, species composition would be maintained at levels appropriate for that ecological forest type.

Damage to residual trees may occur during harvesting operations including damage to stems, bark scraping, wrenched stems, broken branches, broken tops, and crushed foliage (McIver et al. 2003). These effects are typical in logging operations, but care would be taken to minimize the potential for damage to residual trees. The Forest Service would inspect timber sales during harvesting to ensure that damage to residual trees is within reasonable tolerances.

In accordance with the 2004 Record of Decision on the SNFPA Final Supplemental EIS (table 2, page 69)(USDA 2004b), four to six snags per acre that are 15 inches in diameter or greater would be retained within treatment units dependent on forest type and treatment (refer to the “Design Criteria” section in chapter 2). Incidental removal of snags may occur for operability and safety; however, guidelines set forth in the Pacific Southwest Region and Plumas National Forest Product Theft Prevention and Investigation Plan would be used to ensure that operability, safety, and minimum snag densities would be met. The snags to be retained would receive preference in locations where operability and safety are not anticipated to be issues. Snags within falling distances of roads, landings, and heavily used public areas would receive preference for removal where desired levels of large down woody debris have been met. Where minimum snag densities do not currently exist, marking guidelines would provide for the retention of large live trees with wildlife habitat characteristics (such as multiple or broken tops, crooks, and/or bole cavities) to serve as future snag recruitment. For additional information regarding snag retention and recruitment, please see the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix C.

Existing skid trails, landings, and temporary roads would be used, when available, to facilitate the harvesting and removal of forest products (biomass and sawlogs). Skid trails, landings, and temporary roads could be constructed under all action alternatives to facilitate the removal of forest products when existing infrastructure does not exist. Under all action alternatives, no more than 6.8 miles of temporary road would be constructed, and any temporary roads constructed would be decommissioned after use. Construction of skid trails, landings, and temporary roads would require incidental removal of trees beyond those described for silvicultural purposes. This may include incidental removal of trees greater than 30 inches in diameter for operability. However, the location and size of skid trails, landings, and temporary roads, and the trees harvested for the construction of such facilities must be approved and agreed upon by the Forest Service. The removal of trees for operability would be incidental and minimized, and therefore, would have negligible effects on stand structure.

All action alternatives propose to use whole-tree yarding to treat slash generated by harvest activity. The removal of limbs and tops by such methods would greatly reduce activity-generated surface fuels (Agee and Skinner 2005). Some of the skyline units would not include whole-tree yarding due to feasibility constraints, but would treat biomass and residual slash through piling and burning of this material. The majority of trees would be removed using whole-tree yarding, which would effectively reduce the potential for activity-generated fuel accumulation. Slash would be lopped and scattered to minimize fuel bed depth, continuity, and arrangement if whole-tree yarding is not feasible (such as when mechanical yarding of an individual large tree would result in excessive damage to a residual stand). The net effect may result in incidental activity-generated fuel accumulations. Underburning would be used, as determined by post-treatment evaluations, to reduce activity-generated and existing fuels.

Alternative A – Proposed Action

Treatments and silvicultural prescriptions under alternative A were designed using the conceptual framework present in recent scientific literature regarding ecosystem management strategies for the Sierran Mixed-Conifer Forests (North et al. 2009). These concepts include: 1)emphasizing the importance and long-term enhancement of shade-intolerant species such as ponderosa pine, Jeffrey pine, sugar pine, and black oak, 2) reducing surface fuels, ladder fuels, and canopy fuels as appropriate to approximate an active-fire adapted stand structure, 3) reducing stand densities as appropriate to accelerate the development of large leave trees and improve stand resilience to agents of change such as fire, drought, insect and disease occurrences, and changing climate, 4) maintaining defect trees and intermediate-sized and large sized trees, which provide legacy structure that serves as important attributes of wildlife habitat, and 5) promoting heterogeneity at multiple scales (both within-stand and landscape level variability) to enhance structural diversity at the stand level, while creating landscape level diversity of seral stages and open-canopy stands which is more characteristic of an active-fire adapted forest.

Treatments and silvicultural prescriptions would be compliant with and would primarily implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Under alternative A, acres of group selection would be less than the amount allowed under full implementation of the HFQLG Pilot project, and group selection and mechanical thinning treatments would generally implement lower upper diameter limits for retention of intermediate and large-sized desirable shade-intolerant species. Table 26 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative A.

Table 26. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative A.

Type	Treatment	Prescription	Acres
DFPZ	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn.	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 2: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	824
		Rx 3: Thin to 30 – 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	255
		Rx 4: Thin to 30 to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 5M/5D, thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; in RHCAs thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	870
		Rx 5: Thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH and underburn.	180
		Rx 8: Thin to 30 – 50 percent canopy cover, generally retain live trees greater than or equal to 12 inches DBH, and underburn.	206
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn.	231
	Mechanical Thinning	Rx 3: Thin to 30 – 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; except in CWHR 4M/4D, thin to 40 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in CWHR 5M/5D thin to 40-50 percent canopy cover, generally retain live trees greater than or equal to 24 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	262
Group Selection		Harvest trees less than 30 inches DBH . Consider retaining healthy vigorous undamaged trees of desired shade intolerant species greater than 20 inches for seed tree and forest structure purposes, where appropriate.	284

Direct and Indirect Effects: Hand Thinning Treatments

The effects of pile burning treatments would be highly localized and dispersed. These effects would include scorch and subsequent mortality of individual trees; however, this would be a negligible effect due to the relative scale and dispersion associated with the nature of these treatments. These treatments would reduce understory vegetation and would result in incidental mortality in the midstory but would not be expected to change CWHR size class or density class. Hand thinning treatments are analyzed for hand thinning, piling, and burning, as well as follow-up underburning where conditions permit. Table 27 displays the average post-treatment stand attributes for hand thinning treatments that would be implemented under alternative A.

Table 27. Average Post-Treatment Stand Attributes for Hand Thinning Treatments under Alternative A

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx1	179	-46%	100%	160	-9%	42	16.9	7.3%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Hand thinning treatments would reduce stand density through hand thinning, piling, and burning trees less than 8 inches in DBH. These treatments would reduce trees per acre by 19 to 62 percent while retaining all trees greater than 8 inches DBH.

Hand thinning treatments would also reduce basal area per acre by 9 percent to 160 square feet of basal area, on average. The reduction of basal area would be limited to trees less than 8 inches DBH. Approximately 53 percent of stands would be thinned to less than 150 square feet; in the remaining 47 percent of the stands hand thinning alone is not sufficient to reduce basal area below the 150 square foot basal area threshold.

Hand thinning treatments would reduce relative stand densities to desirable level post-treatment. Fifty-three percent of stands proposed for hand thinning would have relative stand densities of 40 percent or lower. Approximately 11 to 16 percent of these stands would have higher relative stand densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

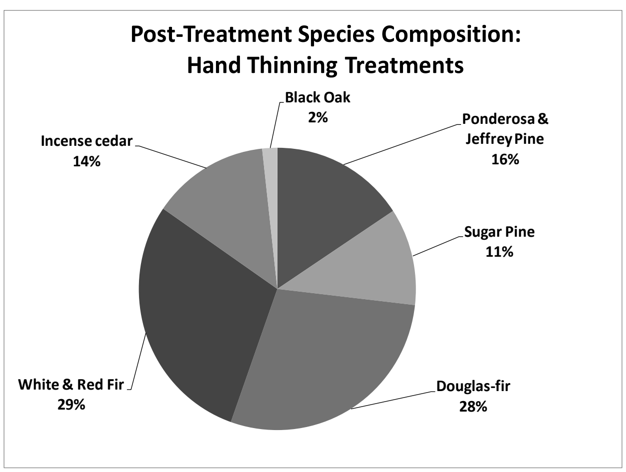


Figure 5. Average Post-Treatment Species Composition of Hand Thinnning Treatments under Alternative A

Species Composition

On average, hand thinning treatments could increase shade-intolerant species composition by 1 percent; however, depending on individual stand conditions, this increase could be as much as 4 percent. Hand thinning treatments would not have a notable effect on overall stand species composition primarily because these treatments limit tree removal to trees less than 8 inches DBH, and consequently, have little effect on basal area distribution by species.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Hand thinning treatments would not enhance development into the next size class or notably affect stand canopy cover. Hand thinning treatments would increase the quadratic mean diameter of treated stands by 7 percent on average and would also decrease stand canopy cover; however, these reductions be negligible as the vast majority of the trees that would be removed would be from the understory.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Hand thinning, piling, and burning treatments would reduce excess surface fuels through piling and burning of existing dead and down material and ladder fuels through hand thinning, piling, and burning trees less than 8 inches DBH. In addition, follow-up underburning would further reduce surface fuel loading. Table 28 displays the average post-treatment fuel and potential fire behavior attributes of hand thinning treatments under alternative A,

Table 28. Average Post-Treatment Fuel and Potential Fire Behavior Attributes of Hand Thinning Treatments under Alternative A

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx1	12	< 1	9	Incidental	25.0	Surface Fire	13

Hand thinning treatments would result in a reduction in predicted flame lengths, probabilities of torching, and basal area mortality by raising the canopy base height and reducing surface fuel loads. The resulting predicted fire type would be surface fire. The longevity of these treatment effects would last between 10-20 years until flame lengths increase above 4 feet where direct attack with handline is not feasible. Based on observations on the 2001 Stream Fire (Beckman 2001), the 2006 Boulder Fire, the 2007 Antelope Complex Fire (Fites et al. 2007), and recent scientific literature (Fule et al. 2006, Safford et al. 2009), lighter intensity, hand thinning treatments may not be as effective as mechanical treatments in modifying ladder and crown fuels and resulting fire behavior or tree mortality, dependent on individual stand conditions. Consequently, hand thinning treatments are prescribed for specific stand conditions where removal of smaller diameter material alone may be effective.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical treatments would be employed in both DFPZ and Area Thinning treatments. These treatments are designed to meet the purpose and need for reducing hazardous fuels, improving forest health, and protecting and enhancing habitat for sensitive species. Only a third of mechanical thinning treatments would occur in later seral forested stands best characterized by CWHR size class 5.

Silvicultural prescriptions under alternative A would implement a diverse range of canopy covers and species/objective specific diameter limits depending on CWHR type and maintenance of values discussed above. For example, prescriptions under alternative A would reduce canopy cover to lower limits within mid-seral CWHR 4M and 4D stands to accelerate growth of residual trees into later-seral open canopy stands characterized by CWHR 5; however, treatments in CWHR 5 stands and riparian habitat conservation areas would maintain more closed-canopy conditions as well as more intermediate and large-sized trees to retain later seral structure. These treatments, when combined with group selection and other treatments would enhance both within-stand and landscape level heterogeneity by creating horizontal diversity including canopy gaps and open canopy stand conditions favorable for the establishment and development of shade-intolerant species as well as clumps of closed-canopy stands with more vertical structural diversity.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 29.9 inches DBH. Table 29 displays the average post-treatment stand attributes for mechanical thinning treatments that would be implemented under alternative A by prescription. On average by prescription, these treatments would reduce trees per acre by 36 to 68 percent, however, dependent on individual stand conditions this could range from 17 to 91 percent. The vast majority of the trees removed would be less than 20 inches DBH. *On average, 97 percent of trees greater than 20 inches DBH would be retained. Depending on the individual stand conditions, a minimum of 73 to 100 percent of the trees greater than 20 inches DBH would be retained.*

Table 29. Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments that would be Implemented under Alternative A by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx2	127	-68%	73%	137	-34%	35	18.8	30%
Rx3	169	-58%	87%	155	-24%	38	18.0	24%
Rx4	226	-49%	94%	144	-22%	40	16.8	19%
Rx5	210	-36%	100%	175	-8%	44	16.5	8%
Rx8	214	-62%	100%	124	-18%	38	14.2	15%
Average	177	-57%	73%	147	-25%	38	17.7	23%

Basal area per acre would be reduced by 25 percent on average for all mechanical treatments. By prescription, basal area reduction would average between 8 and 34 percent; however, dependent on individual stand conditions and CWHR type, basal area reduction could range from 5 to 63 percent. *Basal area per acre would be reduced below the 150 square feet per acre threshold in 70 percent of the treated stands.*

In addition, relative stand densities would be reduced to desirable levels post-treatment. *Two-third of the stands would have relative stand densities within desired conditions immediately post-treatment.*

Within 20 to 30 years after treatment, only 7 percent of stands would have relative stand densities that would exceed the 60 percent threshold and would need to be evaluated for re-treatment.

Species Composition

Mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand. Prescriptions that generally retain trees greater than 24 inches DBH would allow for the removal of undesirable trees such as, a shade-tolerant white fir, up to 29.9 inches DBH if it is competing with a desired tree such as shade-intolerant ponderosa pine or a legacy tree greater than 30 inches DBH or within proximity of a group selection unit where shade-intolerant regeneration would be emphasized. On average, species stand composition of shade-intolerant species would increase by 5 percent; however, depending on individual stand conditions, this increase could be as much as 30 percent or in the case of 14 percent of the stands, result in no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 23 percent under mechanical thinning prescriptions in alternative A. This increase in stand quadratic mean diameter would enhance the development of CWHR 4 stands into CWHR 5 stands. Within 30 years of growth, approximately 39 percent of stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, alternative A provides a range of prescriptions which would create a diverse range in canopy covers. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum, and canopy cover would be maintained at 50 percent with RHCAs.

The prescriptions for mechanical thinning are designed to create both horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. CWHR 4 stands would receive heavier thinning (removal of more trees and canopy cover) to create open canopy stands and enhance diameter growth of residual trees into CWHR 5. CWHR 5 stands would receive lighter thinning (less removal of trees and canopy cover) to maintain closed-canopy stand conditions of later seral stands while reducing ladder fuels and stand density to reduce negative impacts of future fires, drought, and insect and disease occurrences.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would reduce ladder and canopy fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribed fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 30 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative A by prescription.

Table 30. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative A by Prescription

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx2	14	< 1	33	Incidental	41	Surface Fire	10
Rx3	12	< 1	18	Incidental	25	Surface Fire	12
Rx4	11	< 1	20	Incidental	26	Surface Fire	13
Rx5	9	< 1	14	Incidental	22	Surface Fire	12
Rx8	11	< 1	21	Incidental	31	Surface Fire	15
Average	12	< 1	22	Incidental	30	Surface Fire	12

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 25 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribed fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be notably reduced – to less than 1 foot on average, well below the 4 foot threshold which would allow for direct attack utilizing hand crews. The probability of torching would also be greatly reduced – to incidental amounts which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas, small pitches of steep, untreatable ground, and clumps retained with high canopy cover and vertical structure of retained understory trees.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment's reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 12 percent on average, and would range from 4 to 20 percent. All of the treated stands would result in low severity fire.

Direct and Indirect Effects: Mastication Treatments

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mastication treatments would occur in plantations and pole sized stands and would re-arrange shrub fuels and conifer tree ladder fuels less than 10 inches in diameter. Post-treatment residual conifer tree spacing would range from 25 to 30 feet, on average, resulting in approximately 50 to 110 trees per acre. Trees per acre and basal area per acre would be reduced as well as relative stand density.

Species Composition

Mastication treatments would employ species preferences to retain species native to the forest stand ecological type. Desired shade-intolerant species such as black oak, ponderosa and Jeffrey pine, rust-resistant sugar pine, and Douglas-fir would typically receive preference for retention while allowing for a diverse mix of species occupying the site. While mastication treatments are limited in their capacity to treat trees less than 10 inches DBH, the treatment's capacity to affect species composition change is greater than hand thinning or 12 inch mechanical thinning because mastication would occur in stands where the vast majority of trees are less than 10 inches DBH.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Mastication treatments would create open canopy stands within plantations and naturally occurring pole sized (less than 11 inches DBH) stands. These treatments would enhance the development of CWHR 2 and 3 sized stands into CWHR 4 sized stands with Open (P) and Sparse (S) canopy cover (less than 39 percent canopy cover).

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mastication treatments would increase and compact surface fuels by modifying aerial arrangements of shrubs and ladder fuels (small trees less than 10 inches DBH) into a compact surface fuel bed. While these treatments actually increase surface fuel loads, the treatments also reduce vertical continuity of fuels and modify potential fire behavior in terms of flame length and rate of spread.

The reduction of the vertical continuity of fuels would reduce the probability of torching and the initiation of passive crown fire. This would result in surface fire behavior; however, potential fires would likely have higher fireline intensities which would influence direct attack and fire suppression strategy. Basal area mortality would likely remain high where fire occurs as stems of the small trees are exposed to high levels of heat from the increased fuel bed and residence time of burning fire (Fites et al. 2007).

Direct and Indirect Effects: Prescribed Fire Treatments

The effects of prescribed fire treatments in all action alternatives are expected to be the same. Underburning is nonselective, and it may kill some dominant and codominant trees that may have otherwise been retained in mechanical treatments. Implementation of prescribed burning treatments would have a negligible to minor effect on species composition in underburn units. According to the HFQLG Final Supplemental EIS (page 19), overall, the overstory canopy would not be affected by underburning, although torching of individual or small groups of trees would occur on up to 10 percent of the burn area where high surface fuel concentrations and ladder fuels can occur together. Torching may result in gaps in the canopy typically less than 0.5 acre in size. Localized torching from underburning would occur, thereby creating small openings in the overstory where shade-intolerant species may become established and grow, depending on size.

Implementation of prescribed burning is expected to reduce surface fuel loading including existing rotten woody debris, but overall would strive to maintain the current total volume of snags and woody debris greater than 10 inches in diameter (Stephens and Moghaddas 2005c). Prescribed burn-only treatments are expected to result in standing dead snags (Stephens and Moghaddas 2005c) that will likely fall to the ground within 5 to 10 years, thereby maintaining surface woody debris. Prescribed fire-only treatments may need to be treated sooner than mechanical fuel treatments (Fernandes and Botelho 2003).

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Prescribed fire treatments would reduce trees per acre, basal area per acre and relative stand density. Prescribed fire treatments would reduce trees per acre by causing fire-induced mortality primarily in the 1 to 10 inch diameter classes and some mortality in the 10 to 20 inch diameter classes. Mortality in the larger diameter classes may occur as the result of torching and/or delayed conifer mortality as a result of fire-damage and subsequent bark beetle attack.

Species Composition

Prescribed fire treatments would not notably affect species composition. However, prescribed fire treatments are the first step in the process of re-introducing fire into landscapes that have not burned for decades. Multiple entries of prescribed or natural fire may favor fire adapted shade-intolerant species over decades if not a century.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Prescribed fire treatments would not notably affect stand size class and density. Prescribed fire treatments would incur mortality of the smaller diameter trees, primarily those less than 10 inches in diameter with some incidental mortality of larger trees due to torching or post-fire delayed conifer mortality. Prescribed fire treatments would reduce vertical structure by preferentially consuming understory and mid story vegetation. Canopy cover density could be reduced by isolated torching events, however, most tree mortality resulting from prescribed fire treatments would occur in the understory which would not notably affect the overstory canopy cover. Multiple entries of prescribed or natural fire may begin to enhance forest structure and heterogeneity over decades if not a century.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Prescribed fire treatments would reduce surface fuel loading and incur mortality of ladder fuels. Prescribed fire treatments would modify fire behavior by consuming surface fuel and would result in lower predicted flame lengths and probability of torching, similar to a low load compact conifer timber litter fuel model (as described by TL-1 in Scott and Burgan 2005), which has flame lengths well below 4 feet. This, in turn, would modify potential fire type which would be best characterized by surface fire resulting in low basal area mortality.

Over the period of decades, mortality from prescribed fire treatments would fall to the ground as fuel loading recruitment. This would result in increasing fuel loads, probability of torching, and fire type as well as basal area mortality, and result in the need for maintenance re-treatment.

Direct and Indirect Effects: Group Selection Treatments

Alternatives A and E would implement group selection harvest as directed by the Herger-Feinstein Quincy Library Group Forest Recovery Act (HFQLG Act)(USFS 1999a, b) to “test the effectiveness of an uneven-aged silvicultural system in achieving an uneven-aged, multistory, fire-resilient forest; provide an adequate timber supply that contributes to the economic stability of rural communities; and improve and maintain ecological health of the forest.”

The group selection method would create openings in the canopy to mimic gaps caused by natural agents, thereby emulating regeneration of a multicohort (multiple age classes) system across the landscape (York et al. 2003; Helms and Tappeiner 1996). Bonnicksen and Stone (1981, 1982) describe the southern mixed conifer forest of the Sierra Nevada as consisting of "mosaic aggregations in a space-time system." The aggregations (collections) of cohorts (groups of individuals commonly consisting of trees of similar age [Helms 1998]) created using the group selection system may be used to increase diversity in forest structure on the landscape scale (McDonald and Abbot 1994), as well as promote the regeneration, growth, and development of shade-intolerant species (Leak and Filip 1977).

The ability of group selection to promote the regeneration, growth, and development of shade-intolerant conifer species is largely dependent on the size of the opening (York et al. 2004; McDonald and Reynolds 1999). "Seedlings of very shade-intolerant species such as ponderosa pine require a minimum of 30 percent full sunlight to survive in the understory" (Oliver and Larson 1996). The amount of sunlight reaching the group is a function of group size relative to the surrounding codominant and dominant tree height on the edge of the group. Consequently, those trees in the center of the group selection receive the most amounts of light and water, while those trees near the edge receive partial shade and must compete with surrounding codominant trees for water resources (York et al. 2003). A range of group selection sizes would be used to most appropriately "fit" the site requirements to encourage the regeneration, growth, and development of shade-intolerant species. Group selection openings would range in size from 0.5 acre to 2 acres, averaging 1.5 acres in size.

The group selection silvicultural system is designed to create a regulated, uneven-aged stand over time comprised of a balanced distribution of different age classes. The combination of DFPZ, area thinning and group selection harvest methods would strive to emulate gap dynamics of an uneven-age forest system. This system focuses on maintaining forest structure while providing openings that encourage regeneration, growth, and development of shade-intolerant species, and it may be effective in enhancing structural and compositional diversity, which contributes to the ecological health of the forest.

Group selection treatments are designed to promote the establishment, growth, and development of a new age class – or cohort – of shade-intolerant tree species such as ponderosa pine, Jeffrey pine, and rust-resistant sugar pine. Black oak and all trees greater than or equal to 30 inches DBH would be retained. Under alternative A, over 85 percent of group selection treatments would be occur in CWHR 4 stands to convert mid-seral closed-canopy stands dominated by less desirable shade-tolerant species into early seral open canopy openings where establishment, growth, and development of desirable shade-intolerant species is more favorable. Those group selection treatments that would occur in CWHR 5 stands would be strategically placed in areas dominated by uniformly sized, smaller shade-tolerant species.

Site preparation and regeneration needs would be evaluated after harvest. Those Group Selection Units requiring natural and activity slash treatment would undergo "site preparation" via machine piling, brush raking, hand piling, and/or underburning to clear any activity slash and debris that would prevent site regeneration.

Both artificial and natural regeneration would be used to reforest group selection units. A combination of natural and artificial would be used to achieve desired stocking levels, with an emphasis on regenerating shade-intolerant species. Those units requiring artificial regeneration would be planted with a mix of species native to the ecological forest type. Species to be planted would include Jeffrey pine, ponderosa pine, rust-resistant sugar pine, Douglas-fir, and incense cedar. Natural regeneration would be used for incense cedar, white fir, and red fir species. This regeneration method would have a major beneficial effect on enhancing desired species composition on both the stand and landscape scales.

After establishment of regeneration, release treatments (manual grubbing and/or pre-commercial thinning) would be used to reduce competing vegetation to favor the growth and development of desired species. Without release treatments, shrub and naturally regenerated tree species would likely compete with desired species and slow the growth and development into subsequent seral stages. Over time, these treatments would contribute to the development from seral stages CWHR SMC 1 and 2 to CWHR 3, represented by a quadratic mean diameter greater than 6 inches.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Group Selection treatments would reduce trees per acre by greater than 90 percent, on average, and would reduce basal area per acre by 74 percent on average. Relative stand density would also be greatly reduced to levels far less than 25 percent; however, this would be favorable for promoting the establishment, growth, and development of shade-intolerant tree species.

Species Composition

Species composition of shade-intolerant tree species would be enhanced through two mechanisms: 1) the preferential retention of healthy vigorous pine and black oak species as seed trees, if available on site, and 2) planting a mix of tree species native to the ecological type while emphasizing the shade-intolerant species in that forest type. These two mechanisms would enhance the establishment of shade-intolerant species. Group selection treatments would increase relative proportions of desirable shade-intolerant species such as ponderosa pine, sugar pine, and black oak, (accounting for more 50 percent) and would decrease relative proportions of less desirable shade-tolerant species such as white fir (Figure 6).

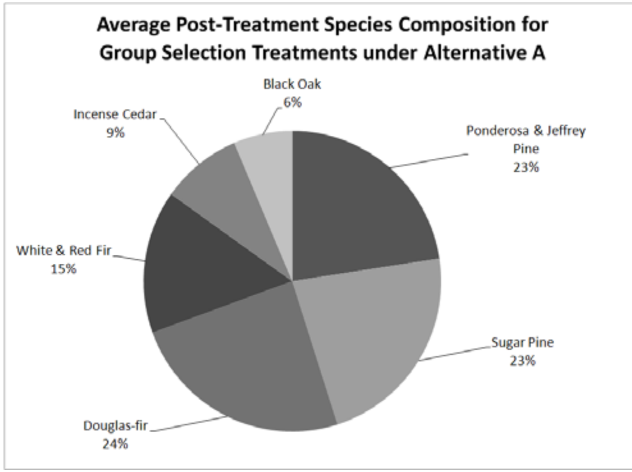


Figure 6. Average Post-Treatment Species Composition for Group Selection Harvest under Alternative A

Landscape Structure and Heterogeneity: Stand Size Class and Density

Group Selection treatments would enhance landscape structure and heterogeneity by converting mid-seral closed-canopy forest dominated by shade-tolerant species to early seral, open canopy gaps which would create favorable conditions for the establishment, growth, and development of shade-intolerant species. Primarily CWHR 4 stands and less desirable areas (in terms of tree size and species composition) within CWHR 5 stands would be converted to areas best characterized by CWHR 1 and 2 stands. Under alternative A, approximately 85 percent of the group selection treatments would occur in CWHR size class 4 stands, and less than 15 percent would occur in CWHR size class 5 stands. Furthermore gaps of openings with tree regeneration are an inherent component of within-stand variability which is thought to be more characteristic of a low to mixed severity, active fire stand structure (North et al. 2009, Collins and Stephens 2010).

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Post-harvest group selection site preparation would be performed, if necessary, to create favorable reforestation conditions. This would also reduce total surface fuel loads in the short-term. However, over the subsequent 20 to 30 years, the establishment and growth of shrub species and sapling/pole-sized trees would create areas of potentially high severity fire behavior.

Predicted flame lengths would exceed the 4 foot threshold for initial attack. Consequently, the probability of torching would increase to 77 percent on average within 30 years resulting in passive crown fire behavior that would result in high levels of basal area mortality. Early seral stands, by nature of their inherent structure, are susceptible to these risks (Thompson et al. 2007); however the scattered, disparate arrangement and small scale of group selection treatments strategically located within DFPZ and Area thinning mechanical thinning treatments mitigates these risks

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Noxious weeds may compete for water, light, and nutrients with native understory vegetation and tree seedlings which would have a negative effect on native forest vegetation. The treatments proposed in alternative A would have a beneficial effect by controlling the invasion and spread of noxious weeds and reducing competition with native forest vegetation in the analysis area. In particular, noxious weed treatments would have a beneficial effect for tree regeneration, as these treatments would reduce the potential for noxious weed establishment in such early seral, open canopy environments. The removal of noxious weeds by mechanical or chemical method would have a negligible effect on stand- and landscape-level fire behavior and related tree mortality. The target weed species are found in small, isolated populations and are not generally considered unusually flammable.

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Noxious weed treatments and borax treatments would not reduce trees per acre, basal area per acre or relative stand density and consequently would have negligible effects on stand structure.

Species Composition

Noxious weed treatments would have negligible effects on species composition. Borax treatments would prevent the infection of pine stumps by the *Heterobasidion* root disease. Borax treatments would have both short-term and long-term beneficial effects by reducing the potential for ponderosa pine mortality.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Noxious weed treatments and borax treatments would not affect CWHR Size class and density and consequently, would have negligible effects on landscape structure and heterogeneity.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Noxious weed treatments and borax treatments would have negligible effects on fuel loading, predicted flame length, probability of torching, fire type, and basal area mortality, and consequently, would have negligible effects on fuels and potential fire behavior.

Direct and Indirect Effects: Watershed Improvements

Watershed improvements include road decommissioning, maintenance, and road reconstruction. Since these activities are largely restricted to the road prism, the effects to forest vegetation, fuels, and potential fire behavior and effects would be negligible.

Stand Structure: Trees per Acre, Basal Area perAacre, and Relative Stand Density

Watershed improvements would not notably reduce trees per acre, basal area per acre or relative stand density and consequently would have negligible effects on stand structure.

Species Composition

Watershed improvements would have negligible effects on species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

Watershed improvements would not affect CWHR size class and density and consequently, would have negligible effects on landscape structure and heterogeneity.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Watershed improvements would have negligible effects on fuel loading, predicted flame length, probability of torching, fire type, and basal area mortality, and consequently, would have negligible effects on fuels and potential fire behavior. However watershed improvements would improve access along roads which could enhance fire suppression efforts in direct and initial attack of wildfire ignitions.

Direct and Indirect Effects: Air Quality

Under alternative A, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative A

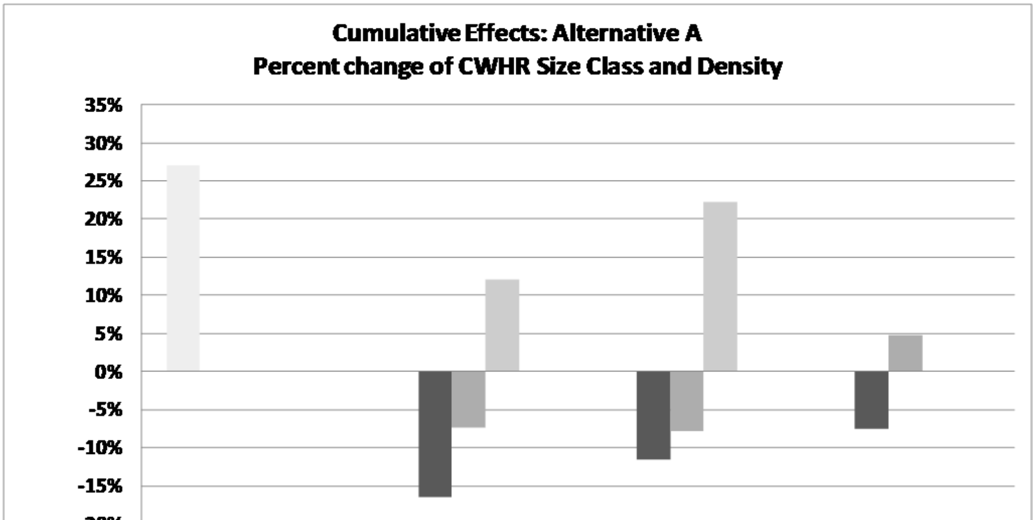
The cumulative effects of past projects may be characterized by the existing conditions that exist on the landscape today. Present and future projects may be characterized by a shift in land management values and practices that emphasize forest structure (including the retention of large dominant and codominant trees), the importance of species diversity, the role of fire as a process, and their relationship to landscape diversity and healthy, resilient ecosystems.

Due to the nature of the proposed treatments and silvicultural prescriptions, cumulative effects would include the maintenance and development of large trees throughout the analysis area. Upper diameter limits focus on retaining both large dominant and codominant as well as intermediate sized-trees which would maintain the component of large trees that exist in the analysis area. In addition, thinning from below treatments would create conditions favorable for growth and development of large trees.

Snag levels could be reduced in current, proposed, and future fuel reduction projects, therefore the cumulative effect would be the reduction of snags in treated areas to minimum retention levels determined by forest type. However, across the analysis area, snag recruitment would continue to occur, particularly in untreated areas where high stand densities would continue to contribute to mortality. Snag retention guidelines implemented in current, proposed, and future forest management projects (as directed by the 2004 SNFPA (USDA 2004b)) in combination with snag recruitment in untreated areas would contribute to maintaining snags throughout the analysis area.

The cumulative effect of current, proposed, and reasonably foreseeable projects would include maintaining and promoting species diversity, particularly enhancing the regeneration and development of shade-intolerant species. Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands and preferential regeneration of shade-intolerant species in group selection units would enhance the regeneration, growth, and development of shade-intolerant species. These treatments would contribute to a higher shade-intolerant species composition in treated areas immediately post-treatment.

Given the current direction in the 2004 SNFPA (USDA 2004b) and the Forest Service's emphasis on ecological restoration through the retention of large trees and thinning primarily small trees, the cumulative effect of, current, proposed, and future forest management projects would be a reduction in



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	27.0%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	-7.8%	4.7%
Open		12.1%	22.3%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 7. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative A

stand densities, particularly in the smaller tree sizes. Stand density would be reduced particularly in the smaller diameter classes through all action alternatives. This effect (and the longevity of this effect) differs by alternative due to the differences in amount of acres treated under differing canopy cover retention guidelines.

Figure 7 displays the cumulative effects of percent change in CWHR size class and density under alternative A. Stand structure within treated stands would have lower stand densities and would be characterized by mid- to later-seral open canopy stands. Under alternative A, treatments would contribute to a decrease in mid-seral closed-canopy conditions, primarily in CWHR 4M and 4D, would correspond with 22 percent increase in mid-seral open canopy stands and a 27 percent increase in early seral areas. The horizontal and vertical structure of these stands would be diverse and would be comprised of clumps of trees, gaps in the canopy, and intermingled openings. The intensity of this effect would be limited by the number of acres treated over time and tempered by the development of mid-seral closed-canopy forests in untreated stands; however, alternative A would provide for the greatest reduction in stand density on the stand level and create more open canopy stands that would enhance development of later seral open canopy stands and would be more resistant to the effects of fire, drought, insects, and disease. These open canopy stands would also promote conditions favorable for shade-intolerant species to establish and develop and contribute to species diversity across the landscape. Relative to all alternatives, alternative A provides for the largest change in landscape structural diversity with the greatest longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative C – Non-Commercial Alternative

Treatments and silvicultural prescriptions under alternative C were designed to meet the purpose and need to reduce hazardous fuel accumulations. Treatments focus on reducing surface fuel accumulations and ladder fuels. These treatments would also be compliant with, but generally would not fully implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b) Table 31 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative C.

Table 31. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative C

Type	Treatment	Prescription	Acres
DFPZ	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 8: Thin to 30-40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; except in CWHR 5M/5D, thin to 40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; and In RHCA's , thin to 50 percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and underburn.	2,591
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	231
	Mechanical Thinning	Rx 8: Thin to 30-40 percent canopy cover, retain live trees greater than or equal to 12 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, thin to 40-50percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and In RHCA's , thin to 50 percent canopy cover , retain live trees greater than or equal to 12 inches DBH; and underburn.	290

Direct and Indirect Effects: Hand Thinning Treatments

Direct and Indirect effects of hand thinning treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Mechanical Treatments

Mechanical treatments under alternative C would implement a 12 inch upper diameter limit; however canopy cover reduction would follow table 2 standards and guidelines as directed under the 2004 SNFPA. This would allow for canopy cover reductions in CWHR size class 4down to 30 percent canopy cover within DFPZ treatments, and down to 40 to 50 percent canopy cover in area thinning treatments. Table 32 displays the average post-treatment stand attributes of mechanical thinning treatments under alternative C.

Table 32. Average Post-Treatment Stand Attributes of Mechanical Thinning Treatments under Alternative C

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx8	255	-43%	100%	173	-15%	46	16.6	14%

Stand Structure: Trees per acre, Basal Area per acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 12 inches DBH. These treatments would reduce trees per acre by 43 percent, on average, and would range from 13 to 88 percent depending on the individual stand. *Across all stands, 100 percent of the trees* *greater than 12 inches DBH would be retained.* On average, alternative C would retain 255 trees per acre which would consistently have higher tree densities than desired conditions for forest health, and would not resemble forest structure adapted to an active fire disturbance regime.

Basal area per acre would be reduced by 15 percent on average, and basal area reduction would range from 2 to 56 percent depending on individual stand conditions and CWHR type. On average, stands would retain approximately 173 square feet of basal area. *Basal area per acre would be reduced below the 150 square feet per acre threshold in only 36 percent of the treated stands.*

Relative stand densities would be reduced to 46 percent post-treatment, on average. Nearly *62 percent of the stands would NOT have relative stand densities within desired conditions immediately post-treatment.* Approximately 25 to 32 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

While mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand, mechanical treatments under alternative C would have lower capacity to affect species composition change because prescriptions that retain trees all trees greater than 12 inches DBH would not affect overstory tree composition. Overstory tree is important because overstory trees have reached reproductive maturity and will produce the majority of seed in the stands for future regeneration. Mechanical thinning treatments under alternative C would not remove undesirable shade-tolerant trees greater than 12 inches DBH, and consequently, would retain shade-tolerant trees that would be a future seed source for more shade-tolerant tree regeneration.

As a result, species stand composition of shade-intolerant species would only increase by 1 percent, on average; however, depending on stand conditions, this increase could be as much as 4 percent or, in the case of 39 percent of the stands, result in a decrease or no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 14 percent under mechanical thinning prescriptions in alternative C. This increase in stand quadratic mean diameter, however, would not notably enhance the development of CWHR 4 stands into CWHR 5 stands. In thirty years after treatment, only 7 percent of treated stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, since alternative C has a 12 inch upper diameter limit, this reduction in canopy would be limited to primarily understory and mid-story trees. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum. On average canopy cover would be 44 percent and would range from 33 to 59 percent dependent on individual stand conditions. *Two-thirds of the stands would have greater than 40 percent canopy cover and moderate and dense closed-canopy conditions would be maintained.*

The 12 inch upper diameter limit for mechanical thinning under alternative C would limit opportunities to enhance horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. While the mechanical treatments would reduce ladder fuels, but the efficacy to reduce stand densities and associated negative impacts of future fires, drought, and insect and disease occurrences would be notably limited.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would primarily reduce ladder fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 33 displays the average post-treatment fuels and potential fire behavior attributes for mechanical treatments under alternative C.

Table 33. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Treatments under Alternative C

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx8	12	< 1	15	Incidental	23	Surface Fire	13

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 25 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be reduced to well below the 4 foot threshold in 96 percent of the stands which would allow for direct attack utilizing hand crews. The probability of torching would be incidental which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas and small pitches of steep, untreatable ground.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment’s reduction of surface, ladder, and crown fuels in 96 percent of the stands. Consequently, potential basal area mortality would also be reduced to 13 percent on average, and would range from 6 to 28 percent depending on individual stand conditions.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would not occur under alternative C.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, borax, and noxious weed treatments would not occur under alternative C.

Direct and Indirect Effects: Watershed Improvements

Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

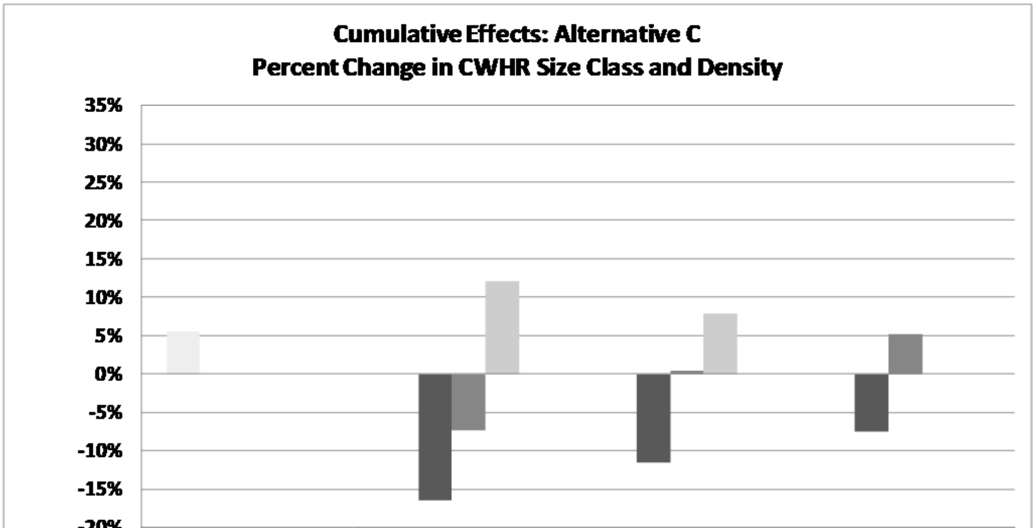
Under alternative C, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative C

Due to the nature of the proposed treatments and silvicultural prescriptions under alternative C, cumulative effects would include the maintenance and development of large trees throughout the analysis area. Upper diameter limits would retain all intermediate and large sized trees including all small trees between 12 and 20 inches DBH, As a result, stand densities would be reduced only in trees less than 12 inches which would only affect densities of understory and some mid-story trees. This effect compromises the ability of these treatments to meet forest health objectives such as improvement of conditions that favor shade-intolerant species, reducing stand densities to desired levels, and creating open canopy stands that contribute to landscape heterogeneity and enhance growth of small and medium sized trees into larger diameter classes.

Snag levels would be maintained due to the 12 inch upper diameter limit and across the project area, snag recruitment would continue to occur where high stand densities would continue to contribute to mortality.

Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands would be implemented, however the efficacy of these preference guidelines would be limited by the upper diameter limit. As a result, retention of small and intermediate sized shade-tolerant trees would be retained and the improvement of species composition would be less relative to alternatives A and E. In addition, alternative C does not implement group selection and generally retains higher stand densities and closed canopies on average which would limit the establishment, growth, and development of desirable shade-intolerant species. Over time, these relatively denser and closed canopy conditions would favor shade-tolerant species.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	0.5%	5.2%
Open		12.1%	7.8%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 8. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative C

Figure 8 displays the cumulative effects of percent chance in CWHR size class and density under alternative C. Under alternative C, mid-seral closed-canopy conditions would generally be maintained with the exception of a relatively minor 7.8 percent increase in mid-seral open canopy stands. The 12 inch upper diameter limit would provide for vertical separation between surface and canopy fuels; however, horizontal continuity of closed-canopy stands would be maintained. The homogeneity of these stands would temper the resistance to the effects of fire, drought, insects, and disease. Maintenance of mid-seral closed-canopy stands would not promote conditions favorable for shade-intolerant species to establish and develop and would not notably contribute to species diversity across the landscape. Relative to all alternatives, alternative C provides for a modest change in landscape structural diversity with a lower longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction in landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative D – 2001 SNFPA ROD Consistent Alternative

Treatments and silvicultural prescriptions under alternative D were designed to meet the standards and guidelines for treatments and land allocation which would be compliant with the 2001 Sierra Nevada Forest Plant Amendment ROD (USDA 2001b). These treatments would also be compliant with, but generally would not fully implement the standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Table 34 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative D.

Table 34. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative D

Type	Treatment	Prescription	Acres
DFPZ	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,464
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 9: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 15 percent of the stand untreated; and underburn.	709
		Rx 10: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 25 percent of the stand untreated; and underburn.	71
		Rx 11: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D, thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	574
		Rx 12: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	346
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	Hand Thinning	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	301
	Mechanical Thinning	Rx 10: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; leave 25 percent of the stand untreated; and underburn.	26
		Rx 11: Thin to 50 percent canopy cover, retain all live trees greater than or equal to 20 inches DBH; except in CWHR 5M/5D, thin to 50 percent canopy cover, retain all live trees greater than or equal to 12 inches DBH; leave 25 percent of the stand untreated; and underburn.	140

Direct and Indirect Effects: Hand Thinning Treatments

Direct and indirect effects of hand thinning treatments would be similar in intensity to those described for alternative A; however the number acres that would receive hand thinning treatments would increase by as much as 40 percent. This is due to canopy cover reduction restrictions associated with the SNFPA 2001 ROD (USDA 2001b) which would prohibit mechanical thinning in stands with less than 50 percent canopy cover in CWHR 5M, 5D, and 6 stands, Old Forest Emphasis Areas, California spotted owl home range core areas, and WUI: Threat Zone and General Forest land allocations. Within these areas, the SNFPA ROD 2001 specifies:

> *"In stands that currently have between 40 and 50 percent canopy cover, do not reduce canopy cover except where canopy cover reductions result from removing primarily shade-tolerant trees less than 6 inches DBH." (USDA 2001b, pages A-26, A-41,A-44, A-48, A-49, A-50)*

This would result in approximately 500 acres that would not receive the beneficial effects of mechanical thinning on further reduction of stand density, species composition improvement, and enhancement of landscape structure and heterogeneity.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical thinning prescriptions under alternative D allow removal of conifers up to 20 inches DBH, and retain a 50 percent minimum canopy cover. In addition, the SNFPA 2001 ROD (USDA 2001b) guidelines specify that 10 to 25 percent of the stand is to be left untreated depending on land allocation or CWHR type. A portion of these stands have pre-treatment existing canopy covers that are less than 50 percent canopy cover and under the SNFPA 2001 ROD guidelines, treatment in these stands should be limited to hand thinning shade-tolerant trees less than 6 inches in diameter. Table 35 displays the average post-treatment stand attributes for mechanical treatments under alternative D by prescription.

Table 35. Average Post-Treatment Stand Attributes for Mechanical Treatments under Alternative D by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx1	251	-48%	100%	194	-9%	52	15.3	6.4%
Rx10	243	-39%	100%	204	-6%	53	15.6	4.6%
Rx11	316	-33%	100%	194	-9%	52	15.8	6.4%
Rx12	235	-39%	100%	179	-7%	48	16.1	3.7%
Rx9	340	-34%	100%	168	-9%	50	13.5	2.7%
Average	292	-37%	100%	187	-8%	51	15.2	5.0%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 12 to 20 inches DBH depending on land allocation; a minimum canopy cover of 50 percent would be retained. These treatments would reduce trees per acre by 37 percent, on average, and would range from 6 to 75 percent depending on the individual stand. *Across all stands, 100 percent of the trees greater than 20 inches DBH would be retained.*

Basal area per acre would be reduced by 8 percent on average, and basal area reduction would range from 1 to 34 percent depending on individual stand conditions and CWHR type. On average, stands would retain approximately 187 square feet of basal area. *Basal area per acre would be reduced below the 150 square feet per acre threshold in only 14 percent of the treated stands.*

Relative stand densities would be reduced to 51 percent post-treatment, on average. Approximately 86 percent of stands *would NOT have relative stand densities within desired conditions immediately post-treatment.* Approximately 32 to 43 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

While mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand, mechanical treatments under alternative D would have lower capacity to affect species composition change because prescriptions that retain trees a minimum canopy cover of 50 percent limits opportunities to affect overstory tree composition through tree removal. Overstory tree is important because overstory trees have reached reproductive maturity and will produce the majority of seed in the stands for future regeneration. Mechanical thinning treatments under alternative D would not remove undesirable shade-tolerant trees greater than 20 inches DBH and opportunities to remove trees less than 20 inches would be limited by canopy cover constraints. Consequently, this would retain shade-tolerant trees that would be a future seed source for more shade-tolerant tree regeneration.

As a result, species stand composition of shade-intolerant species would only increase by 1 percent, on average; however, depending on stand conditions, this increase could be as much as 8 percent or, in the case of 50 percent of the stands, result in a decrease or no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 5 percent under mechanical thinning prescriptions in alternative D. This increase in stand quadratic mean diameter, however, would not notably enhance the development of CWHR 4 stands into CWHR 5 stands. In thirty years after treatment, only 7 percent of treated stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, since alternative D has a 20 inch upper diameter limit AND specifies a minimum canopy cover retention of 50 percent, this reduction in canopy would be limited to primarily understory and mid-story trees. On average canopy cover would be 50 percent and would range up to 66 percent dependent on individual stand conditions. *Moderate and dense closed-canopy conditions would be maintained.*

The 20 inch upper diameter limit, 50 percent canopy cover minimum retention standards, and guidelines specifying that up to 25 percent of stands be left untreated under alternative D would limit opportunities to enhance horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. While the mechanical treatments would reduce ladder fuels, the efficacy to reduce stand densities and associated negative impacts of future fires, drought, and insect and disease occurrences would be notably limited.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would primarily reduce ladder fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 36 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative D by prescription.

Table 36. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative D by Prescription

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx1	12	0.5	7	Incidental	19	Surface Fire	14
Rx10	8	3.4	13	27%	18	Surface Fire	22
Rx11	14	3.4	11	37%	19	Surface Fire	21
Rx12	13	3.9	13	33%	21	Surface Fire	19
Rx9	11	2.8	13	32%	21	Surface Fire	21
Average	12	2.9	11	28%	20	Surface Fire	19

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 27 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths, on average, would be reduced below the 4 foot threshold which would allow for direct attack utilizing hand crews. Approximately 11 percent of the stands would have flame lengths greater than 4 feet primarily due to the amount of fuel loading, and untreated vegetation left in the stand. The probability of torching would be reduced to 28 percent on average which would reduce the likelihood of passive crown fire initiation. Potential for torching would exist in untreated areas such as control areas and small pitches of steep, untreatable ground, and specified untreated areas. In a portion of the stands, the canopy cover retention guidelines simply limit the amount of ladder fuels that can be removed to modify fire behavior.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment’s reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 19 percent on average, and would range from 8 to 32 percent.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would not occur under alternative D.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Direct and Indirect effects of herbicide, borax, and noxious weed treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Watershed Improvements

Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

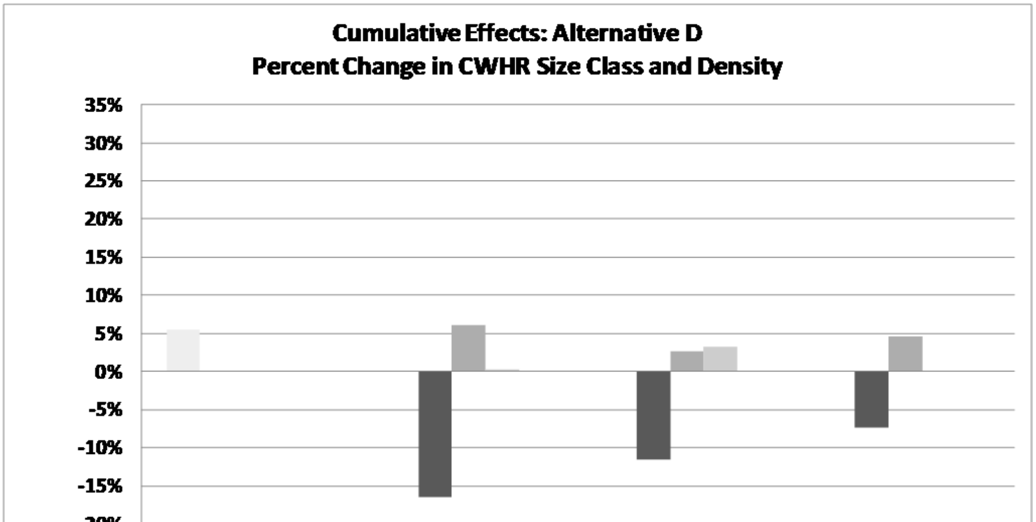
Under alternative D, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative D

Due to the nature of the proposed treatments and silvicultural prescriptions under alternative D, cumulative effects would include the maintenance and development of large trees throughout the analysis area. The variable 12 to 20 inch upper diameter limits would retain all intermediate and large sized trees. In addition, the 50 percent canopy cover minimum would maintain closed-canopy conditions. Lastly, under alternative D, 15 to 25 percent of the unit, depending on land allocation, would remain untreated. As a result, stand densities would be reduced only in trees less than 20 inches which would only affect densities of understory and some mid-story trees. This effect (and the longevity of this effect) compromises the ability of these treatments to meet forest health objectives such as improvement of conditions that favor shade-intolerant species, reducing stand densities to desired levels, and creating open canopy stands that contribute to landscape heterogeneity and enhance growth of small and medium sized trees into larger diameter classes.

Snag levels would be maintained due to the 12 inch upper diameter limit and across the analysis area, snag recruitment would continue to occur where high stand densities would continue to contribute to mortality.

Preference in thinning prescriptions for retaining shade-intolerant species in Sierra Mixed conifer stands would be implemented; however the efficacy of these preference guidelines would be limited by the upper diameter limits, the 50 percent canopy cover minimum retention guidelines, and the untreated areas. As a result, retention of small and intermediate sized shade-tolerant trees would be retained and the improvement of species composition would be less relative to other action alternatives. In addition, alternative D does not implement group selection and generally retains higher stand densities and closed canopies on average which would limit the establishment, growth, and development of desirable shade-intolerant species. These relatively denser and closed-canopy conditions would favor shade-tolerant species.



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	5.5%			
Dense		-16.5%	-11.6%	-7.4%
Moderate		6.0%	2.6%	4.6%
Open		0.3%	3.2%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 9. Cumulative Effects: Percent Change in CWHR Size Class and Density under Alternative D

Figure 9 displays the cumulative effect of percent change in CWHR size class and density under alternative D. Under alternative D, mid-seral closed-canopy conditions would be maintained. The 12 inch to 20 inch upper diameter limits would provide for vertical separation between surface and canopy fuels in treated areas, however, horizontal continuity of closed-canopy stands would be maintained. The homogeneity of these stands would temper the resistance to the effects of fire, drought, insects, and disease. Maintenance of mid-seral closed-canopy stands would not promote conditions favorable for shade-intolerant species to establish and develop and would not notably contribute to species diversity across the landscape. Relative to all alternatives, alternative D provides for the most modest change in landscape structural diversity with a lower longevity of treatment.

Stand-level treatments would reduce potential fire behavior, fire-related tree mortality, and spotting in Fuel Treatment and Area Thinning Units. Vertical continuity of surface, ladder, and canopy fuels would be maintained in the units where 15 to 25 percent of the area is left untreated. These treatments would increase the ability of fire management personnel to suppress and contain wildfires during initial and extended operations while increasing firefighter and public safety. At the landscape level, these treatments would provide connectivity between existing fuel treatments on private and public land and break up the continuity of surface and crown fuels. A reduction landscape-level fire-related tree mortality would help maintain stand structure in RHCAs, PACs, and HRCAs in the analysis area.

Alternative E – 2004 SNFPA ROD Consistent Alternative

Treatments and silvicultural prescriptions under alternative E were designed to fully implement standards and guidelines for the Herger-Feinstein Quincy Library Group pilot project area as described in Table 2 of the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004b). Table 37 displays the treatments, prescriptions, and corresponding acres that would be implemented under alternative E.

Table 37. Treatments, Prescriptions, and Corresponding Acres Proposed under Alternative E

Type	Treatment	Prescription	Acres
DFPZ	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	1,026
	Mastication	Rx 6: Masticate brush and trees less than 10 inches DBH to 25-30 foot spacing and retain all hardwoods greater than 3 inches DBH.	357
	Mechanical Thinning	Rx 13: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 5M/5D, thin to 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	2,242
		Rx 14: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, Thin to 40-50 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	53
	Prescribed Fire	Rx 7: Low to moderate intensity prescribed underburn. Aproximately 73 acres within a spotted owl habitat area (SOHA) would be underburned at low intensity.	1,456
Area Thinning	**Hand Thinning**	Rx 1: Hand thin, pile, and burn trees less than 8 inches DBH and underburn	231
	Mechanical Thinning	Rx 14: Thin to 30 – 40 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; except in CWHR 4M/4D and CWHR 5M/5D, Thin to 40-50 percent canopy cover, retain all live trees greater than or equal to 30 inches DBH; in RHCAs, thin to 50 percent canopy cover, generally retain live trees greater than or equal to 20 inches DBH; and underburn.	261
Group Selection		Harvest trees less than 30 inches DBH .	326

Direct and Indirect Effects: Hand thinning Treatments

Direct and Indirect effects of hand thinning treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Mechanical Thinning Treatments

Direct and indirect effects of mechanical thinning treatments under alternative E would be similar in scale and intensity to those described in alternative A. However, under alternative E, the upper diameter limit of mechanical thinning in DFPZ and Area thinning units would be 30 inches DBH. Table 38 displays the average post-treatment stand attributes for mechanical thinning treatments under alternative E by prescription.

Table 38. Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments under Alternative E by Prescription

Rx	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
Rx13	178	-59%	73%	144	-27%	37	18.1	24 %
Rx14	204	-44%	91%	164	-14%	41	16.5	15%
Average	183	-56%	73%	148	-25%	38	17.7	22%

Stand Structure: Trees per Acre, Basal Area per Acre, and Relative Stand Density

Mechanical treatments would reduce stand density through thinning and removal of conifers up to 29.9 inches DBH. These treatments would reduce trees per acre by 56 percent, on average, and would range from 20 to 91 percent. The vast majority of the trees removed would be less than 20 inches DBH. *On average, 96 percent of trees greater than 20 inches DBH would be retained. Depending on the individual stand conditions, 73 to 100 percent of the trees greater than 20 inches DBH would be retained.*

On average, basal area per acre would be approximately 148 square feet per acre. Basal area per acre would be reduced by 25 percent on average, and basal area reduction would range from 6 to 57 percent depending on individual stand conditions and CWHR type. *Basal area per acre would be reduced below the 150 square feet per acre threshold in sixty one percent of the treated stands.*

In addition, relative stand densities would be reduced to desirable levels post-treatment, approximately, 38 percent on average. *Sixty one percent of the stands would have relative stand densities within desired conditions immediately post-treatment.* Approximately 7 percent of these stands would have higher densities than desired 20 to 30 years in the future and would need to be evaluated for re-treatment.

Species Composition

Mechanical thinning treatments would employ species preference guidelines to enhance species composition of the residual stand. On average species stand composition of shade-intolerant species would increase by 7 percent; however, depending on stand conditions, this increase could be as much as 30 percent or, in the case of 21 percent of the stands, result in no change in shade-intolerant species composition.

Landscape Structure and Heterogeneity: Stand Size Class and Density

The average increase in stand quadratic mean diameter would be 22 percent under mechanical thinning prescriptions in alternative E. This increase in stand quadratic mean diameter would enhance the development of CWHR 4 stands into CWHR 5 stands. Within 30 years of growth, approximately 39 percent of stands would have stand quadratic mean diameter of 24 inches or greater which is the threshold used to classify CWHR size class 5.

Canopy cover would be reduced through mechanical treatments; however, alternative E provides a range of prescriptions which would create a diverse range in canopy covers. Canopy cover in CWHR 4 stands could be reduced down to 30 percent canopy cover while canopy cover in CWHR 5 stands would be maintained above 40 percent, at a minimum.

The prescriptions for mechanical thinning are designed to create both horizontal and vertical structural heterogeneity best characterized by an open canopy stand with gaps of low densities/canopy cover and clumps of high density/canopy covers. CWHR 4 stands would receive heavier thinning (removal of more trees and canopy cover) to create open canopy stands and enhance diameter growth of residual trees into CWHR 5. CWHR 5 stands would receive lighter thinning (less removal of trees and canopy cover) to maintain closed-canopy stand conditions of later seral stands while reducing ladder fuels and stand density to reduce negative impacts of future fires, drought, and insect and disease occurrences.

Fuels and Potential Fire Behavior: Fuel Loading and Predicted Flame Length, Probability of Torching, Fire Type, and Basal Area Mortality

Mechanical thinning treatments would reduce ladder and canopy fuels, whole-tree yarding would minimize the addition of activity fuels, and follow-up prescribe fire treatments would reduce surface fuels. In combination, these treatments would reduce fuel loadings and predicted flame length, probability of torching, fire type, and basal area mortality of potential future fires. Table 39 displays the average post-treatment fuels and potential fire behavior attributes for mechanical thinning treatments under alternative E.

Table 39. Average Post-Treatment Fuels and Potential Fire Behavior Attributes for Mechanical Thinning Treatments under Alternative E

Rx	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
Rx13	12	< 1	24	Incidental	31	Surface Fire	11
Rx14	13	< 1	17	Incidental	24	Surface Fire	15
Average	12	< 1	22	Incidental	30	Surface Fire	12

Fuel loading would be reduced to 12 tons per acre, on average, and would range between 3 and 26 tons per acre. Mechanical treatments alone would compact and crush existing surface fuels and greatly reduce ladder fuels to reduce potential fire behavior prior to prescribe fire treatments. However, the prescribed fire treatments would reduce existing surface fuels even further and allow for the re-introduction of fire into the ecosystem.

Flame lengths would be reduced to less than 1 foot on average, well below the 4 foot threshold in all stands which would allow for direct attack utilizing hand crews. The probability of torching would be incidental which would substantially reduce the likelihood of passive crown fire initiation. Potential for torching would be restricted to islands of untreated areas such as control areas, small pitches of steep, untreatable ground, and clumps retained with high canopy cover and vertical structure of retained understory trees.

Potential fire type would be reduced from high severity passive crown fire as sustained under existing conditions to a low severity surface fire due to the treatment's reduction of surface, ladder, and crown fuels. Consequently, potential basal area mortality would also be reduced to 12 percent on average, and would range from 4 to 20 percent.

Direct and Indirect Effects: Mastication Treatments

Direct and Indirect effects of mastication treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Prescribed Fire Treatments

Direct and Indirect effects of prescribed fire treatments would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Group Selection Treatments

Direct and Indirect effects of group selection treatments would be similar to those described for alternative A. However, approximately 42 additional acres of group selection would be implemented under alternative E for a total of 326 acres. Under alternative E, approximately 80 percent of the group selection treatments would occur in CWHR size class 4 stands, and approximately 20 percent would occur in CWHR size class 5 stands. In addition, all trees less than 30 inches DBH would be removed from group selection units regardless of species.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, borax, and noxious weed treatments would not occur under alternative E. Noxious weed populations would have greater potential to spread. The spread of these noxious weeds could complicate future vegetation management activities requiring more mitigation measures to limit the spread of these species.

Borax treatments would also not occur under alternative E. Thinning treatments that do not include borax treatments would increase the probability for the spread and development of new infections of *Heterobasidion* root disease. This could result in increased tree mortality and increased fuel accumulations over time.

Direct and Indirect Effects: Watershed Improvements

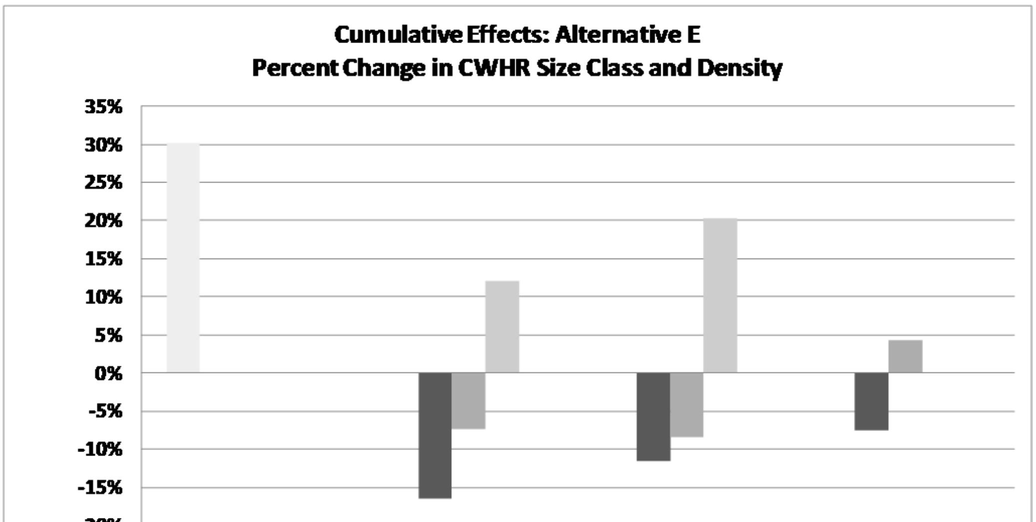
Direct and Indirect effects of watershed improvements would be similar in scale and intensity to those described for alternative A.

Direct and Indirect Effects: Air Quality

Under alternative E, underburning, pile burning, and mechanical treatments proposed under action alternatives would produce emissions. Please refer to the Direct, Indirect, and Cumulative Effects discussion for Air Quality in the Comparison of Alternatives section.

Cumulative Effects of Alternative E

Cumulative effects of alternative E would be similar to those described for alternative A, with the exception of group selection treatments. Alternative E would implement 326 acres of group selection



	CWHR 1 & 2 (Seedlings & Saplings)	CWHR 3 (Pole-sized trees)	CWHR 4 (Small Trees)	CWHR 5 (Medium/Large Trees)
All	30.2%			
Dense		-16.5%	-11.6%	-7.6%
Moderate		-7.3%	-8.4%	4.3%
Open		12.1%	20.3%	0.0%
Sparse		0.0%	0.0%	0.0%

Figure 10. Cumulative Effects: Percent change in CWHR size class and density under alternative E

treatments which would provide for a 25 percent increase in CWHR 1 and 2 on NFS lands. Alternative E would contribute to slightly more early seral stage forest habitat than alternative A. This would correspond with a slightly lower increase (17 percent) in mid-seral open canopy stands characterized by CWHR 4P. Figure 10 displays the percent change in CWHR size class and density under alternative E.

Comparison of Effects by Alternatives

Treatments and corresponding direct, indirect, and cumulative effects are compared for all alternatives in the discussion below.

Direct and Indirect Effects: Hand thinning Treatments

Hand thinning treatments would be similar in intensity for all action alternatives, but the scale of these treatments would vary by alternative. Similar acres of hand thinning treatments would occur under alternatives A, C, and E – approximately 1, 257 acres. Alternative D would implement 1,765, approximately 508 acres of additional hand thinning in lieu of mechanical thinning treatments. Under alternative B, hand thinning treatments would not occur.

Table 40. Comparison of Average Post-Treatment Stand Attributes for Hand Thinning Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
B (No Action)	359	0%	100%	175	0	61 %	15.8	0%
All Action Alternatives	179	-46%	100%	160	-9%	42 %	16.9	7.3%

Table 41. Comparison of Average Post-Treatment Fuel and Potential Fire Behavior Attributes for Hand Thinning Treatments by Alternative

Alternative	Surface Fuel Load (tons per acre)	Flame Length (feet)	Canopy Base Height (feet)	Probability of Torching	Crowning Index (mph)	Fire Type	Percent Basal Area Mortality
B (No Action)	28	18	5	74%	22	Passive Crown Fire	85
All Action Alternatives	12	< 1	9	Incidental	25	Surface Fire	13

Table 40 and Table 41 display the comparison of average post-treatment stand attributes and fuel and potential fire behavior attributes for hand thinning treatments by alternative.

Direct and Indirect Effects: Mechanical Thinning Treatments

Mechanical thinning treatments would be implemented in all action alternatives, but the scale and intensity of these treatments would vary by alternative. The acres of mechanical thinning treatments by DFPZ and Area thinning types are displayed by alternative in Table 42.

Table 42. Comparison of Acres of Mechanical Thinning Treatments by Alternative

Alternative	Type	Acres	Total Acres
A	DFPZ	2,336	2,598
	Area Thinning	262	
B	n/a	0	0
C	DFPZ	2592	2,882
	Area Thinning	290	
D	DFPZ	1699	1,864
	Area Thinning	165	
E	DFPZ	2295	2,556
	Area Thinning	261	

Alternatives A and E would implement similar amounts of mechanical thinning, but slightly differ due to the amount of group selection treatments which would occur in the “footprint” of the mechanical thinning units. Alternative C would implement the most acres of mechanical thinning because it does not include group selection treatments, which are deducted from alternatives A and E to correct for “double-counting” of acres. Alternative D would implement the least amount of mechanical thinning treatments of all the action alternatives due to factors that include: 1) guidelines for mechanical thinning treatments under the 2001 SNFPA require that 15 to 25 percent of the stand be left untreated, depending on land allocation, and 2) guidelines for mechanical thinning treatments under the 2001 SNFPA prescribe hand thinning treatments in lieu of mechanical treatments for stands with less than 50 percent canopy cover – this would result in 508 acres of mechanical thinning treatments which would be converted to hand thinning treatments. Alternative B would not implement any mechanical treatments.

Mechanical thinning treatments would also vary in intensity between action alternatives. Table 43 displays the comparison of average post-treatment stand attributes for mechanical thinning treatments by alternative.

Table 43. Comparison of Average Post-Treatment Stand Attributes for Mechanical Thinning Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-treatment Relative Stand Density	Post-treatment QMD	Average Increase in Diameter
A	177	-57%	73%	147	-25%	38	17.7	23.2%
B	513	0%	100%	206	0%	61	14.6	0.0%
C	255	-43%	100%	173	-15%	46	16.6	14.5%
D	292	-37%	100%	187	-8%	51	15.2	5.0%
E	183	-56%	73%	148	-25%	38	17.7	22.1%

Mechanical thinning treatments under alternatives A and E are very similar in effects; while both alternatives would implement similar ranges in canopy cover retention for CWHR types and RHCAs, alternative A would generally retain more intermediate-sized trees, and remove more small diameter sized trees. Alternative E would include slightly more removal of intermediate-sized trees and correspondingly slightly more retention of small diameter-sized trees. These differences, on average, are very slight and would only be discernable on an individual stand basis of a portion of the stands treated.

Under both alternatives A and E, average post-treatment stand conditions would meet desired conditions for stand structure and density, create open-canopy stands, and enhance growth of residual trees into larger diameter classes, thereby promoting the development of later seral stand conditions.

Alternatives C and D would result in relatively less reduction in stand densities and average post-treatment conditions would not meet desired basal area or relative stand density conditions; however this would vary by individual stand conditions. Diameter limits and canopy cover constraints associated with these alternatives limit the capacity and efficacy of these alternatives in meeting the purposes and needs for forest health. As a result, on average, these alternatives maintain more closed-canopy conditions resulting in less opportunity to enhance heterogeneity and relatively less growth and development of later seral conditions. In particular, treatments under alternatives C and D would maintain closed-canopy mid-seral stand conditions resulting in a homogenous landscape condition which is less diverse and resilient to forest disturbances such as drought, insects and disease, and trends such as increasing fire severity (Miller et al. 2009) and climate change (Millar et al. 2007, North and Hurteau 2009, Battles et al. 2008).

Under alternative B, stands would develop untreated which would result in increasing densities and increased risk for tree mortality and high severity effects from potential disturbances such as drought, fire, and insect and disease occurrences.

These changes in density would also have an effect on species composition. Table 44 displays the percent change in shade-intolerant species composition as a result of hand thinning and mechanical thinning treatments.

Table 44. Comparison of Average Post-Treatment Percent Change in Desired Shade-intolerant Species Composition by Alternative and Treatment

Alternative	Average Post-Treatment Percent Change in desired Shade-Intolerant Species Composition			
	Hand thinning Treatments	Mechanical Thinning Treatments	Group Selection Treatments	Total
A	1.2%	6.7%	26.9%	12.2%
B	0.0%	0.0%	0.0%	0.0%
C	1.2%	1.6%	0.0%	1.4%
D	1.2%	1.3%	0.0%	1.3%
E	1.2%	6.7%	13.7%	7.9%

Alternative A would provide for the greatest increase in shade-intolerant species composition as a result of the lower upper diameter limits desired species as well as the preferentially retention of desirable shade-intolerant species under 30 inches diameter within group selection units. Alternative E would also provide a notable increase in shade-tolerant species composition as canopy cover retention and upper diameter limits in mechanical thinning treatments provide the greatest opportunity to preferentially remove relatively larger amounts of shade-tolerant in order to retain desired shade-intolerant species.

Alternatives C and D provide for little increase in shade-intolerant species composition. In alternative C, the 12 inch upper diameter limit reduces the capacity to improve species composition by eliminating the opportunity to remove shade-tolerant trees greater than 12 inches that would compete with shade-intolerant trees. Similarly, under alternative D, the 50 percent canopy cover retention limits, the 20 inch upper diameter limit, and the 15 to 25 percent retention of untreated areas in the stand reduces the capacity to improve species composition by limiting the opportunity to remove shade-tolerant trees that would compete with shade-intolerant trees. Alternative B would not provide opportunities to improve species composition.

For further discussion on stand density, desired and existing conditions for forest structure and health, and climate change with regards to the treatments proposed under the alternatives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Table 45. Comparison of Average Post-Treatment Fuel and Potential Fire Behavior Attributes for Mechanical Thinning Treatments by Alternative

Alternative	Post-Treatment Surface Fuel Load (tons per acre)	Post-Treatment Flame Length (feet)	Post-Treatment Canopy Base Height (feet)	Post-Treatment Probability of Torching	Post-Treatment Crowning Index (mph)	Post-Treatment Fire Type	Post-Treatment Percent Basal Area Mortality
A	12	< 1	22	Incidental	30	Surface Fire	12
B (No Action)	28	24 - 25	6	77%	18	Passive Crown Fire	84
C	12	< 1	15	Incidental	23	Surface Fire	13
D	12	2 - 3	11	28%	20	Surface Fire	19
E	12	< 1	22	Incidental	30	Surface Fire	12

Under all action alternatives, fuel loading and potential fire behavior would be reduced through a combination of treating surface fuels, ladder fuels, and canopy fuels with varying degree. As shown in Table 45, all action alternatives would improve fuel conditions and potential fire behavior relative to the existing condition which would be expected to persist under alternative B.

Alternatives A and E would provide for the greatest reduction in fuels and fire behavior which include the greatest reduction in canopy fuels – as a result these alternatives have the highest crowning index, the wind speed which would be required for fire to move from crown to crown of individual trees. In both alternatives A and E, flame lengths, canopy base height, torching, crowning index, fire type, and basal area mortality meet desired conditions.

Alternatives C would also meet desired conditions by reducing primarily surface fuels and ladder fuels with some reduction of canopy fuels depending on individual stand conditions.

Alternative C would not reduce canopy fuels as much as alternatives A or E and as a result would have a lower predicted average crowning index – meaning that tree crowns would be relatively closer more indicative of closed-canopy stand conditions. The reduction of stand density would be, in part, due to greater tree mortality incurred through follow-up prescribed fire treatments under alternative C relative to alternatives A and E.

Relative to all action alternatives, alternative D would reduce primarily surface fuels and ladder fuels, with limited amounts of canopy fuel reduction. Alternative D provides the smallest reduction in ladder fuels and potential fire behavior reduction because these mechanical treatments retain a minimum of 50 percent canopy cover, and maintain 15 to 25 percent of the stand in an untreated condition. These factors contribute to higher flame lengths, larger probabilities of torching, and lower crowning indices relative to the other action alternatives.

While all action alternatives met the fuel objectives in terms of reducing potential fire behavior, research indicates that models used to predict potential fire behavior may, in some instances, under predict potential for crown fire behavior (Scott and Reinhardt 2001, Cruz and Alexander 2010). These models are best interpreted in a relative rather than an absolute sense. As a result, while all alternatives are predicted to meet desired conditions, alternatives that create lower canopy covers and reduce stand density (alternatives A and E) would have the greatest potential for limiting crown fire potential relative to alternatives that maintain higher canopy covers and implement lower diameter limits, such as alternatives C and D. This thought is consistent with the latest research on simulating fire and forest dynamics for landscape fuel treatment projects in the Sierra Nevada (Collins et al. In press). Collins et al. (In press) noted that this trend is substantiated by Safford et al. (2009) who found that lighter intensity, hand thinning treatments did not reduce fire severity as effectively as more intensive treatments, particularly in areas where slope may influence fire behavior. In addition, Fule et al. (2006) noted that while treatments with lower diameter limits (such as alternatives C and D) could reduce potential fire behavior, such constraints were found to hinder restoration of forest structure that is better adapted to an active fire regime. Consequently, alternatives A and E would better meet fuel reduction objectives and re-align forest health and resiliency with an active fire disturbance regime than alternatives C and D. For further discussion regarding fuels reduction treatments, desired conditions for forest health, and the interaction between fuels reduction and forest health objectives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A and B.

In general, the greatest difference in vegetation and fuels treatments between alternatives lies in the mechanical thinning treatments. Amounts of prescribed fire treatments and mastication treatments are identical throughout all action alternatives, and amounts of hand thinning treatments between alternatives A, C, and E are similar. Under alternative D, approximately 508 acres of additional hand thinning treatments would be implemented in lieu of mechanical treatments for stands with less than 50 percent canopy cover. Table 47 displays the comparison of mechanical treatments by alternative using the measurement indicators.

Table 46. Comparison of Mechanical Treatments by Alternative using Measurement Indicators

	Stand Structure & Density				Species Composition	Landscape Structure and Heterogeneity		Fuels and Potential Fire Behavior		
Alternative	Post-Treatment Percent Retention of trees > 20 inches dbh	Post Treatment Basal Area < 150 sq ft. per acre	Post-Treatment Relative Stand Density = 25-40%	Relative Stand Density > 60 % at 20-30 years	Post Treatment % Shade intolerant Species Composition improved	Quadratic Mean Diameter @ 30 yrs > 24 inches dbh (CWHR Size class 5)	Canopy Cover @2010	Post Treatment Flame Lengths less than < 4 ft	Post Treatment Fire type = Surface fire	Post Treatment Basal Area mortality < 25%
A	All stands would retain 73-100% of trees >20"	68% of stands would meet desired conditions	68% of stands would meet desired conditions	7% of stands would exceed the threshold	61% of stands would improve species comp	25% stands would grow into CWHR 5 in 30 years	50% open canopy stands, 50%closed canopy stands	100% of stands meet desired condition	100% of stands would meet desired conditions	100% of stands would meet desired conditions
B	All Stands would retain 100% of trees >20" dbh	17% of stands would meet desired conditions	14% of stands would meet desired conditions	77 - 89% of stands would exceed the threshold	No improvement across any stand	4% of stands would grow into CWHR 5 in 30 years	18% open canopy stands, 82% closed canopy stands	0% of stands meet desired condition	4% of stands would meet desired conditions	0% of stands would meet desired conditions
C	All Stands would retain 100% of trees >20" dbh	38% of stands would meet desired conditions	38% of stands would meet desired conditions	25 - 32% of stands would exceed the threshold	35% of stands would improve species comp	7% of stands would grow into CWHR 5 in 30 years	32% open canopy stands, 68% closed canopy stands	96% of stands meet desired condition	96% of stands would meet desired condition	96% of stands would meet desired condition
D	All Stands would retain 100% of trees >20" dbh	14% of stands would meet desired conditions	14% of stands would meet desired conditions	32 - 43% of stands would exceed the threshold	21% of stands would improve species comp	7% of stands would grow into CWHR 5 in 30 years	18% open canopy stands, 82% closed canopy stands	96% of stands meet desired condition	96% of stands would meet desired condition	86% of stands would meet desired conditions
E	All stands would retain 73-100% of trees >20"	61% of stands would meet desired conditions	61% of stands would meet desired conditions	7% of stands would exceed the threshold	61% of stands would improve species comp	39% stands would grow into CWHR 5 in 30 years	43% open canopy stands, 57% closed canopy stands	100% of stands meet desired conditions	100% of stands would meet desired conditions	100% of stands would meet desired conditions

Direct and Indirect Effects: Mastication Treatments

Mastication treatments would be similar in scale and intensity for all action alternatives. Mastication treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Prescribed Fire Treatments

Prescribed fire treatments would be similar in scale and intensity for all action alternatives. Prescribed fire treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Group Selection Treatments

Group selection treatments would occur under action alternatives A and E; however, these treatments would vary primarily in scale. Alternative A would implement 284 acres of group selection whereas alternative E would implement 326 acres of group selection. Group selection units would be located primarily in CWHR 4M stands and would be used to convert to enhance shade-intolerant species composition and promote regeneration of a new age class within areas dominated by shade-tolerant species such as white fir. Group selection under alternative A differs from similar treatments in alternative E by preferentially retaining a portion of the shade-intolerant species as leave trees and structural diversity. Table 47 displays the differences in group selection treatments by alternative.

Table 47. Comparison of Average Post-Treatment Stand Attributes for Group Selection Treatments by Alternative

Alternative	Post-Treatment Number of Trees per acre > 20 inches	Average Reduction of Trees per Acre	Post-Treatment Minimum Retention of Trees >20 inches	Post-Treatment Basal Area per Acre	Average Reduction of Basal Area per Acre	Post-Treatment Relative Stand Density	Post-treatment QMD
A	8	-91%	42%	50	-74%	12	28.6
B	Group Selection treatments would not occur						
C	Group Selection treatments would not occur						
D	Group Selection treatments would not occur						
E	5	-92%	24%	37	-82%	9	30.2

Over the long-term of 20 to 30 years, regeneration of young trees and shrub species in the group selection treatments would be susceptible to higher flame lengths, lower canopy base heights, and higher probabilities of torching which would likely lead to passive crown fire behavior resulting in higher basal area mortality – yet, the potential for this type of fire behavior would be restricted to the ½ to 2 acre group selection units. Early seral stands, by nature of their inherent structure, are susceptible to these risks (Thompson et al. 2007); however the scattered, disparate arrangement and small scale of group selection treatments strategically located within DFPZ and Area thinning mechanical thinning treatments mitigate these risks. In addition, the strategic location of group selections within these mechanical fuel treatments would provide greater opportunities for initial attack fire suppression tactics.

Group selection treatments in both action alternatives A and E would enhance landscape structure, heterogeneity and species composition by creating early seral conditions (characterized by CWHR 1 and

2) that are favorable for the establishment, growth, and development of a new age class of shade-intolerant species. Under alternatives B, C, or D, Group selection treatments would not occur and these benefits would not be realized.

Direct and Indirect Effects: Herbicide, Borax, and Noxious Weed Treatments

Herbicide, Borax, and Noxious weed treatments would occur in similar scale and intensities under alternatives A and D. These treatments would limit the spread of noxious weeds and the infection and spread of *Heterobasidion* root disease. These treatments would result in beneficial effects to forest vegetation by maintaining and enhancing understory species composition of native plant communities and reducing tree mortality and shift in species composition of forested stands.

Alternatives C and E would not implement herbicide, borax, or noxious weed treatments, but would implement site disturbing activities such as hand thinning, mechanical thinning, prescribed burning, mastication, and group selection treatments which would: 1) create disturbed areas where noxious weeds could be introduced or spread and 2) create tree stumps suitable for infection and spread of *Heterobasidion* root disease. This could result in potential negative effects to the native species composition of forested stands and directly result in tree mortality from *Heterobasidion* root disease. Considering that *Heterobasidion* root disease persists in infected sites for as long as fifty years, this could have long-term negative effects for forested stands.

Alternative B would not implement herbicide, borax, or noxious weed treatments and would not implement site disturbing activities. However, the potential for spread of noxious weeds and the negative effects on native understory vegetation would persist. The potential for *Heterobasidion* root disease would be negligible since stump surfaces suitable for *Heterobasidion* infection would not be created.

For further information regarding Heterobasidion rood disease and treatments, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix D.

Direct and Indirect Effects: Watershed Improvements

Watershed improvement treatments would be similar in scale and intensity for all action alternatives. Watershed improvement treatments would not occur under alternative B, the no action alternative.

Direct and Indirect Effects: Air Quality

Burning would occur in hand thinning, mechanical thinning, prescribed fire, group selection, and noxious weed treatments which are displayed on project maps. Within mechanical thinning and group selection treatments, biomass removal would be used to minimize potential ladder fuels that would be underburned. Total emissions by alternative are listed in Table 48.

Table 48. Predicted Emissions for All Alternatives

Alternative	Total PM_{10} Emissions (tons)	Total $PM_{2.5}$ Emissions (tons)	Total PM CH_4 Emissions (tons)	Total CO Emissions (tons)	Total PM CO_2 Emissions (tons)	Total NMHC Emissions (tons)	Total VOC Emissions (tons)	Total Vehicle Emissions[a] (tons)
A	183	161	133	1813	28738	97	237	38
B	0	0	0	0	0	0	0	--
C	181	160	132	1800	28533	96	234	12
D	211	185	156	2096	33251	113	304	11
E	183	161	133	1815	28768	97	238	50
Wildfire	835	751	197	4425	89925	637	1413	--

Note: PM = particulate matter; CH4 = methane; CO2 = carbon dioxide; NMHC = non-methyl hydrocarbon; VOC = volatile organic compound
a. Vehicle Emissions = emissions (dust) from vehicles used during implementation. Assumes an 80 percent reduction in emissions from road surfaces (1.2 pounds per vehicle mile) through implementation of standard road watering procedures. Vehicle miles assumes 20-mile average round trip on dirt roads per load; number of trips determined by data contained in the economic analysis.
b. Wildfire assumes emissions for a 5,593-acre wildfire in the mixed conifer forest type.

All burning would be completed under approved burn and smoke management plans. These smoke management plans would describe Northern Sierra Air Quality Management District regulations for burning activities and associated smoke management, and would detail an implementation schedule, the responsible parties, and monitoring and reporting requirements. Piles would be constructed to minimize mixing of soil and burned under weather conditions that would allow efficient combustion. In terms of actual acres of underburning and pile burning implemented, all treated units would be evaluated after treatment to determine if surface fuels were meeting desired conditions. The units meeting desired conditions may not be burned, thereby decreasing total burned acres and emissions. Implementation of underburning, pile burning, and burning of landing piles would occur over five to seven years as weather conditions and resource availability permit. As a result, annual smoke production from burning activities wou1d result in particulate matter emissions less than the threshold of 100 tons per year for a general conformity analysis.

Implementation of fuel treatments in the Keddie Ridge Project could reduce emissions from future wildfires by reducing their size and intensity. Alternative B, the no action alternative would not implement any emission producing activities; however, for comparison, Table 48 displays emissions assuming a 5,593-acre wildfire burned those acres that would not be treated under the action alternatives. In conjunction with mechanical fuel treatments, underburn activities are expected to reduce accumulated surface and ladder fuels and reduce the “unacceptable risk of wildfire” and related uncontrollable emissions as described in U.S. Environmental Protection Agency (2006).

Due to the dispersed nature of the burn piles, the near complete combustion of piled material, and the control over ignition times to favor good smoke dispersion, it is not anticipated that pile burning would substantially impact the local communities. During underburn and pile burn activities, smoke would likely be visible from Indian Valley and Lake Almanor but would move northeast towards Highway 395, Susanville, and the Honey Lake Valley during the day. At night, inversion could reduce visibility in Indian Valley until late morning when the inversion layer typically lifts (Schoeder and Buck 1974).

Harvesting, biomass removal, and road work would be completed primarily with diesel-powered equipment, including feller bunchers, skidders, tractors, graders, and trucks. This equipment would be inspected to determine equipment (spark arresters, fire extinguishers, and firefighting equipment) compliance with fire safety standards. The condition of emissions control systems of various pieces of equipment would vary by age, maintenance, manufacturer, and past use.

Dust emissions would be spread out during the mechanical treatment implementation period of approximately five years. Dust would be mitigated by road watering and other standard management practices described in contracts (Provisions T-806 and B-5.3).

Serpentine-based soils do occur within the project area in the vicinity of Round Valley Reservoir, and these soils would likely be disturbed by project implementation activities. California Air Resources provide regulations concerning operations on serpentine based soils. Agriculture operations and timber harvesting is exempt under California Air Resource regulations (2002-07-029 Asbestos ACTM for Construction, Grading, Quarrying, and Surface Mining Operations, Section 93105, (c)3; http://www.arb.ca.gov/toxics/atcm/asb2atcm.htm) with the exception of road building. The geology report provides additional treatment design criteria to mitigate exposure to naturally occurring asbestos. Dust would be mitigated by road watering and other standard management practices described in contracts (Provisions T-806 and B-5.3) Activities proposed under action alternatives would follow Region 5 interim draft direction for naturally occurring hazardous minerals as described in the November 12, 2010 Draft Guidance for assessing naturally occurring hazardous minerals in travel management subpart A and other planning documents. These serpentine soils would be mapped and monitored for the presence of naturally occurring asbestos. If naturally occurring asbestos is not present above threshold levels, project implementation activities would occur as planned and would include standard management practices for dust mitigation as discussed above. If naturally occurring asbestos is present in levels above threshold, mitigation measures such as 1) specifying winter season for operations that would minimize dust emissions, 2) specifying respiratory protection equipment and soil moisture conditions to minimize dust exposure, 3) altering treatment type such as converting mechanical thinning to hand thinning in conjunction with other aforementioned mitigations, and/or 4) dropping affected units from implementation.

Cumulative Effects

The cumulative effects of all alternatives on vegetation diversity as examined through changes in CWHR size class and density are displayed in Table 49. While existing conditions serve as the baseline for cumulative effects of past activities within the analysis area, present and future projects would have a minor cumulative effect on change in vegetation throughout the analysis area. These effects are best represented by the no action alternative, alternative B which would not implement any of the treatments proposed under the action alternatives. Alternative B would largely maintain existing conditions of dense, closed-canopy, mid-seral stands which are susceptible to 1) extreme potential fire behavior due to heavy accumulations of surface fuels in combination with a homogeneous continuity of ladder and canopy fuels, and 2) drought, insect and disease driven tree mortality as a result of high stand densities and increased inter-tree competition. It is important to recognize that while alternative B maintains existing conditions, these forested landscapes are dynamic, and maintenance of such homogenous conditions would be relatively unstable and pre-dispose this landscape to rapid change due to high severity disturbance events such as fire, drought, and insect and disease occurrences. Such events like the Moonlight and Antelope Fires of 2007 underscore the scale and severity of disturbances which can occur.

Action alternatives would implement proposed treatments which would further alter the diversity of vegetation on National Forest System Lands within the analysis area and these cumulative effects would vary in intensity and scale dependent on alternative.

Alternatives A and E implement treatments and prescriptions which, in general, allow greater opportunity to create more open canopy, mid-seral stands while maintaining closed-canopy, late seral stands which serve as habitat for late seral dependent species. These effects are displayed by the greater reductions in CWHR 4M and 4D, the greater increase in CWHR 4P, and the maintenance of CWHR 5M. Alternatives A and E also provide for the creation of early seral habitat as displayed by the greater increases in CWHR 1 and 2 size classes. The creation of early seral habitat would provide favorable conditions for the establishment, growth, and development of a new age class of shade-intolerant species which would enhance landscape diversity; however, this effect would come from the conversion of primarily mid-seral stands (CWHR 4) and a minor portion from late-seral stands in CWHR size class 5. Approximately 15 to 20 percent of group selection treatments (38 to 66 acres) would occur in CWHR size class 5 under alternatives A and E, respectively.

Table 49. Comparison of Cumulative Effects: Percent Change of CWHR Size Class and Density Across NFS lands within the Analysis Area by Alternative

CWHR Size Class	CWHR Density	Existing Acres	A	B	C	D	E
CWHR 1 & 2 (Seedlings & Saplings)	All	1321	**27.0%**	**5.5%**	**5.5%**	**5.5%**	**30.2%**
CWHR 3 (Pole-sized trees)	Dense	492	**-16.5%**	**-0.5%**	**-16.5%**	**-16.5%**	**-16.5%**
	Moderate	1270	**-7.3%**	**-0.2%**	**-7.3%**	**6.0%**	**-7.3%**
	Open	1440	**12.1%**	**0.3%**	**12.1%**	**0.3%**	**12.1%**
	Sparse	425	0.0%	0.0%	0.0%	0.0%	0.0%
CWHR 4 (Small Trees)	Dense	6611	**-11.6%**	**-2.5%**	**-11.6%**	**-11.6%**	**-11.6%**
	Moderate	16230	**-7.8%**	**-1.1%**	**0.5%**	**2.6%**	**-8.4%**
	Open	7537	**22.3%**	**3.2%**	**7.8%**	**3.2%**	**20.3%**
	Sparse	1543	0.0%	0.0%	0.0%	0.0%	0.0%
CWHR 5 (Medium/Large Trees)	Dense	5057	**-7.6%**	**-4.8%**	**-7.6%**	**-7.4%**	**-7.6%**
	Moderate	6998	**4.7%**	**3.2%**	**5.2%**	**4.6%**	**4.3%**
	Open	1102	0.0%	0.0%	0.0%	0.0%	0.0%
	Sparse	102	0.0%	0.0%	0.0%	0.0%	0.0%
Non-Forest Vegetation Types	n/a	4719	0.0%	0.0%	0.0%	0.0%	0.0%

The treatments employed under alternatives A and E would best meet desired conditions for the Fuels Reduction and Forest Health purposes and needs as described in chapter 1. Particularly, the diverse prescriptions that would be implemented under alternative A would enhance heterogeneity at multiple scales - both the stand and landscape scale – while reducing fuels and potential fire behavior and improving forest stand structure, species composition, and forest health, in general. Alternative A would best meet desired conditions for both the fuels reduction and forest health objectives as described in chapter 1 and would re-align forest structure, composition, and heterogeneity with an active fire disturbance regime which would enhance forest resiliency to trends presented by climate change.

Alternatives C and D implement treatments and prescriptions which, in general, maintain relatively greater closed-canopy conditions in mid-seral and late seral stands. These effects are displayed by the maintenance of moderate canopy cover in CWHR size classes 4 and 5, and the relatively smaller increases in open canopy stands in CWHR size classes 4 and 5. In addition, there would be no cumulative addition in early seral conditions as displayed by CWHR size classes 1 and 2.

Alternatives C and D would meet fuel reduction purposes and needs to varying degrees. Alternative C would allow for greater canopy cover reduction and treat more acres relative to alternative D, which would maintain canopy covers greater than 50 percent and would not implement treatments within 15 to 25 percent of the stands, which limits the capacity to affect ladder fuels. While treatments under alternatives C and D could enhance structural diversity at the stand level depending on individual stand conditions, the capacity of these treatments to enhance heterogeneity and improve species composition are limited by the upper diameter limits and canopy cover restrictions associated with the treatments and prescriptions respective to each alternative. This tempers the efficacy of alternatives C and D to enhance heterogeneity and species composition at the landscape scale. Consequently, this also reduces the effectiveness of alternatives C and D to meet desired conditions under the forest health purpose and need.

For further discussion regarding fuels reduction, forest health, and landscape heterogeneity, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A, B, and C.

Cumulative Effects: Air Quality

Potential cumulative emissions of smoke, dust, and greenhouse gases for all alternatives are displayed in Table 50. Action alternatives would cumulatively contribute to emissions within the analysis area primarily by contributing to short-term direct effect primarily through underburning and pile burning associated with project activities. All burning would be completed under approved burn and smoke management plans, and the cumulative total amount of emissions would be spread over project implementation timelines of 5 to 7 years. As a result, annual emissions wou1d be less than the threshold of 100 tons per year for a general conformity analysis.

Table 50. Predicted Cumulative Emissions from NFS Lands within the Analysis Area that Would Occur Over A 7 Year Period

Alternative	Total PM_{10} Emissions (tons)	Total $PM_{2.5}$ Emissions (tons)	Total PM CH_4 Emissions (tons)	Total CO Emissions (tons)	Total PM CO_2 Emissions (tons)	Total NMHC Emissions (tons)	Total VOC Emissions (tons)
A	340	298	255	3385	53741	184	536
B	157	136	122	1572	25003	87	299
C	339	296	254	3372	53536	183	533
D	368	322	278	3668	58255	200	602
E	340	298	255	3387	53772	184	536
Wildfire	1296	1166	306	6868	139556	988	2192

Note: PM = particulate matter; CH4 = methane; CO2 = carbon dioxide; NMHC = non-methyl hydrocarbon; VOC = volatile organic compound

b. Wildfire assumes emissions for an 8,336-acre wildfire in the mixed conifer forest type that would occur within an annual fire season.

Action alternatives and present and future proposed vegetation management projects would implement treatments that would reduce the potential for future related uncontrollable smoke/greenhouse gas emissions from wildfires by reducing available fuels within the project area. These projects could contribute to reducing or limiting emissions from future wildfires by promoting desirable fuel conditions across the landscape and reducing wildfire size and/or intensity. Alternative B, the no action alternative would not implement any emission producing activities; however would also not improve fire hazard or fuel reduction to desirable levels within the project area. Table 50 displays emissions assuming an 8,336-acre wildfire burned those acres that would not be treated under present, proposed, or future vegetation management projects. In combinations, these projects are expected to reduce accumulated surface and ladder fuels and reduce the “unacceptable risk of wildfire” and related uncontrollable emissions as described in U.S. Environmental Protection Agency (2006).

Climate Change Considerations

Forests play a major role in the carbon cycle. The carbon stored in live biomass, dead plant material, and soil represents the balance between CO2 absorbed from the atmosphere and its release through respiration, decomposition, and burning. Over longer time periods, indeed as long as forests exist, they will continue to absorb carbon. Complete quantifiable information about project effects on global climate change is not currently possible and is not essential to a reasoned choice among alternatives. However, based on climate change science, the relative effects of these treatments on the ecosystem carbon cycle are recognized. The positive long-term effects on the carbon cycle of proposed fuel reduction treatments are a good example of this. Given the anticipated increase in large wildfires in California (Calif. Climate Action Team 2009), the action alternatives propose beneficial fuel reduction treatments which could contribute to reducing or limiting emissions, size, and intensity of potential future wildfires.

In addition, action alternatives that implement treatments which meet desired conditions for forest health would enhance growth of large residual trees, reduce stand densities, and improve stand and landscape resiliency to forest disturbances such as insect outbreaks greater than endemic levels and large scale high severity fire, thereby enhancing the potential for carbon sequestration within the project area. These treatments would have long-term beneficial indirect effects which would contribute to beneficial cumulative effects on air quality. For more information regarding climate change trends and how these interact with the proposed alternatives, please refer to the Forest Vegetation, Fuels, Fire, and Air Quality Report, Appendix A.

Compliance with the Forest Plan and Other Direction

All action alternatives were designed to fully comply with the Plumas National Forest LRMP (USDA 1988) as amended by the Herger-Feinstein Quincy Library Group FSEIS and ROD (USDA 1999a, b; USDA 2003a, b) and the Sierra Nevada Forest Plan Amendment FSEIS and ROD (USDA 2004a, b). All prescriptions comply with table 2 (page 69) of the Sierra Nevada Forest Plan Amendment ROD (USDA 2004b) which provide the standards and guidelines applicable to the HFQLG pilot project area for the life of the pilot project. In addition, prescriptions under all action alternatives are designed to comply with the National Forest Management Act (NFMA) of 1976.

Wildlife – Terrestrial and Aquatic

Introduction

This section presents a summary of the biological assessment / biological evaluation (BA/BE) for the Keddie Ridge Hazardous Fuels Reduction Project and includes complete discussions of possible effects of the proposed project and alternatives on Federal Threatened and Endangered species, Federal Proposed species, Forest Service Sensitive species and Management Indicator Species (MIS). The BA/BE and MIS report (and appendices) are on file at the Mt. Hough Ranger District office and available upon request.

Threatened and Endangered Species

Those species listed under the Federal Endangered Species Act. Threatened species are likely to become endangered throughout all or a significant portion of their range (16 United States Code [USC] 1532).

Endangered species are in danger of extinction throughout all or a significant portion of their range (16 USC 1532).

Candidate Species

A Candidate species is a candidate for listing as a Proposed species. The U.S. Fish and Wildlife Service recently changed its policy on Candidate species—the term "Candidate" now strictly refers to species for which the service has enough information on file to warrant or propose listing the species as Endangered or Threatened.

Forest Service Sensitive Species

Those species, generally Federal Candidates for listing or Species of Concern, that have been designated by the Forest Service as needing special management attention because of viability concerns. The Forest Service manages for these species to ensure they will not require listing as Threatened or Endangered.

Management Indicator Species (MIS)

The MIS are used in project analysis because it is believed their population changes indicate whether management activities are having an effect on the viability and diversity of animal and plant communities. There is one MIS listed as Forest Service Sensitive species—the California spotted owl. This species is addressed in the "Forest Service Sensitive Terrestrial Species" section of this EIS.

Analysis Framework

Guiding Regulations

The Keddie Ridge Project is designed to fulfill wildlife management direction specified in the National Forest Management Act of 1976 and the 1988 Plumas National Forest Land and Resource Management Plan (PNF LRMP), as amended by the 1999 Record of Decision on the Herger-Feinstein Quincy Library Group (HFQLG) final environmental impact statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental EIS (USDA 1988, 1999b, 2004a,b). Additional management direction for Threatened, Endangered, Candidate, Sensitive, Management Indicator, and migratory bird species on the Plumas National Forest can be found in the following documents:

- Code of Federal Regulations (23, 36, 50 CFR)
- Forest Service Manual and Handbooks (FSM/H 1200, 1500, 1700, 2600)
- Endangered Species Act of 1976
- National Environmental Policy Act (NEPA) of 1969
- National Forest Management Act of 1976
- USDA Forest Service Region 5 Best Management Practices
- Regional Forester (Region 5) Sensitive Animal Species List (June 10, 1998), updated October 2007
- Bald and Golden Eagle Protection Act of 1940
- MIS Analysis and Documentation in Project-Level NEPA, R5 Environmental Coordination (2006)
- Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment ROD (2007)
- Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report (2008)
- Migratory Bird Treaty Act of 1918

- Memorandum of Understanding between the US Department of Agriculture Forest Service and the US Fish and Wildlife Service to promote the conservation of migratory birds (2008)

Effects Analysis Methodology

Geographic Area Evaluated for Impacts on Wildlife

Aquatic Wildlife

The “aquatic wildlife species analysis area” geographic boundary was delineated based on the potential direct, indirect, and cumulative effects on aquatic resources. The analysis area for aquatic wildlife species is the same as the “Watershed Analysis Area” used for the cumulative watershed effects analysis as described in the “Hydrology and Soils” section of this chapter. All potential direct, indirect, and cumulative effects on aquatic species would occur within the Watershed analysis area.

Terrestrial Wildlife

The “Wildlife Analysis Area” boundary for terrestrial wildlife was delineated based on the potential direct, indirect, and cumulative effects on California spotted owl protected activity centers (PACs), home range core areas (HRCAs), and breeding home range distribution. The average home range of the owl is representative of the home range of other terrestrial species analyzed in this document using similar habitats (CWHR 4M, 4D, 5M, 5D, and 6), and therefore effects to the owl at this spatial scale would be indicative of the effects to other late seral stage species. The wildlife analysis area extends to a point at which no direct or indirect effects would be discernable and would not act cumulatively with other actions. The wildlife analysis area (115,185 acres) extends beyond the Keddie Ridge Project area (which is approximately 103,309 acres). Of these 115,185 acres, 66,040 acres (57 percent) are National Forest System lands and 49,145 acres (43 percent) are private lands within the wildlife analysis area.

Duration of Impacts

The direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bound of the cumulative effects analysis. Cumulative effects are based on past actions that have occurred in the Keddie Ridge Project area since 1979 (for which there is some information available on the effects of wildlife), and carried forward for 50 to 100 years to reflect the potential long-term effects of the proposed Keddie Ridge Project vegetation treatments.

Forest Vegetation

Forest-wide vegetation typing into California Wildlife Habitat Relationships (CWHR) classifications (Mayer and Laudenslayer 1988) was done for the Plumas-Lassen Administrative Study in 2002 (Vestra 2002). This vegetation layer was updated after the Moonlight Fire of 2007, which affected six percent of the wildlife analysis area. The Vestra vegetation map layer, as it is known, did not include thirteen percent (over 14,000 acres) of the analysis area. The HFQLG 2005 Vegetation Mapping Project mapped areas on the forest not covered by Vestra. These two maps were combined in a GIS to provide a complete map of the existing vegetation within the analysis area. All vegetation information is displayed using the CWHR vegetation codes and serves as the baseline acres for analysis. Other sources of information used in the assessment of effects were aerial photos, data generated from common stand exam plots, and field reconnaissance.

Indicator Measures

Indicator Measure: Acres of treatment within riparian habitat conservation areas (RHCAs) and the resulting percent of threshold of concern (TOC) in relation to stream condition. Implementation of ground-disturbing activities in watersheds that are approaching or over the TOC could increase the risk of adverse effects and cumulative watershed effects.

California Spotted Owl—Indicator Measure: Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable California spotted owl habitat.

Northern Goshawk—Indicator Measure: Acres were used as the indicator measure to show the effects of the proposed action and alternatives on changes of availability of suitable northern goshawk habitat.

Mesocarnivores—Indicator Measure: Acres of suitable habitat and habitat connectivity were the indicator measures used to show the effects of the proposed action and alternatives on Pacific fisher and American marten habitat and connectivity.

Affected Environment

Federally Threatened and Endangered Species

A list of Threatened and Endangered species was provided by the “Federal Endangered and Threatened Species that may be affected by Projects in the Plumas National Forest”, updated April 29, 2010, accessed via United States Fish and Wildlife Service (USFWS) county list web page (http://www.fws.gov/sacramento/es/spp_lists/auto_list_form.cfm). Based on this list, and information regarding range of species, presence of species or presence of species suitable habitat within project area, it is determined that the Keddie Ridge Project would have no affect on the two Federally listed species present on the Plumas National Forest. There are no Federally Proposed species identified by the USFWS as occurring on the PNF. Table 51 displays Federally-listed species affects determinations.

Table 51. Federally-Listed Species Affects Determinations

Scientific Name	Common Name	Suitable Habitat in area	Observed in Project area (Y/N)	Finding
Desmoceras californicus dimorphus	Valley Elderberry Longhorn Beetle	No	No	No effect
Rana aurora draytonii	California Red-legged Frog	No	No	No effect

USDA Forest Service R5 Sensitive Species

The Keddie Ridge Hazardous Fuels Reduction Project Wildlife Biological Assessment / Biological Evaluation (BA/BE) (USDA 2011b) provides a discussion of the affected environment for all sensitive wildlife species analyzed for the Keddie Ridge Project. The BA/BE is located in the Keddie Ridge Project record, and the analysis of effects on the species identified in Table 52 is incorporated by reference. The bald eagle, California spotted owl, northern goshawk, American marten, Pacific fisher, and Mountain yellow-legged frog are highlighted in this Keddie Ridge Project EIS because of the potential direct, indirect, and cumulative impacts of the proposed action and alternatives on their habitat.

Table 52. Forest Service Region 5 Sensitive Terrestrial Wildlife Species that Potentially Occur on the Plumas National Forest

Species	Category
Birds	
Bald Eagle (Haliaeetus leucocephalus)	Sensitive
American peregrine falcon (Falco peregrinus anatum)	Sensitive
Northern goshawk (Accipiter gentilis)	Sensitive
California spotted owl (Strix occidentalis occidentalis) [a]	Sensitive
Great gray owl (Strix nebulosa)	Sensitive
Willow flycatcher (Empidonax trailii brewsteri)	Sensitive
Greater sandhill crane (Grus canadensis tabida)	Sensitive
Swainson's hawk (Buteo swainsoni)	Sensitive
Mammals	
Sierra Nevada red fox (*Vulpes vulpes necator*)	Sensitive
American marten (*Martes americana*)	Sensitive
Pacific fisher (*Martes pennanti pacifica*) b	Sensitive
California wolverine (*Gulo gulo luteus*)	Sensitive
Pallid bat (*Antrozous pallidus*)	Sensitive
Townsend’s big-eared bat (*Corynorhinus townsendii*)	Sensitive
Western red bat (*Lasiurus blossevillii*)	Sensitive
Amphibians and Reptiles	
Mountain yellow-legged frog (*Rana muscosa*) b	Sensitive
Foothill yellow-legged frog(*Rana boylii*)	Sensitive
Northern leopard frog (*Rana pipiens*)	Sensitive
Northwestern pond turtle (*Clemmys marmorata marmorata*)	Sensitive
Fish	
Hardhead (*Mylopharodon conocephalus*)	Sensitive

Notes:
a. Plumas National Forest Management Indicator Species

b. Pacific fisher, wolverine, and mountain yellow-legged frog designated as Candidate species for listing under the Endangered Species Act.

Bald Eagle

There is one known nesting territory in the Keddie Ridge Project wildlife analysis area, the Round Valley territory, located on the west side of Round Valley Reservoir. This territory was discovered active as early as 1960 but nest monitoring and productions data was not recorded prior to 1971. Since 1971 nesting chronology has been well documented by monitoring activity conducted by California Department of Fish and Game and U.S. Forest Service biologists. Between 1971 and 2010, the one primary nest tree in this territory has produced a total of 39 fledglings. A Bald Eagle Management Area

(BEMA) was identified for habitat allocation in 1988 (USDA 1988) to provide sufficient nesting and foraging habitat to the breeding eagle pair. It is suspected, based on 39 years of monitoring this site, that the adult eagles are non-migratory, staying within the Bald Eagle Management Area (BEMA) (USDA 1988) year round. When the reservoir freezes up, Indian Valley and Indian Creek, both approximately 2 miles east and south respectively, become important forage areas.

California Spotted Owl

Habitat Use and Management Direction—Habitat suitability standards for the California spotted owl (CSO) have been described in a number of sources, including the California spotted owl (CASPO) Interim Guidelines (USDA 1993a), the 1999 HFQLG Final EIS (USDA 1999a), the 2001 SNFPA final EIS (USDA 2001a), the 2004 SNFPA Final Supplemental EIS (USDA 2004a), and the 2004 SNFPA Record of Decision (USDA 2004b).

Stands suitable for nesting and roosting have (1) two or more canopy layers; (2) dominant and co-dominant trees in the canopy averaging at least 24 inches diameter at breast height (DBH); (3) at least 70 percent total canopy cover (including the hardwood component); (4) higher than average levels of very large old trees; and (5) higher than average levels of snags and downed woody material (USDI 2006). The CWHR size classes 5M and 5D (M = moderate; D = dense) have the highest probability of providing stand structures associated with preferred nesting, roosting, and foraging. The threshold canopy cover value that contributes to or detracts from occurrence and productivity is a value near 50 percent (USDA 2001a, Hunsaker et al. 2002). For the Keddie Ridge Project, all of the CWHR 5M size-density classes are considered spotted owl nesting habitat.

Suitable foraging habitat is found in the same forest types listed above for nesting habitat (CWHR classes 5D and 5M), as well as class 4D (trees 11 to 24 inches DBH with dense canopy (60 to 100 percent), and class 4M (trees 11 to 24 inches DBH and moderate canopy cover between 40 and 59 percent). The stands considered to be suitable for foraging have at least two canopy layers, dominant and co-dominant trees in the canopy averaging at least 11 inches DBH, at least 40 percent canopy closure, and higher than average levels of snags and downed woody material (15- to 30-square-foot basal area in snags, 10 to 15 tons per acre downed woody debris) (Verner et al. 1992). Although canopy cover down to 40 percent is suitable for foraging, it appears to be only marginally so (based on owl occurrence and productivity threshold at around 50 percent canopy cover [ibid.]). In its most recent notice concerning the California spotted owl, the USFWS states that owl foraging habitat “is generally described as stands of trees 30 centimeters (12 inches) in diameter or greater, with canopy cover of 40 percent or greater” (USDI 2006), with no other habitat parameters for foraging habitat described. Thus, there appears to be an element of uncertainty associated with what constitutes foraging habitat. For this Keddie Ridge Project analysis, all class 4M are considered owl foraging habitat. In the red fir type, stands with 30 percent or greater canopy cover should be considered suitable for foraging (USDA 2001a).

Table 53 summarizes the potential acres of suitable spotted owl habitat on National Forest System lands in the wildlife analysis area. Suitable CWHR types (USDA 2001a) are Sierra mixed conifer, white fir, red fir, montane hardwood-conifer, montane hardwood, ponderosa pine, montane riparian, lodgepole pine, and eastside pine.

Table 53. Potential Acres of Suitable Spotted Owl Habitat in the Keddie Ridge Project Wildlife Analysis Area

CWHR Type	Habitat Type	National Forest System Acres in Wildlife Analysis Area
4M	Foraging	18,865
4D	Foraging	7,485
5M	Nesting	9,051
5D	Nesting	5,969
Total	Suitable	41,370

The SNFPA Record of Decision (USDA 2004b) management strategy and direction for the California spotted owl recognizes two land allocations with discretely mapped areas, the nest area, or PAC, and the HRCA. Land allocation direction for HRCAs on the Mt. Hough Ranger District include the 300-acre PAC, plus an additional 700 acres of the best habitat available within a 1.5-mile radius of the activity center for a total of 1,000 acres. The direction in the 2004 SNFPA Record of Decision allows for full implementation of HFQLG Pilot Project activities within HRCAs that are established in the HFQLG Pilot Project area until the conclusion of the HFQLG Act in 2012. When the Pilot Project concludes, management direction associated with the HRCA designations will apply to the Plumas National Forest. Therefore, this analysis assesses the impacts of the proposed action and alternatives on HRCAs and suitable spotted owl habitat.

The comprehensive adaptive management strategy to investigate the effects of fuels treatments and group selection silviculture on California spotted owl viability is referred to as the Plumas-Lassen Administrative Study (PLAS). The Administrative Study is being conducted as a collaborative effort by the Forest Service Pacific Southwest Research Station (at Sierra Nevada Research Center); the Universities of California at Berkeley and Davis; and Point Reyes Bird Observatory to determine the long-term effects from forest management practices on spotted owl, song birds, and small mammals. The study will identify the response of these old-forest-dependent species to changes in vegetation composition, structure, and distribution over space and time. When the PLAS began in 2003, the study areas chosen to collect CSO data were all located on the Plumas National Forest. In 2005, the Lassen Demographic Study Area and Plumas NF Survey Areas were fully integrated to define the overall PLAS project area and provide consistent CSO survey effort across the HFQLG project area.

Portions of four PLAS study areas (SAs) are located in the Keddie Ridge Project analysis area. Study areas SA-2 and SA-3, located in the west and southwest portion of the analysis area, have been surveyed since 2003. SA-7 was added in 2009 to encompass the Empire Project area, a portion of which is located in the southern portion of the wildlife analysis area. The Moonlight and Antelope Complex fire study area was added to the PLAS in 2008 to collect information on the association between CSOs and wildfire. This study area makes up a large portion of the northeastern wildlife analysis area and was surveyed again in 2009. Together, these four PLAS areas take in 33,515 acres (29 percent) of the Keddie Ridge Project analysis area.

Spotted owl surveys have occurred in the wildlife analysis area and project area. In 2006 and 2007 the Keddie Ridge Project area was surveyed (Silva_Environmental 2007) following the Protocol for Surveying for spotted owls in Proposed Management Activity Areas and Habitat Conservation Areas (USDA 1993b). As mentioned earlier, four PLAS study areas fall within a portion (29 percent) of the analysis area. SA-2 and SA-3 have been surveyed from 2003-2010. The Moonlight and Antelope Complex fire study area was surveyed in 2008 and 2009. The Empire Project study area (SA-7) was surveyed in 2009 and 2010. PLAS CSO surveys planned for 2011 will include SA-2, SA-3, and SA-7.

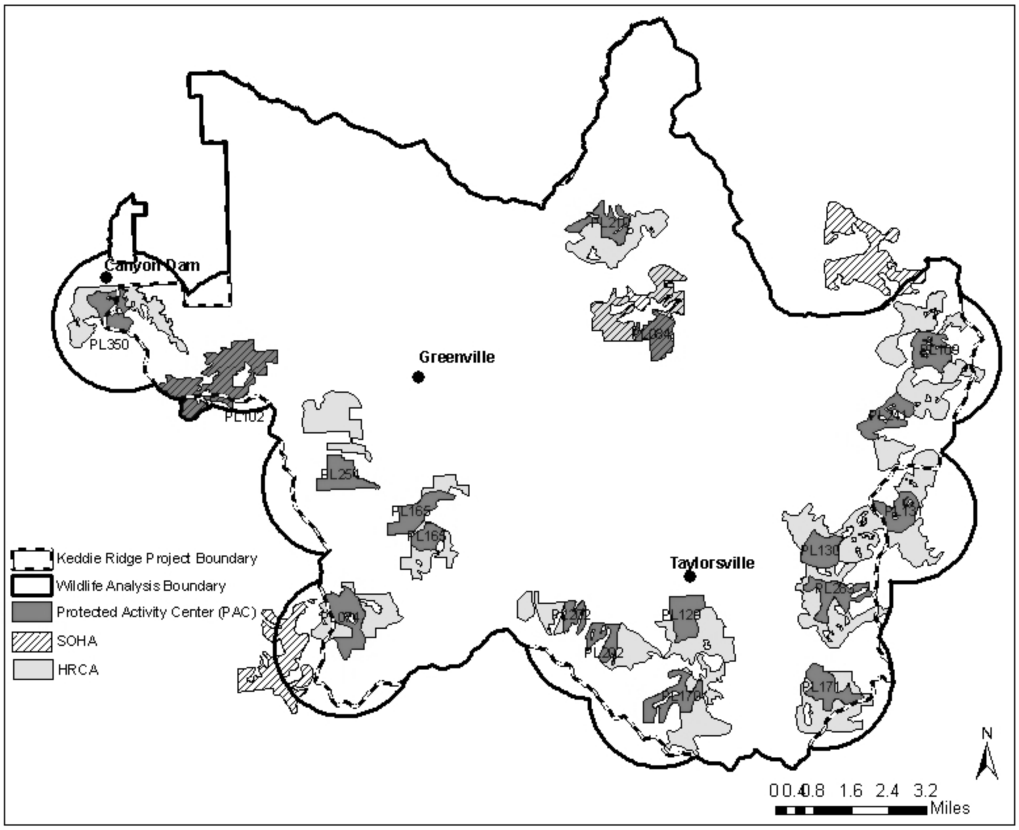


Figure 11. Spotted Owl PACs, SOHAs, and HRCAs in the Keddie Ridge Project Wildlife Analysis Area

Protected Activity Centers and Home Range Core Areas—There are a total of 16 PACs and associated HRCAs in the wildlife analysis area, including all or a portion of four SOHAs (Figure 11). Two spotted owl PACs (PL084, PL131) are located in the project area that could potentially incur direct habitat impacts due to proposed Keddie Ridge Project underburning. Nine associated HRCAs could potentially be directly affected by project activities. The remaining 14 PACs and 6 HRCAs within the wildlife analysis area could be indirectly affected by proposed actions but not directly affected by habitat change as a result of project implementation. Acreages, best detection dates, and current status (based on the most recent surveys to date) for all 16 PACs within the analysis area can be found in Attachment 5 of the Keddie Ridge Project BA/BE.

Areas of Concern—The CASPO Technical Report (Verner et al. 1992) identified Areas of Concern (AOC) within the range and distribution of the California spotted owl. These AOC's are identified simply to indicate potential areas where future problems may limit owl populations and where future problems may be greatest if the owl's status were to deteriorate. Two AOC's identified in the CASPO Report are adjacent to the Plumas National Forest (page 46-49 of the CASPO Report):

- Area of Concern 1: In Lassen County, within the Lassen National Forest and adjacent to the Plumas National Forest. The reason for the concern is that the habitat in this area is discontinuous, naturally fragmented, and poor in quality due to drier conditions and lava-based soils.
- Area of Concern 2: In northern Plumas County, within the Lassen National Forest. The reason for the concern is a gap in known distribution, mainly on private lands, which extends east to west in a band almost fully across the width of the owl's range.

A portion of Area of Concern 2 is located in the wildlife analysis area. The boundaries drawn for this small, narrow section of AOC 2 was based solely on the map provided in the CASPO Report (pg. 47). AOC boundaries in that map, were extremely broad, displayed at the state level scale, and the method used to define boundaries remains unclear (Gould 2008). This roughly 2.25 mile wide band of AOC 2 extends west and northwest of Greenville and lies outside of all proposed activities and would not be directly affected by the Keddie Ridge Project.

Northern Goshawk

The latest published information regarding the goshawk, in terms of population status, distribution, population and habitat trends, and species requirements can be found in the 2001 SNFPA final EIS (USDA 2001a), and in the 2004 SNFPA Final Supplemental EIS (USDA 2004a). A total of 588 northern goshawk breeding territories have been reported from Sierra Nevada National Forests. The Plumas National Forest supports approximately 149 goshawk territories—this is approximately 25 percent of the total number of breeding territories in the Sierra Nevada. These numbers represent goshawks that have been found as a result of both individual project inventories following standardized protocols, as well as nest locations found by other incidental methods. The 1988 Plumas National Forest Land and Resource Management Plan (USDA 1988) calls for a network of 60 nesting territories to provide for the viability of the goshawk. The Plumas National Forest has been developing territories (pre-SNFPA), and now there are 200-acre PACs (USDA 2004a) designated for all newly discovered goshawk breeding sites. Therefore, it is believed that the current density of goshawk territories is contributing to goshawk viability within the Plumas National Forest.

The population trends of northern goshawks in the Sierra Nevada are unknown, although numbers are suspected to be declining due to habitat reductions and loss of territories to timber harvest (Bloom et al. 1986 in USDA 2001a). Based on numerous studies (Bloom et al. 1986; Reynolds et al. 1992; Kennedy 1997; Squires and Reynolds 1997; Smallwood 1998; DeStefano 1998—all citations are in USDA 2001a), there is concern that goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality. Goshawk surveys were conducted in the Keddie Ridge Project wildlife analysis area in 2006 and 2007 by contractors (Klamath Wildlife Resources and MGW Biological) following methodologies for broadcast acoustical surveys as described in the Forest Service Regions 5 Northern Goshawk Survey Protocols

(USDA 2000b). Approximately 453 call points were surveyed twice in each year. Two new goshawk nesting sites were located, and corresponding 200-acre PACS for these territories were established. A total of 8 goshawk PACs are present on National Forest System lands within the wildlife analysis area. All but one (Canyon Dam PAC) fall completely within this boundary.

The northern goshawk requires mature conifers and deciduous forests with large trees, snags, and downed logs; dense canopy closure for nesting and forests with moderately open overstories; open understories interspersed with meadows, brush patches, or other natural or artificial openings; and riparian areas for foraging (USDA 2001a). Recent studies indicate that goshawks typically select canopy closures greater than 60 percent for nesting (Hall 1984, Richter and Calls 1996, Keane 1997). The following affected CWHR types provide high nesting habitat capability: Sierra mixed conifer, white fir, montane hardwood-conifer, lodgepole pine, montane riparian, ponderosa pine, and montane hardwood (CWHR size and density classes 5D, 5M, 4D, 4M). The following CWHR types are rated as providing moderate nesting habitat capability: aspen (4D, 4M, 5D, 5M), red fir (4D, 4M), and eastside pine (5D, 5M, 4D, 4M) (USDA 2001a). There are approximately 40,935 acres of northern goshawk habitat in the wildlife analysis area that provide high nesting habitat capability and an additional 400 acres that provide moderate nesting habitat capability.

Table 54. High and Moderate Capability Northern Goshawk Nesting Habitat in the Wildlife Analysis Area (National Forest System Acres)

CWHR Size/Density Class	Nesting Habitat Capability	National Forest System Acres in Wildlife Analysis Area
4M	High	18,690
4D	High	7,303
5M	High	8,997
5D	High	5,945
Subtotal	**High**	**40,935**
Eastside Pine 4M/4D/5M/5D	Moderate	52
Red Fir 4M/4D	Moderate	348
Subtotal	**Moderate**	**400**
Total	**All Nesting**	**41,336**

Mesocarnivores (Pacific Fisher and American Marten)

The Plumas National Forest has mapped a forest carnivore network across the Forest that consists of scattered known marten sightings, large habitat management areas, and wide dispersal or connecting corridors. The SNFPA standards and guidelines for mesocarnivore habitat do not speak to carnivore networks, allowing each National Forest to decide on the management need for the network. The Plumas National Forest carnivore network is not incorporated into the Forest Plan as a land allocation with standards and guidelines; rather, it is a plan to evaluate impacts of specific projects on habitat connectivity. The management intent of the network is to provide a continuously connected system of habitats focused on the needs of marten and fisher. This corridor is designed to provide a habitat connectivity corridor linking the Tahoe National Forest with the Lassen National Forest. However, there is concern for corridors between these reserves that allow immigration and emigration to maintain healthy populations. Approximately 13,153 acres (3 percent) of the forest carnivore network are within the wildlife analysis area.

Approximately 50 percent of the Plumas National Forest has been systematically surveyed to protocol using track plates and camera stations (Plumas GIS database). To date, there have been no fisher, Sierra Nevada red fox, or California wolverine detections associated with these surveys. On the Plumas National Forest, all but five sightings of marten occurred within the Lakes Basin-Haskell Peak area or around Little Grass Valley Reservoir. The additional five sightings are unverified reports (verified report consists of photograph, tracks, hair sample, and sighting by a reputable biologist).

Portions of the wildlife analysis area have been surveyed several times for mesocarnivores, beginning in the mid-1980's, using both camera stations and track plates. This includes survey efforts by private contractors and Forest Service crews, as well as survey efforts completed under the PLAS small mammal study module. A total of 181 stations have been surveyed with no mesocarnivores detected to date in the wildlife analysis area. The most recent mesocarnivore surveys in the wildlife analysis area were in 2001, for the Moonlight-Jura DFPZ project, and in 2003, for PLAS study areas 9 and 10.

Pacific Fisher—The USFWS completed an initial 90-day review of a petition submitted by 20 groups seeking to list the Pacific fisher as Endangered in Washington, Oregon, and California. After reviewing the best available scientific information, the USFWS found that substantial information indicated that listing the Pacific fisher as Endangered in its West Coast range may be warranted (USDI 2004). After a 12-month status review, the West Coast population of the fisher was designated as a Candidate species by USFWS (ibid), but listing under the Endangered Species Act is precluded by other higher-priority listing actions.

The current distribution of Pacific fisher in California suggests that the once continuous distribution is now apparently fragmented into two areas separated by a distance that greatly exceeds reported fisher dispersal ability. The methods used to detect fisher in numerous survey efforts have failed to detect this species in an area between Mount Shasta and Yosemite National Park (Zielinski et al. 1995). These authors strongly suggest that the absence of fisher detections within this large 240-mile area is because they do not occur in the areas surveyed. This gap in distribution may be effectively isolating the southern Sierra Nevada population from the rest of the fisher range in Northern California. Since 1990 there have generally been no detections or confirmed sightings of fisher within this 240-mile gap of the Sierra Nevada (note: gap equates to 240 miles as identified in the 2001 SNFPA and 260 miles in the April 8, 2004, Federal Register). The Keddie Ridge Project area is located within this "gap."

A joint partnership between the California Department of Fish and Game, Sierra Pacific Industries (SPI), U.S. Fish and Wildlife Service, and North Carolina State University has embarked on a fisher re-introduction effort within the distribution gap discussed above, specifically within SPI's Sterling Management Tract (Butte County). The Forest Service Pacific Southwest Region supports this reintroduction and is actively pursuing partnerships in this effort as a feature of the SNFPA management strategy (USDA 2004a). The SPI lands in which these fisher re-introductions have taken place are approximately 30 miles to the west-southwest of the Keddie Ridge wildlife analysis area. This re-introduction effort began during November 2009 with a total of 13 animals being released onto SPI lands. In 2010 an additional 15 animals were released. Monitoring data also shows the majority of all individual fisher movements since their release have been on private lands (A. Facka, personal communication, March, 2011). Detections of released fishers on public lands (both the Lassen and Plumas National Forests) have primarily been from dispersing males, all of which have been documented returning back to private land (ibid). These male movements onto public lands are not considered relevant from a population establishment standpoint and there is no evidence at this time that any re-introduced individual has permanently moved onto the Plumas National Forest (ibid). In April, 2011 a fisher den established by a released Sterling Tract female, was located on the Lassen National Forest (ibid). Due to reproduction occurring on the Sterling Tract private land, the Forest Service anticipates that additional females may likely den on the Lassen NF in the coming years. Remaining fisher releases for 2011-2012 (8 females, 4 males) will likely occur closer to the Plumas NF than previous releases. Therefore, it is likely that the PNF will also have residing fishers in the next coming years.

The 2004 SNFPA Record of Decision (USDA 2004b) identifies large trees, large snags, large down wood, and higher than average canopy closure as habitat attributes important to fisher. CWHR size classes 4M, 4D, 5M, 5D, and 6 are identified as being important to fisher. A vegetated understory and large woody debris appear important for their prey species. The fisher's preferred forest types include montane hardwood conifer, mixed conifer, montane riparian, ponderosa pine, lodgepole pine, eastside pine, and possibly red fir. The higher-elevation forests are less suitable for fishers because of deep snow packs (USDI 2004). Table 55 displays the acres of denning (CWHR size-density classes 4D and 5D) and foraging (CWHR size-density classes 4M and 5M) habitat present in the wildlife analysis area.

Table 55. Suitable Pacific Fischer Habitat in the Wildlife Analysis Area (NFS Lands)

Habitat Use	CWHR Type	National Forest System Acres
Denning	4D/5D	13,454
Foraging	4M/5M	27,916
Total		41,370

The physical structure of the forest and the prey associated with forest structures are thought to be the critical features that explain fisher habitat use. Powell (in USDI 2004) states that forest type is probably not as important to fishers as the vegetative and structural aspects, and fishers may select forests that have low and closed canopies. Numerous studies (as referenced in the 2004 SNFPA Final Supplemental EIS) indicate that canopy closure over 60 percent is important, and fisher preferentially select home ranges to include high proportions of dense forested habitat. Stands with greater canopy cover, greater variation in tree size, and more hardwood and large snag components provide suitable resting habitat where fishers seek refuge during periodic resting bouts (Zielinski et al. 2010). The fisher's need for overhead cover was well documented in the April 8, 2004, Federal Register. Fishers select stands with continuous canopy cover to provide security cover from predators. The dense canopy increases snow interception, lowers the energetic costs of traveling between foraging sites, and preferred prey species may be more abundant and vulnerable in areas of higher canopy closure (ibid). A number of studies have shown that the fisher avoids areas with little forest cover or significant human disturbance and prefers large areas of contiguous interior forest (ibid.).

American Marten—In the Sierra Nevada, marten are most often found above 7,200 feet, but the species' core elevation range is from 5,500 to 10,000 feet (USDA 2001a). Recent studies (Zielinski 2004, Zielinski et al. 2005), which compared historical and contemporary records of martens, strongly indicates that populations now appear to be discontinuous in the northern Sierra Nevada. This reduction in their distribution is likely the result of several factors, including timber harvest on NFS lands, road building, and trapping.

There are over 40 records of marten observations/detections on the Plumas National Forest dating back to 1975. Only one record, a sighting in 1980 at Taylor Lake, is within close proximity to the wildlife analysis area. Extensive surveys using both soot-covered track plates and baited photo stations have been conducted since the mid-1990s across the majority of the Mt. Hough Ranger District landscape; no marten have been found (documented survey results are on file). Marten have not been detected during surveys conducted within and adjacent to the Keddie Ridge Project area; therefore, it is suspected that marten are likely not present in the wildlife analysis area.

Martens prefer coniferous forest habitat with large-diameter trees and snags, large down logs, moderate-to-high canopy closure, and interspersion of riparian areas and meadows (USDA 2001a). Martens generally avoid habitats that lack overhead cover; rather, they select stands with greater than 40 percent canopy closure for both resting and foraging and usually avoid stands with less than 30 percent canopy closure (ibid.). Foraging areas are generally in close proximity to both dense riparian corridors (used as travel ways) and forest meadow edges and include an interspersion of small (less than 1 acre) openings with good ground cover used for foraging (USDA 2001a).

Important forest types include mature mesic (moderately moist) forests of red fir, Sierra mixed conifer-fir, lodgepole pine, and eastside pine (USDA 2001a). The CWHR size-density classes 4M, 4D, 5M, 5D, and 6 are identified as moderately to highly important for the marten (ibid.). The red fir zone forms the core of marten occurrence in the Sierra Nevada (ibid.). Table 56 displays the acres of denning (4D, 5D) and foraging (4M, 5M) habitat present in the wildlife analysis area.

Table 56. Suitable Marten Habitat in the Wildlife Analysis Area (NFS Lands)

Habitat Use	CWHR Type	National Forest System Acres in Wildlife Analysis Area
Denning	4D/5D	12,389
Foraging	4M/5M	24,872
Total		37,261

Mountain Yellow-legged Frog

The only detections to date of mountain yellow-legged frogs (MYLFs) in the project area occurred in 1979, when four incidental sightings were reported. These sightings were on private land in the north arm of Indian Valley, two within Cooks Creek and two within Lights Creek. Formal amphibian surveys were conducted in the Keddie Ridge Project area in 2006 (Arroyo_Chico_Resources 2006). Contractors followed “A Standard Protocol for Surveying Aquatic Amphibians” (Fellers and Freel 1995). There were no detections of MYLFs during this survey. Many of the streams in the 2006 survey consisted of a cobble substrate and appeared to be highly suitable for MYLFs. However, large numbers of fish, primarily rainbow trout, were also detected in these streams. The presence of such fish populations lowers the suitability of streams for MYLFs (Arroyo_Chico_Resources 2006).

USDA Forest Service R5 Management Indicator Species

MIS for the PNF are identified in the 2007 Sierra Nevada Forests Management Indicator Species (SNF MIS) Amendment (USDA 2007e). The habitats and ecosystem components and associated MIS analyzed for the project were selected from this list of MIS, as indicated in Table 57. In addition to identifying the habitat or ecosystem components (1st column), the CWHR type(s) defining each habitat/ecosystem component (2nd column), and the associated MIS (3rd column), Table 57 discloses whether or not habitat for each MIS is potentially affected by the Keddie Ridge Project (4th column).

Table 57. Selection of MIS for Project-Level Habitat Analysis for the Keddie Ridge Project

Habitat or Ecosystem Component	CWHR Type(s) defining the habitat or ecosystem component[1]	Sierra Nevada Forests Management Indicator Species *Scientific Name*	Category for Project Analysis [2]
Riverine & Lacustrine	lacustrine (LAC) and riverine (RIV)	aquatic macroinvertebrates	3
Shrubland (west-slope chaparral types)	montane chaparral (MCP), mixed chaparral (MCH), chamise-redshank chaparral (CRC)	fox sparrow *Passerella iliaca*	3
Oak-associated Hardwoods & Hardwood/conifers	montane hardwood (MHW), montane hardwood-conifer (MHC)	mule deer *Odocoileus hemionus*	3
Riparian	montane riparian (MRI), valley foothill riparian (VRI)	yellow warbler *Dendroica petechia*	3
Wet Meadow	Wet meadow (WTM), freshwater emergent wetland (FEW)	Pacific tree frog *Pseudacris regilla*	2
Early Seral Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, and 3, all canopy closures	mountain quail *Oreortyx pictus*	3
Mid Seral Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 4, all canopy closures	mountain quail *Oreortyx pictus*	3
Late Seral Open Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P	sooty (blue) grouse *Dendragapus obscurus*	3
Late Seral Closed Canopy Coniferous	ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6.	California spotted owl *Strix occidentalis occidentalis*	3
		northern flying squirrel *Glaucomys sabrinus*	3
Snags in Green Forest	Medium and large snags in green forest	hairy woodpecker *Picoides villosus*	3
Snags in Burned Forest	Medium and large snags in burned forest (stand-replacing fire)	black-backed woodpecker *Picoides arcticus*	2

[1] All CWHR size classes and canopy closures are included unless otherwise specified; Canopy Closure classifications: S=Sparse Cover (10-24% canopy closure); P= Open cover (25-39% canopy closure); M= Moderate

cover (40-59% canopy closure); D= Dense cover (60-100% canopy closure); Tree size classes: 1 (Seedling)(<1" DBH); 2 (Sapling)(1"-5.9" DBH); 3 (Pole)(6"-10.9" DBH); 4 (Small tree)(11"-23.9" DBH); 5 (Medium/Large tree)(≥24" DBH); 6 (Multi-layered Tree) [In PPN and SMC]

[2] Category 1: MIS whose habitat is not in or adjacent to the analysis area and would not be affected by the project.
Category 2: MIS whose habitat is in or adjacent to analysis area, but would not be either directly or indirectly affected by the project.
Category 3: MIS whose habitat would be either directly or indirectly affected by the project.

The two MIS included in this final EIS is the hairy woodpecker, due to the proposal to treat forested stands with medium to large snags, which is the habitat component for this MIS, and aquatic macroinvertebrates, due to the cumulative effects to watersheds. A summary of existing conditions and environmental effects for these two species, derived from the project level MIS Report, is presented in this final EIS. Affected environment and environmental consequences to the California spotted owl, also a MIS, can be found in the Forest Service R5 Sensitive Species sections of this final EIS. It has been determined that the habitat for the remaining MIS in Table 57, with the exception of two (wet meadows and snags in burned forest), will also be affected by this project but these effects are considered indirect, minor, or beneficial. Refer to the Keddie Ridge Project MIS Report for complete discussion of potential effects on all PNF MIS species due to implementation of this project.

Hairy Woodpecker

The hairy woodpecker was selected as the MIS for the ecosystem component of snags in green forests. Medium (diameter breast height between 15 to 30 inches) and large (diameter breast height greater than 30 inches) snags are most important. The hairy woodpecker uses stands of large, mature trees and snags of sparse to intermediate density; cover is also provided by tree cavities (CDFG 2006). Mature timber and dead snags or trees of moderate to large size are apparently more important than tree species (Siegel and DeSante 1999). Based on data derived from common stand exam plots within the Keddie Ridge Project, snags over 15 inches DBH, on average, exist at 3 snags per acre.

Aquatic Macroinvertebrates

Aquatic macroinvetebrates are MIS for riverine and lacustrine habitat in the Sierra Nevada. They have been demonstrated to be very useful as indicators of water quality and aquatic habitat condition (Resh and Price 1984, Karr et al. 1986, Hughes and Larsen 1988, Resh and Rosenberg 1989). They are sensitive to changes in water chemistry, temperature, and physical habitat; factors of particular importance are: flow, sedimentation, and water surface shade.

Aquatic macroinvertebrates are invertebrates that live in water and can be seen by the unaided human eye. They provide an important ecological link between microscopic food organisms and fish. Aquatic macroinvertebrates include insects, such as the commonly thought of mayflies, stoneflies, caddisflies, helgrammites and midges. Many of these groups are most highly developed for running water environments with adults and larvae living primarily in cold, running streams; many feed and breed under rocks, in the spaces among loose gravel and rocks, piles of waterlogged leaves and debris, and submerged logs.

There are nearly 1,000 miles of streams in the watershed analysis area. Approximately 53 percent of the stream miles are ephemeral, 32 percent are intermittent, and 15 percent are perennial. Ephemeral and intermittent streams are seasonal—they run water during some portion of the year, but are typically dry by late summer. Ephemeral streams only flow in response to storm events or snowmelt, and do not necessarily flow every year. Intermittent streams are seasonally connected to the surrounding water table and may flow during all but the driest months, whereas perennial streams typically flow year round.

Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA 1999a). The sensitivity ratings were based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorm events, and on revegetation potential. The HFQLG Pilot Project watersheds applicable to this project received moderate sensitivity ratings. Based on these ratings, most subwatersheds analyzed in this assessment were considered to have moderate sensitivity and were assigned a “threshold of concern” (TOC) value of 12 percent of the subwatershed area refer to the MYLF cumulative effects section below for further discussion of TOC).

Migratory Landbirds

Under the National Forest Management Act (NFMA), the Forest Service is directed to “provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives.” (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service Landbird Conservation Strategic Plan (USDA 2000a) followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan reference goals and objectives for integrating bird conservation into forest management and planning.

The Plumas National Forest utilizes the U.S. Fish and Wildlife Service 2008 Birds of Conservation Concern for the Sierra Nevada as its framework for analyzing effects to migratory birds. Of this list of eleven birds, Keddie Ridge project level reports (e.g. BA/BE, MIS) address nine of the species either directly or by using a surrogate species that utilize the same or similar habitat attributes. Table 58 highlights how and where these nine migratory birds are addressed directly or by using a surrogate species.

Table 58. Analysis of Migratory Birds for the Keddie Ridge Project

Birds of Conservation Concern (Sierra Nevada - BCR 15)	Forest Service Sensitive Species (S) or Management Indicator Species (MIS)	Project Level Report (BA/BE or MIS)	Critical Habitat component or threat as defined by Sierra Nevada Bird Conservation Plan (PIF)
Bald Eagle	Bald Eagle (S)	BA/BE	Designated as a non-land bird by DeSante
Flammulated Owl	Mule Deer (MIS) Hairy Woodpecker (MIS)	MIS MIS	Depends critically on oaks or oak woodlands, Loss of snags
California Spotted Owl	California Spotted Owl (S)	BA/BE	Depends critically on old growth
Calliope Hummingbird	Sooty (Blue) Grouse (MIS) Yellow Warbler (MIS) Willow Flycatcher (S)	MIS MIS BA/BE	Open Forested habitats, and moist habitats on the East Slope
Lewis' Woodpecker	Hairy Woodpecker (MIS)	MIS	Loss of snags
Williamson's Sapsucker	Hairy Woodpecker (MIS)	MIS	Loss of snags
Olive-sided Flycatcher	California Spotted Owl (S) Hairy Woodpecker (MIS)	BA/BE MIS	Utilize late successional/old growth forest, but does not depend on it critically, Loss of snags
Willow Flycatcher	Willow Flycatcher (S)	BA/BE	Depends critically on montane meadow habitat
Cassin's Finch	California Spotted Owl (S)	BA/BE	Depends critically on old growth

The remaining two species, the Peregrine Falcon and Black Swift, occur in known established sites or have habitats that are very localized and limited in extent on the Plumas NF.

Peregrine Falcon

PNF biologists have reviewed habitat for the Peregrine Falcon on the Plumas NF extensively since the early 1980's. Documented eyries for the Peregrine falcon consists of three rock cliff sites on the Forest, located at Bald Rock (Feather River RD), Pulga (Feather River RD), and North Fork of the Feather River (Mt. Hough RD), just west of Canyon Dam. Disturbance to these habitats is limited, as most activities do not impact these rock cliff sites. Projects that falls within a ½ mile vicinity of these three sites would analyze impacts to Peregrine Falcon, whereas projects outside of a ½ mile vicinity of these sites would not require further analysis. The Canyon Dam site is located over two miles to the west of proposed Keddie Ridge Project activities. No direct or indirect effects are expected to occur to this territory with implementation of the Keddie Ridge Project and consequently does not require further analysis.

Black Swift

Based on surveys and work by the Plumas County Audubon Society the Black Swift is a rare spring and fall migrant across the PNF and has not been confirmed as a resident on the PNF. However suitable wet cliff/waterfall habitat does occur at selected sites on the Forest. Two sites appear to be suitable for Black Swifts, Feather Falls on the Feather River RD and Frazier Falls on the Beckwourth RD. Both sites fall within recreation areas or recreation sites, and do not receive ground disturbing activities that would modify or alter habitat values for the Black Swift. No known sites occur in or are within a ½ mile of the Keddie Ridge Project area.

Environmental Consequences

Summary of Effects

The Keddie Ridge Project Wildlife Biological Assessment / Biological Evaluation (USDA 2011b) provides a discussion of the direct, indirect, and cumulative effects for all sensitive animal species analyzed for the Keddie Ridge Project. The BA/BE is located in the Keddie Ridge Project record and incorporated by reference. The BA/BE concluded that the Keddie Ridge Project would not affect the following species: California red-legged frog, Foothill yellow-legged frog, Valley elderberry longhorn beetle, northern leopard frog, greater sandhill crane, and Swainson's hawk.

Based on the direct, indirect, and cumulative effects discussed in the BA/BE, it was concluded that the Keddie Ridge Project would affect individuals but would likely not result in a trend toward listing or loss of viability for the following species: hardhead minnow, mountain yellow-legged frog, northwestern pond turtle, Sierra Nevada red fox, pallid bat, Townsend's big eared bat, western red bat, willow flycatcher, bald eagle, California spotted owl, northern goshawk, great gray owl, California wolverine, American marten, and Pacific fisher.

The NEPA (*National Environmental Policy Act*) process requires agencies to identify "the significant environmental issues deserving study and de-emphasizing insignificant issues, narrowing the scope of the environmental impact statement" 40 CFR 15001.1(d). Due to the high visibility of old-forest species in California, and the potential impacts of fuels treatment, group selection, and area thinning on forested habitat, the effects on bald eagle, California spotted owl, northern goshawk, American marten, and Pacific fisher are emphasized in this EIS. The mountain yellow-legged frog is also emphasized in this Final EIS due to the proposed use of herbicides in riparian habitat conservation areas (RHCAs) and proposed DFPZ and area thinning within RHCAs.

Terrestrial Wildlife Species

All Action Alternatives (A, C, D, and E)

DFPZ and area thinning treatments applied to CWHR size-density class 4M and 4D stands, which provide important foraging, nesting, and denning habitat to old-forest species, would modify stand structure attributes, species composition, and landscape structure (distribution of CWHR size class and density and percent of open canopy forest conditions created). Based on silviculture prescriptions and design criteria specific to the Keddie Ridge Project, it is expected that the majority of size-density 4M and 4D stands treated under all alternatives would retain habitat suitability values for old-forest species. Alternative D would have the least adverse effects on habitat suitability, reducing 553 acres of 4D stands to a 4M condition. No stands under this alternative would be reduced to an unsuitable state (4P or below). Alternative C, the non-commercial alternative, would reduce the same amount of 4D stands as alternative D as well as create approximately 234 acres of 4P (unsuitable) due to thinning some 4M stands to below 40 percent canopy cover. Alternative C would maintain 92 percent of treated 4M and 4D stands in a suitable state. Alternatives A and E, with implementation of group selection and heavier DFPZ prescriptions, would have the largest adverse effects on habitat suitability but still maintain 66 percent and 57 percent, respectively, of treated 4M and 4D acres in a suitable state. Alternative A would reduce 1,052 acres to an unsuitable condition (818 acres to 4P, 234 acres to GS) and alternative E would reduce 1,325 acres to an unsuitable condition (1,082 acres to 4P, 243 acres to GS).

Approximately 1,303 acres of CWHR size density class 5M and 5D is proposed for treatment under each action alternative. These stands, with their larger tree components and higher canopy closure, provide important nesting habitat for spotted owls and goshawks and denning habitat for mesocarnivores. Approximately 140 acres of 5D under alternatives A, C, and E and 130 acres of 5D under alternative D would be reduced to a 5M condition. Unique prescriptions associated with each alternative more fully identifies the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 or 24 inch DBH trees and would maintain 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inch DBH and maintaining 40-50 percent CC in treated 5M and 5D stands.

The majority of group selection treatments proposed under alternatives A and E would be located outside of CWHR 5M and 5D stands (88 percent under alternative A, 81 percent under alternative E). However, a small percentage of GS acres would fall within size and density class 5M stands considered suitable for nesting owls. No 5D habitat is proposed for GS. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. These acres would exist in a Sierran mixed conifer (SMC 1) state after group selection treatment.

Table 59 shows the cumulative changes in CWHR size density classed 4M, 4D, 5M, and 5D that would occur from implementing the DFPZs, area thinning, and group selections proposed in the action alternatives.

Table 59. Approximate Change in CWHR Size Density Classes 4M, 4D, 5M, 5D Habitat Types in the Wildlife Analysis Area (Based on 66,040 National Forest System Acres)

CWHR Size Density Class	No Action Alternative (Existing Acres)	Alternative A Post-Project	Alternative C Post-Project	Alternative D Post-Project	Alternative E Post-Project
4M	18,865	18,384	19,184	19,418	18,111
	% remaining	97%	103%	103%	96%
4D	7,485	6,914	6,932	6,932	7,039
	% remaining	92%	93%	93%	94%
5M	9,051	9,157	9,191	9,182	9,129
	% remaining	101%	102%	101%	101%
5D	5,969	5,829	5,829	5,838	5,829
	% remaining	98%	98%	98%	98%
Total Change	41,370	40,284	41,138	41,370	40,108
		97%	100%	100%	97%

California Spotted Owl

Two PACs would be entered under all action alternatives to conduct low intensity underburns (PAC 84 – 65 acres, PAC 131 – 8.4 acres). The objectives of this treatment would be to reduce fuel loads and thus decrease potential effects of wildfire. No other activities are proposed in PACs or SOHAs.

Eight of the 15 HRCAs in the analysis area would be affected by proposed treatments under the action alternatives. Under alternatives A, C, and E, four HRCAs would see a reduction in suitable acres. The percent reduction in these four HRCAs would range from 1 percent to 16 percent and would include some group selection acreage. Group selection under alternative E is estimated to reduce a small percentage of nesting habitat in two HRCAs (PL165 – 2 acres of Sierra Mixed Conifer (SMC) 5M, PL254 – 23 acres of SMC 5M).

Northern Goshawk

Fuel treatments, group selections, or area thinning proposed in the action alternatives would not occur in any of the eight northern goshawk PACs present in the wildlife analysis area.

Mesocarnivores (American marten and Pacific Fisher)

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area.

Alternatives A and E, due to the heavier DFPZ treatments and group selections proposed, would reduce some mesocarnivore suitable habitat to an unsuitable state (CWHR 4P or SMC 1). Reductions in denning habitat would occur under all alternatives as a result of thinning treatments opening up the canopy closure. Denning habitat treated under alternatives A and E would be reduced by 4.6 percent and 5.3 percent respectively. Alternatives C and D would reduce denning habitat by 5 percent. Suitable foraging habitat treated under alternatives A and E would result in a decrease of 1.3 percent and 2.4

percent respectively. Alternatives C and D, due to the reduction of 5D and 4D stands to an M state as a result of thinning, would increase existing foraging acres by 450 and 693 acres respectively.

Alternative B (No Action)

Alternative B would pose no risk and uncertainty associated with the proposed actions, but it would maintain a high risk of potential habitat loss from wildfire, while the action alternatives would reduce this risk.

Aquatic Wildlife Species

All Action Alternatives (A, C, D, and E)

Approximately 1,279 acres of riparian habitat conservation areas (RHCAs) would be entered for treatment under each action alternative. All alternatives would apply specific RHCA prescriptions that would maintain suitable habitat values for aquatic species and meet riparian management objectives (RMOs) while creating riparian conditions that would be less susceptible to high-severity fire. This reduction of long-term threat of stand-replacing fire as a result of treatments would offset any short-term minor effects.

The Keddie Ridge Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, no subwatersheds would be at or exceed the threshold of concern (TOC). Thus, suitable riparian conditions for aquatic species would not be susceptible to significant adverse cumulative effects as a result of fuel reduction activities implemented under the Keddie Ridge Project.

Based on the latest risk assessments and application design criteria, the herbicides proposed under alternatives A and E to control noxious weeds would pose no significant adverse effects to wildlife species.

Mountain Yellow-legged Frog

Potential direct effects are expected to be negligible to MYLFs due to the likelihood, based on survey results, that populations are not present in treatment areas.

Suitable MYLF riparian habitat would be affected under all alternatives but, based on RHCA prescriptions and design criteria (including equipment exclusion zones), implementation of best management practices, and implementation of soil and water standards (RMOs), adverse effects would be minimal.

Alternative B (No Action)

Alternative A would pose no risk and uncertainty associated with the proposed actions, but it would maintain a high risk of potential habitat loss from wildfire. The action alternatives would reduce this risk. There would be no direct effects on aquatic wildlife species because no activities would occur to create disturbance or result in any impacts on the existing habitat conditions.

Environmental Consequences: USDA Forest Service R5 Sensitive Species

Bald Eagle

All Action Alternatives (A, C, D, and E)

Direct Effects

Area thinning is proposed on approximately 46 acres in the primary nest zone of the Round Valley bald eagle territory. These treatments would occur in two units of the Keddie Ridge Project, units 75 and 75a. Unit 75 comprises 34 acres and is located on the north side of NFS road 26N19, approximately 0.12 miles (800 feet) from the active nest tree. Area thinning treatments in Unit 75 would take place in 19 acres typed as CHWR Sierra Mixed Confer (SMC) 5D and 15 acres typed as SMC 5M. The prescriptions for each action alternative in unit 75 would be as follows: alternative A—thin to 40 percent canopy closure (CC) and up to 24 inch DBH trees; alternative C—thin to 40-50 percent CC and up to 12 inch DBH trees; alternative D—thin to 50 percent CC and up to 20 inch DBH trees, leave 25 percent of stand untreated; alternative E—thin to 40-50 percent and up to 30 inch DBH trees. Unit 75a comprises 12 acres of SMC 5M and is located south of NFS road 26N19 and is adjacent to unit 75. The active nest tree is located in the very southwest corner of this unit, immediately adjacent to private property. The treatment prescriptions for unit 75a under all action alternatives are the same—hand thin, pile, and burn trees less than 8 inch DBH trees. Light underburning treatments are also proposed within both units.

A short temporary road (approximately 200 feet) would be constructed off of FS road 26N19 to access unit 75. At the end of this temporary road a landing would be constructed to receive and facilitate removal of forest products from the 34 acres to be treated. This landing would potentially be ½ acre in size and all existing trees would require removal. The temporary road would be decommissioned upon project completion.

Area thinning prescriptions are designed to accelerate stand growth and provide for future CWHR size class 4 and 5 trees. Area thinning prescriptions are also designed to encourage long-term regeneration of large pines by maintaining the largest and most fire-resilient dominant and codominant trees. The resulting stand condition of such thinning would be an uneven-age forest structure composed of ponderosa and sugar pine greater than 38 inches DBH with total canopy cover of 40-50 percent. Protection and enhancement of nesting habitat by thinning smaller conifers would improve the growth of the residual ponderosa and sugar pines, while surface and ladder fuel reduction would protect the larger tree component for future nest trees. Therefore, the area thinning treatments implemented under the action alternatives would be deemed a beneficial effect, resulting in additional suitable nesting habitat for bald eagles in the future.

The hand thin, pile, and burn treatments proposed in the nest stand unit (unit 75a) would limit the opening of this stand but still remove small diameter (less than 8 inch) trees, which comprise the majority of the ladder fuels. This would result in improved stand conditions by reducing potential wildfire effects while still concealing the nest tree from NFS road 26N19.

Indirect Effects

Changes in the fishery production are not expected in Round Valley Reservoir as a result of implementing proposed DFPZ and area thinning treatments immediately adjacent to the reservoir. Implementing best management practices and meeting all riparian management objectives (the RMO analysis is located in the "Hydrology and Soils" section of this chapter) would ensure that there would be no indirect effects on the fishery or fishery habitat.

To limit disturbance to nesting eagles, the following standard management requirements would be followed: a Limited Operating Period (LOP) would be implemented not allowing area thinning treatments in the Round Valley bald eagle territory (units 75 and 75a) between January 1 and August 15 along NFS road 26N19. No log haul is to occur on this road during the LOP.

Cumulative Effects

The parcels of private ownership land in the Bellas Flat area surround the existing nest tree. The nest tree is on national Forest System land but is 30 feet from the private property. The old growth timber which once existed on the private land within ½ mile of the nest has been heavily cut, with no potential nest trees remaining. Approximately 60 percent of the nest site area and 80 percent of the primary use area are privately owned (as identified in the Round Valley Bald Eagle Management Plan, November 1989). There is continuous pressure to initiate logging activities on private land around the nest that could be adverse to nesting activity.

NFS road 26N19 runs through both the primary nest site area and the secondary nesting area of the Round Valley territory. The existing condition of this road is such that use is limited during the critical stages of nesting because of snow, mud, large dips full of water, and generally poor conditions for vehicle use. No evidence exists that past and present recreational and general use of this road has caused adverse impacts to eagle production/nesting. However, it is a concern that any future road improvements to this road could lead to increased use, which could adversely affect eagle nesting. To remove forest products from unit 75, as proposed under the action alternatives, a small southern section (approximately 120 yards) of NFS road 26N19 could receive minor improvements. The limiting sections of this road to vehicle traffic (due to poor surface conditions) exist north of this short haul route. Therefore, any improvements to NFS road 26N19 associated with implementation of the Keddie Ridge Project is not expected to lead to increased use.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the bald eagle or existing bald eagle habitat. No activities would occur that would cause disturbance to nesting, wintering, or migrating birds.

Indirect Effects

The indirect effects of no action would include the potential for future wildfire and related impacts on habitat development and recovery. The silvicultural recommendations for habitat management presented in the Round Valley Bald Eagle Management Plan to promote present and future bald eagle nesting and foraging activities within the Round Valley Bald Eagle Management Area (BEMA) would not occur. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more severe burn. Increased rates of spread would result in potential loss of bald eagle nesting habitat and other important habitat attributes such as large trees and snags.

Cumulative Effects

No acres of suitable habitat would be treated and would not reduce the average suitability of any habitat types within the analysis area for bald eagles.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the bald eagle.

California Spotted Owl

All Action Alternatives (A, C, D, and E)

Direct Effects

The analysis of direct effects on California spotted owl (CSO) is focused on PACs and spotted owl Habitat Areas (SOHAs) existing or created as a result of surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the "Indirect Effects" section below. Direct effects are expected to be minimal for all action alternatives, as described below.

Direct effects on spotted owls are anticipated within two PACs—PL084 and PL131. The remaining 14 PACs within the analysis area would not be entered for treatment under this project. A low intensity underburn on 65 acres in PL084 and 8.4 acres in PL131 is proposed under all action alternatives. The same underburn prescription is proposed in 105.5 acres of SOHA R3, which is associated with PL084. This prescription will result in less than 10 percent mortality n dominant and codominant trees and CWHR suitability on treated acres will remain unchanged. To prevent disturbance to potential nesting birds, underburning activities within PACs and SOHA would take place outside of the nesting season (appendix H).

If spotted owls are detected during future surveys or project-related activities, PACs and home range core areas (HRCAs) would be delineated, and all treatments would be modified to comply with the standards and guidelines in the HFQLG Act final EIS and Record of Decision (USDA 1999a, b) and the SNFPA 2004 ROD (USDA 2004b).

Limited Operating Periods (LOPs) would be implemented within 0.25 mile of treatment units for active nests identified during present and future surveys or incidental detections. An LOP would also be applied to haul routes within 0.25 mile of an active nest. LOPs are expected to reduce impacts from increased human activity and vehicle and equipment noise. Disturbance would be limited to individual treatment units and would last a few days to two weeks in any location. Impacts from disturbance are not expected to substantially affect habitat use or reproductive capacity of this species.

No new road construction would occur in spotted owl PACs or SOHAs. A LOP could be applied for any road reconstruction in PACs.

Proposed treatment activities could occur as early as fall 2011 and may continue five years beyond the initiation of implementation. There is the potential that spotted owls could establish new, undocumented territories (activity centers) during project implementation and would not be protected as PACs. The decision to conduct additional protocol surveys within the project area will be made by the district biologist based on project implementation timelines.

Indirect Effects

Based on the vegetation map and CWHR model, about 15,020 acres of National Forest System lands in the wildlife analysis area may be considered suitable spotted owl nesting habitat (CWHR size/density classes 5M and 5D), and about 26,350 of National Forest System acres may be considered suitable foraging habitat (CWHR size classes 4M and 4D) (Table 53). The total acres of suitable owl habitat in the wildlife analysis area that would remain after implementation of each action alternative is presented in Table 59 above. The post-project CWHR changes summarized in Table 59 are based on the silviculture prescription assigned to each CWHR stand within treatment units (refer to chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable spotted owl foraging habitat (CWHR size classes 4M and 4D) as a result of implementing project activities would occur under all action alternatives. Approximately 3,065 acres of 4M and 4D habitat is proposed for treatment under each alternative. Prescriptions that would result in 4M and 4D stands reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units and all group selection (GS) units in Alternatives A and E. Alternative A would reduce 818 acres of 4M/4D stands to a 4P state (256 acres from 4D, 562 acres from 4M). Group selection treatments under alternative A would reduce an additional 234 acres of 4M and 4D stands to a SMC 1 condition (approximately 82 acres from 4D and 152 acres from 4M). Alternative E would reduce 1,082 4M/4D acres to a 4P state (361 acres from 4D, 721 acres from 4M). Group selection treatments under alternative E would reduce an additional 243 acres of 4M and 4D stands to an SMC 1 condition (approximately 85 acres from 4D and 158 acres from 4M). GS treatments would specifically target areas dominated by uniformly sized, smaller white fir and that have significant amounts of small down logs or standing small deadwood. Alternatives C would reduce approximately 234 acres of 4M to a 4P state thru thinning 12 inch DBH or smaller trees and creating open (below 40 percent) canopy cover conditions. No stand treated under alternative D would be reduced to an unsuitable state.

The amount of 4D stands reduced to a 4M condition (i.e. canopy closure after treatment would be 40-60 percent) under each alternative would be as follows—alternative A-233 acres, alternatives C and D-553 acres, and alternative E-125 acres. Although canopy cover down to 40 percent is considered suitable for foraging (USFWS 2005), it appears to be only marginally so based on owl occurrence and productivity threshold at around 50 percent canopy cover (Verner et al. 1992). Under all alternatives, the majority of DFPZ and area thinning treatments applied to CWHR 4M and 4D stands would result in no change to CWHR size class or canopy closure class. Of the approximate 3,065 acres of 4M and 4D habitat proposed for treatment, (92 and 100 percent) under alternatives C and D, respectively, would continue to provide suitable foraging conditions for the spotted owl. No group selection would occur under these two alternatives and treatments such as light thinning, mastication, hand-thinning, underburning would maintain these stands in a suitable CWHR state. Alternatives A and E, which would implement group selection and heavier DFPZ treatments, would maintain 2,013 acres (66 percent) and 1,740 acres (57 percent), respectively, of treated 4M and 4D acres in a suitable state.

Based on recent habitat assessments of 103 CSO territorial sites across the Plumas Lassen study area (Keane 2010) the habitat value to nesting/roosting spotted owls of size class 4 stands with a moderate canopy cover increases significantly when larger tree (LT) components (i.e. contribution of greater than 24 inch trees to the total tree crown cover) were recorded. Based on stand exam data collected and modeled for the Keddie Ridge Project, this large tree component exists in a majority of the post-project 4D and 4M stands (i.e. large tree attributed recorded in approximately 55 percent of stands). These areas, based on recent research findings (ibid), would likely provide not just foraging conditions for the spotted owl but also suitable nesting/roosting conditions.

Suitable nesting habitat (CWHR 5M and 5D) proposed for treatment under all alternatives, with the exception of group selection units, is expected to remain suitable for spotted owls (i.e., no change or reduced to 5M). Approximately 1,303 acres of 5M and 5D is proposed for treatment under each action alternative. Mechanical thinning in 140 acres of 5D under alternatives A, C and E and 130 acres under alternative D would reduce these stands to a 5M condition. Unique prescriptions associated with each alternative more fully identify the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 inch or 24 inch DBH trees and would maintain a 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inch DBH and maintaining 40-50 percent CC in 5M and 5D stands.

The majority of group selection treatments proposed under alternatives A and E would be located outside of CWHR 5M and 5D stands (88 percent under alternative A, 81 percent under alternative E). However, a small percentage of GS acres would fall within size and density class 5M stands considered suitable for nesting owls. No 5D habitat is proposed for GS. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. All acreage treated with GS would be reduced to a SMC 1 condition, which is considered unsuitable for spotted owl nesting or foraging. GS treatments in all CWHR types would specifically target areas dominated by uniformly sized, smaller white fir and that have significant amounts of small down logs or standing small deadwood.

Group selection treatments, as proposed under alternatives A and E, would create early seral stages and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The treatment would not result in areas that prevent access to adjoining suitable habitat. By design, group selections make up approximately 11.4 percent of any given stand. The small size of the groups (0.5 acre to 2 acres) would not preclude owls from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in group selection units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is anticipated that the majority of snags would be felled, and very few snags would be left in the 284 acres of group selection under alternatives A and the 326 acres of group selection under alternative E.

Improving forest health is one of the objectives of the Keddie Ridge Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal in mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that owls seek to control exposure and changes in ambient temperature for roosting. Biomass removal can degrade or remove hiding cover in the lower and mid canopy often used by young of the year owlets. On average, the following percentage of stand biomass would be retained in mechanical thin units: under alternatives A and E 27 to 30 percent in CWHR size class 4 and 17 to 22 percent in CWHR size class 5. Alternatives C and D would retain, on average, more biomass in these same units; 41 to 48 percent in CWHR size class 4 and 34 to 44 percent in CWHR size class 5.

Irwin and Rock (Irwin and Rock 2004) found that the probability of stand use by spotted owl increased strongly as basal area rose from 80 to 320 square feet per acre (optimum range is between 160 and 320 square feet per acre) and was positively influenced by the number of trees per acre that were greater than 26 inches DBH. With implementation of mechanical thinning under alternatives A and E the residual basal area in CWHR size class 4 would average 141 to 143 square feet per acre and 163 to 167 in CWHR size class 5. Under alternatives C and D, mechanical thin units in CWHR size class 4 would average 166 to 184 square feet per acre and CWHR size class 5 stands would average 196 to 201 square feet per acre.

Eight of the 15 HRCAs in the analysis area would be affected by proposed treatments under all alternatives (Table 60). Two alternatives, A and E, would decrease existing suitable acres in four HRCAs as a result of implementation of DFPZ and group selection (GS) treatments. Estimated HRCA GS would occur in 4M or 4D stands with the exception being alternative E, which would treat 2 acres of 5M in PL165 and 23 acres of 5M in PL254. Alternative C would decrease existing suitable foraging acres in two HRCAs as a result of thinning 12 inch DBH or below trees to an open cover (4P) condition. HRCA acres treated under alternative. HRCA acres treated under alternative D would retain sufficient size trees and canopy closure to result in no change to existing CWHR size and density classes. No group selection would occur under alternatives C and D.

Table 60. Summary of Existing Conditions and Treatment Effects to Spotted Owl HRCAs

HRCA	Total HRCA acres	Existing suitable acres	Total treated acres	Acres reduced to unsuitable (% reduction)			Estimated group select acres	
				Alt A	Alt C	Alt E	Alt A	Alt E
PL084	717	650 (91%)	27					
PL129	609	580 (95%)	13	5 (1%)		5 (1%)	1	1
PL130	746	662 (89%)	337					
PL165	449	385 (86%)	103	24 (6%)		42 (11%)	6	8
PL202	664	632 (95%)	8					
PL210	684	600 (88%)	178	93 (16%)	61 (5%)	90 (15%)	10	10
PL254	679	475 (70%)	230	6 (1%)	5 (1%)	37 (8%)	1	25
PL283	726	664 (92%)	1					

Several studies provide insight into spatial availability of habitat for California spotted owls (Hunter et al. 1995, Bingham and Noon 1997, Meyer et al. 1998, Franklin et al. 2000, Blakesley 2003, Zabel et al. 2003). Blakesley (2003) states that occupancy, apparent survival, and nesting success all increased with increasing amounts of old-forest characteristics, and reproductive output decreased with increasing amount of nonhabitat within a 500 acre area surrounding nest sites. Blakesley's data indicates that 71 percent suitable habitat within this nest area should be a minimum management target (Blakesley 2005). These studies suggest that effects outside of the PAC (on another 200 acres) may influence a site's "quality" for spotted owls. Based on these studies, it could be assumed that management actions that reduce high-quality spotted owl habitat within a 500-acre area around known nests could present more risk to owls than activities occurring outside of this area.

Using GIS, a 500-acre nest core area for each spotted owl activity center was created. Existing suitable habitat was added to each circle, along with all proposed Keddie Ridge Project treatments. Of the sixteen 500-acre nest cores within the analysis area, only 5 have acreage that will be treated under each alternative. Table 61 (column 2) summarizes the existing condition within these five nest cores. PL241 is the only nest core affected that currently exists at 70 percent suitable habitat, which is just below the minimum management target of 71 percent stated by Blakesley (2005). The 28 acres in this nest core is proposed for hand thin, pile, and burn treatment, which will not reduce suitability in these acres. As Table 61 shows, the remaining four nest cores contain 80-100 percent suitable acres.

Table 59summarizes the effects to suitable CWHR 4M, 4D, 5M, and 5D within the five CSO territories that would be affected by treatments. Total proposed acres of treatment within each nest core is as follows: PL084—99 acres, PL130—16 acres, PL165—21 acres, PL170—38 acres, PL241—28 acres. Under alternative A, based on planned DFPZ treatments in CWHR 4M that would mechanically thin to 30-40 percent canopy closure, 13 acres within PL084 nest core and 2 acres within PL170 nest core would be reduced post-project to an unsuitable condition (CWHR 4P). Under alternative E, based on similar proposed fuel treatments that would remove trees up to 30 inches DBH and create more open canopy conditions unsuitable to the owl, acres in the following nest cores would be reduced to unsuitable : PL084—13 acres of 4M reduced to 4P, PL165—18 acres of 4D reduced to 4P, PL170—2 acres of 4M reduced to 4P. PL084 and PL165 nest cores include portions of two Keddie Ridge DFPZ units where group selection (GS) is proposed under alternatives A and E. The precise acreage and location of group selections in each of these units (42, 81) would be determined in the field b project foresters considering topography, vegetation type, and proximity of resources of concern. An estimated 1.5 acres of group selection in each of these two nest core areas could occur, resulting in additional unsuitable acres from those stated above and displayed in Table 61. Under alternatives A and E PL084 nest core could have 1.5 acres in CHWR 4M reduced by GS and PL165 nest core could have 1.5 acres in CWHR 4D reduced by GS. The percent reduction of suitable acres in these three nest cores is as follows: PL084 – 3 percent, PL165 (alternative E only) – 4.3 percent, PL170 – less than 1 percent.

Table 61. Summary of Existing Condition of 500-Acre Nest Cores Affected by Proposed DFPZ and Area Thinning Treatments and Project's Effects to Suitable CWHR

PAC	Existing suitable nest core acres	Effects to CWHR size/density	Treated acres			Proposed treatment prescription*			
			Alt A	Alt C/E	Alt D	Alt A	Alt C	Alt D	Alt E
PL 084	425 (80%)	4M → 4P	13	13	0	Rx4	Rx8	no acres	Rx13
		4M unchanged	78	78	92	low to moderate underburn			
		4D unchanged	7	7	7	low to moderate underburn			
PL 130	476 (95%)	4M unchanged	2	2	2	masticate brush and trees <10" DBH			
		4D unchanged	14	14	14	masticate brush and trees <10" DBH			
PL 165	421(83%)	4D → 4P	0	18	0	no acres	Rx8	no acres	Rx13
		4D → 4M	18	0	18	Rx3	no acres	Rx9	no acres
		4D unchanged	3	3	3	masticate	handthin	handthin	handthin
PL 170	500(100%)	4M → 4P	2	2	0	Rx2	Rx8	no acres	Rx13
		4M unchanged	29	29	31	masticate brush and trees <10" DBH			
		5M unchanged	7	7	7	masticate brush and trees <10" DBH			
PL 241	348(70%)	4M unchanged	28	28	28	handthin, pile, and burn trees <8" DBH			

*Rx2: Thin to 30-40% CC, 30" UDL , Rx3: Thin to 40% CC, 24"UDL, Rx4: Thin to 30-40% CC, 24" UDL, Rx8: Thin to 12" UDL 30-50% CC, Rx9:Thin to 20" UDL, 50% CC, Leave 15% of the stand untreated, Rx13: Thin to 30-40% CC, 30" UDL

DFPZ, area thinning, and group selection treatments under all alternatives would not reduce CWHR 5M and 5D to an unsuitable state. The only CWHR size class 5 in the affected nest cores is 7 acres of 5M in PL170. Under all action alternatives, these acres are proposed for mastication treatment of trees less than 10 inches DBH, resulting in no change to CWHR.

By quantifying the habitat changes within the home range as a result of project actions, a risk assessment based on habitat needs as outlined by Verner et al. (1992) and Blakesley (2003) among others, can be completed. This method or derivatives of this method have been used for over a decade to predict potential effects and the subsequent risk of implementing vegetation management projects. While there is a large amount of data on habitat suitability with regard to spotted owls, there have been no comprehensive studies on the impacts of vegetation management activities on reproductive success, impacts to prey, and long-term viability at the landscape level within a managed landscape. Specifically, although a risk assessment can be made when projects reduce habitat within a territory below a given threshold, no data exists that permit a reasoned prediction of impacts that vegetation management activities may have when the amount of suitable habitat remains above a given threshold.

The size of the home range selected for this analysis is reflective of breeding home range sizes elsewhere in the Sierra bioregion for mixed conifer forests. While a specific home range size is not discussed per se within the 2004 Record of Decision on the SNFPA Final Supplemental EIS, the Record of Decision does reference an analysis-size circle of 1.5 miles in diameter around the activity center, which equates to approximately 4,500 acres. Home range sizes for the California spotted owl are reported to vary between 3,000 acres (Call et al. 1992, Verner et al. 1992)for breeding pairs to as much as 12,500 acres (Verner et al. 1992) for non-breeding pairs on the east slopes of the Cascade Range. This analysis uses findings from Verner et al. (1992) and SNFPA guidelines (USDA 2004b) in delineating spotted owl home ranges as a circle of approximately 4,500 acres (1.5 mile radius) surrounding the territorial site.

Table 62 shows the amount of suitable habitat and effects of treatment in each territorial home range potentially affected by the Keddie Ridge Project. Thirteen 1.5 mile radius home ranges would have acres treated under this project. Following implementation, all but two (PL102 and PL254) would contain above 30 percent suitable habitat within the 4,500-acre home range, which is the minimum threshold recommended by Bart (1995). The pre-existing suitable home range condition for PL102 is 26 percent and for PL254 it is 20 percent. DFPZ and group selection treatments under alternatives A and E within these two home ranges would change 3 percent of acres in PL102 and 1 percent-10 percent of acres in PL254 to an unsuitable state. Overall, the remaining suitable spotted owl habitat home range percentage for these two territories would only be reduced by 1-2 percent over pre-project levels. The vegetation map used for this analysis indicates these two home ranges include a significant amount of private forested land, which may provide additional suitable acres (as much as 61 percent more for PL102 and 48 percent more for PL254). The home range for PL165 would exist post-project at close to the 30 percent threshold. A large portion of this territory also falls on private forested land, which may provide additional suitable acres (+32 percent).The average percent reduction in suitable habitat for all 4500-acre home ranges is 3 percent for alternative A and 6 percent for alternative E. Treatments under alternatives C and D would not reduce any home range acres to unsuitable.

Table 62. Summary of Existing Conditions and Treatment Effects on CSO Home Ranges in the Wildlife Analysis Area

PAC	Existing suitable Forest System acres	CWHR 4M/4D acres reduced to unsuitable			CWHR density class D reduced to class M				% suitable post project (% acres reduced from existing)	
		Alt A	Alt C	Alt E	Alt A	Alt C	Alt D	Alt E	Alt A	Alt E
PL084	2669 (59%)	263	152	336					53% (10)	52% (13)
PL102	1185 (26%)	36		36					25% (3)	25% (3)
PL129	2427 (54%)	166		178		1	1	1	50% (7)	50% (7)
PL130	3527 (78%)			156					78% (0)	75% (4)
PL131	2776 (61%)			111					61% (0)	59% (4)
PL165	1561 (35%)	90		141		105	95	61	33% (6)	31% (9)
PL170	3768 (83%)	155		200		1	1	1	80% (4)	79% (5)
PL202	2190 (48%)	61		67					47% (3)	47% (3)
PL210	2709 (60%)	321	78	439	10	43	43	12	53% (12)	50% (16)
PL241	2425 (54%)			46					54% (0)	53% (2)
PL254	924 (20%)	8		97	25	33	33	25	20% (1)	18% (10)
PL283	3822 (85%)			50					85% (0)	83% (1)
PL350	2222 (49%)	29		44					49% (1)	48% (2)

Cumulative Effects Common to Old-forest Species, including the California Spotted Owl

The analysis of cumulative effects of the proposed project evaluates its anticipated impact on Threatened, Endangered, and Sensitive species and Management Indicator Species (MIS) and compares those effects to the existing condition (the existing condition reflected by changes that have occurred in the past) within the 115,185 acre wildlife analysis area. Past actions in the area include timber harvest, wildfires, recreation use, wildlife habitat improvement, grazing, and mining. Past timber harvesting on National Forest and private land, together with wildfires, have created a mix of vegetation types and age classes across the wildlife analysis area that has shaped the distribution of old-forest and early seral wildlife species, as reflected by the existing vegetative condition.

The past management history of the Keddie Ridge Project area has strongly influenced stand structure, species composition, fuels, and potential fire behavior at both stand and landscape levels. Fire exclusion and extensive drought-related mortality has created relatively homogeneous areas typified by small even-aged trees existing at high densities. High-density stands are more susceptible to density-dependent mortality driven by drought and insect and disease infestations. Despite many past salvage treatments to remove drought-related mortality, much of this material has fallen over in the last 17 years and become dead and down fuel with high fuel loadings. The high densities of small trees and high fuel loads contribute to continued accumulation of surface, ladder, and canopy fuels, and this accumulation increases the potential for stand-replacing high-severity fire events.

Timber harvest and related activities on NFS lands from 1980 to 2010 affected approximately 27,120 acres in the 115,185 acre wildlife analysis area (approximately 17 percent). Various silvicultural prescriptions were employed, including regeneration (clearcut), selection cut, overstory removal, sanitation cut, commercial thinning, and sanitation salvage (appendix F, table F-1).The majority of these acres were not subject to any harvesting).Site preparation for planting, pre-commercial thinning, and underburning were also part of the timber harvest activities (appendix F). Many of these harvest activities (clearcut, overstory removal, thinning) have resulted in either loss of suitable habitat (stands taken below 40 percent canopy cover) or reduction in habitat value through reductions in canopy cover and removal of stand decadence. These past actions resulted in reduced canopies and simplified overstory and understory structure within treated stands, which could have increased overall habitat diversity at the landscape level at the time of implementation. In summary, the timber/fuels/vegetation projects in the wildlife analysis area focused on even-aged (clearcut, overstory removal) forestry in the 1970s and 1980s, then switched to sanitation and single tree selection, and then to commercial thinning and fuels reduction in the 1990s. This change in focus, brought on by changes in management guidelines (USDA 1988, 1993a, 2001b, 2004b) has created habitat conditions that support the wildlife populations currently present in the wildlife analysis area.

Private land logging activities in the wildlife analysis area that have occurred since 1997 include 550 acres of shelterwood removal; 1,133 acres of commercial thinning; 15,908 acres of selection cut; 1,655 acres of salvage; and 320 acres of clearcutting (Appendix F, table F-2). Approximately 307 of the 320 acres of clearcut harvest activity occurred in 1997, while the selection harvesting (similar to an overstory removal cut) has been occurring consistently almost every year. Clearcuts created early seral habitat and will remain as early seral (grass/forb/brush/ seedling-sapling) for at least the next 10–20 years. After year 20, conifers may start to dominate the vegetative cover, and by year 50, should be classified as size class 3 trees (6–11 inches DBH). With brush control and release activities, which would be commonplace on private lands, trees could attain this size class earlier than 50 years. Selection harvest usually results in opening up the stand while maintaining forested cover, providing for an uneven-sized stand with scattered brush understory throughout. Thus, past management actions on private lands have provided for an uneven-aged continuous forest cover across the private land landscape.

There have been approximately 11,486 acres of wildfires in the wildlife analysis area since 1979. These fires have ranged in size from 17 acres up to 7,048 acres (which was the Moonlight Fire in 2007). These wildland fires burned at high intensity and created large, monotypic openings of early seral brush habitat within the forest that contribute to large-scale fragmentation of continuous forest cover. Specifically, the Moonlight Fire burned within 4,493 acres of suitable habitat, reducing 3,756 acres to an unsuitable state (CWHR 4P or SMC 1). Much of the areas that experienced wildfires in the analysis area are currently occupied by conifer plantation, montane chaparral, and hardwood forest. Brush fields within and between the plantations support very decadent, impenetrable brush. Large brush fields created by wildfire are used extensively by early seral and midseral wildlife species but not used by species requiring old forest and continuous forest conifer cover. Approximately 2,332 acres of under burning for fuel reduction have been conducted within the wildlife analysis area since 1980, resulting in reduced levels of down slash, increased grass/forb growth and regenerated younger age class of brush species.

Since 2001, it is estimated that approximately 20 percent of the commercial woodcutting permits issued for the Mt. Hough Ranger District occurred in the Keddie Ridge Project area, amounting to approximately 9,278 cords of wood. Commercial woodcutting in the past usually consisted of cutting on and removing existing cull decks, which are manmade habitat features on the landscape used by various mammalian species (including mesocarnivores) for cover and den sites. The removal of these features reduces down woody component availability for owl prey species. It is estimated that, since 2001, approximately 25 percent of the Christmas tree permits issued for the Mt. Hough Ranger District occurred in the Keddie Ridge Project area, amounting to approximately 4,949 permits.

The Personal Use Firewood Program on the Plumas National Forest is an ongoing program that has been in existence for years. This program allows the public to purchase a woodcutting permit and remove fuel and firewood from National Forest System lands. A 9-year average (2001–2009) for the Mt. Hough Ranger District indicates that 2,525 permits were issued annually, resulting in the average annual sale of 5,049 cords of wood on the district. Much of this wood material either consists of down logs found in the forest, along forest roads, and within cull decks created by past logging operations, or as standing snags. The Keddie Ridge Project area is open to woodcutting. Snags and logs would continue to be removed, resulting in the cumulative loss of these habitat components across the landscape, negatively affecting those species dependent on such structures. Snags are recruited annually from live trees through natural processes at a rate that may sustain this loss in the analysis area; snag and log removal is required within a short distance from open roads when these structures pose a safety hazard.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Present and ongoing projects occurring in the boundary of the Keddie Ridge wildlife analysis area include the Maidu Stewardship Project, Canyon Dam Fuel Reduction and Forest Health Project, Empire Vegetation Management Project, Moonlight Fire Recovery and Restoration Project, Plumas Fire Safe Council Projects, and Natural Resource Conservation Service (NRCS) Projects.

Maidu Stewardship Project—Project treatments include: approximately 550 acres of commercial and non-commercial thinning to improve Oak habitat; 405 acres of commercial and non-commercial thinning to reduce hazardous fuels, approximately 325 acres of enhancing habitat for culturally important plants. Treatments were initiated in 2006 and are expected to continue through 2016.

Canyon Dam Fuel Reduction and Forest Health Project—Project treatments include: approximately 147 acres of hand thinning, piling, and burning was initiated in fall of 2010 and will be completed over 3 to 5 years. In addition, 488 of mechanical thinning and will be initiated in 2011 and completed over 3 to 5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3 to 5 years.

Empire Vegetation Management Project—Project treatments include: approximately 121 acres of group selection timber harvest; 430 acres of DFPZ mechanical thinning; 133 acres of Individual Tree Selection (ITS) mechanical thinning; and 144 acres of mastication. These treatments will be initiated in fall 2010 and would be completed over 3-5 years. Follow-up prescribed fire treatments will be initiated in 2012 and completed over 3-5 years.

Moonlight Fire Recovery and Restoration Project—Approximately 7,048 acres of the fire burned within the analysis area. Project treatments include: approximately 330 acres of post-fire roadside hazard tree removal and 70 acres of post-fire salvage harvest. These treatments are ongoing and anticipated to be complete by the end of 2010.

Plumas Fire Safe Council Projects—These projects are located on private lands surrounding homes and are currently being implemented by the Plumas Fire Safe Council. Project treatments include approximately 294 acres of a combination of hand thinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Natural Resource Conservations Service (NRCS) Projects—These projects are located on private lands and are currently being implemented by Natural Resource Conservation Service (NRCS). Project treatments include approximately, 1,960 acres of a combination of hand thinning, piling, and burning, mastication, and some removal of commercial and non-commercial forest products.

Two of these ongoing projects, Canyon Dam and Empire, would result in some reduction of suitable CWHR 4M, 4D, 5M, and 5D stands. Based on the BA/BE completed for these projects (USDA 2006, 2007a) the net reduction of suitable habitat after treatment within the Keddie Ridge Project analysis area is presented in Table 63.

Table 63. Empire Project and Canyon Dam Project Treatment (Tx) Effects on Old-Forest Suitable CWHR in the Wildlife Analysis Area

Empire Project						Canyon Dam Project	
DFPZ Tx effects		ITS Tx effects		GS Tx effects		Mech. Thin effects	
	acres		acres		acres		acres
4M–4P	155	**4D–4M**	161	**4M–SMC 1**	44	**4D–4M**	90
4D–4P	228	**5D–5M**	3	**4D–SMC 1**	47	**5D–5M**	200
5M–5P	24			**5M–SMC 1**	19	**4M–4P**	75
Total	407		164		110		365

Therefore, the Empire Project would reduce 517 acres of suitable habitat to an unsuitable state (CWHR 4P or MCP) following DFPZ and GS treatments. Canyon Dam would reduce 75 acres to unsuitable state following mechanical thinning treatments. The acres shown in Table 63, when pooled with the acres presented in Table 59 showing CWHR change after implementation of the Keddie Ridge Project alternatives, provides the total expected cumulative CWHR change in size-density class 4M, 4D, 5M, 5D.

The Empire and Canyon Dam projects would affect three spotted owl territories – PL170, PL202, and PL350 but no PAC acres would be treated. Fourteen acres of suitable habitat (4M/4D-10 acres, 5M-4 acres) in the HRCA for PL170 would be reduced to unsuitable following GS treatment under the Empire

Project. The 500-acre core area for PL170 would also see a slight reduction in suitable habitat – 8 acres of 4M reduced to SMC 1. The 1000-acre home range for all three territories would experience a reduction of suitable habitat from these projects. The Empire Project would reduce 254 acres of habitat in the home range of PL170 to unsuitable (227 acres in 4M, 27 acres in 5M) and 24 acres of habitat in the home range of PL202 to unsuitable (21 acres in 4M/4D, 3 acres in 5M). The Canyon Dam Project would reduce 26 acres of 4M habitat in the home range of PL350 to a 4P (unsuitable) state.

The only future foreseeable project that would potentially affect old forest habitat in the wildlife analysis area is the Belden HFQLG Project. Project Treatments include: Approximately 605 acres of Defensible Fuel Profile Zone treatments, 105 acres of Area thinning treatments, and potentially 81 acres of group selection. The exact amount, location, and design criteria for these treatments have yet to be determined but, based on past HFQLG project effects, there is expected to be a cumulative effect to some CWHR 4M, 4D,5M, and 5D stands (i.e. reduction to unsuitable or more open canopy conditions) following implementation of this project.

The documented range expansion of the barred owl has been hypothesized as a contributing factor in the decline in northern spotted owls, through both hybridization as well as replacing the spotted owl in some areas. It is thought that this range expansion and subsequent northern spotted owl displacement can be a result of forest fragmentation and the barred owl's ability to adapt better to a mosaic of habitats. It is suspected that barred owl expansion into the range of the California spotted owl is occurring due to these same reasons.

Barred owls have expanded their range in California as far south as Sequoia National Park, and in recent years the known range of barred owls has expanded 200 miles southward in the Sierras (USDI 2006). The U.S. Fish and Wildlife Service has concluded that barred owls constitute a threat to site occupancy, reproduction, and survival of the California spotted owl, but that there is currently not enough information to conclude that hybridization with barred owls poses a threat (ibid.).

According to the most recent annual report of the Plumas-Lassen Administrative Study (Keane 2010) based on historical and current occurrence records, there have been a minimum total of 53 individual barred owl records across the Sierra Nevada. This includes a minimum total of 19 records in the PLS study area, a portion of which is located in the Keddie Ridge wildlife analysis area. The pattern of records suggest that barred owls have been increasing in the northern Sierra Nevada between 1989-2009 and are now present in low, stable numbers in the PLS study area. No barred owl detections have occurred within the wildlife analysis area.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the spotted owl or existing spotted owl habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit the owls, as the increased decadence would have a positive effect on prey base numbers and overall habitat values.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn and would result in higher severity effects to vegetation and habitat. Increased rates of spread would result in potential loss of suitable owl nesting habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable habitat for productive owl sites as a result of fire could become patchy or unevenly distributed, and the abundance of owls in the wildlife analysis area could decline.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of spotted owl habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA Final EIS 2001) which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the California spotted owl.

Northern Goshawk

All Action Alternatives (A, C, D, and E)

Direct Effects

The analysis of direct effects on northern goshawk is focused on known PACs up to and including the 2005 surveys. The effects on other potentially suitable nesting and foraging habitat outside of PACs are discussed in the “Indirect Effects” section below. No direct effects on northern goshawk are expected because of the following factors:

- Goshawk PACs would not be entered for the Keddie Ridge Project. Currently, there are 8 goshawk PACs (2,149 acres) in the Wildlife analysis area. Five goshawk PACs overlap with spotted owl PAC habitat (goshawk nesting habitat requirements are similar to California spotted owl nesting and foraging requirements [(USDA 1999a), page 3-106]).
- Limited Operating Periods (LOPs) would be implemented which would not allow treatment activities and use of haul roads within 0.25 mile of active nest sites from February 15 to September 15. The LOPs are expected to eliminate effects from increased human activity and vehicle and equipment noise. If new northern goshawk activity centers, such as nests or young, are detected in future surveys or project activities, PACs would be delineated and applicable resource protection measures (such as LOPs) would be applied.
- No new road construction would occur in northern goshawk PACs. For any road reconstruction in PACs, a LOP would be applied to all goshawk activity centers.

The analysis of direct effects is based on data gathered during the 2005 survey. Surveys were repeated in 2006 to complete the two-year survey effort. The proposed treatments could occur in late summer 2011 and continue an additional 5 years. There is the potential that goshawks could establish new territories (activity centers) during project implementation that would not be protected as PACs.

Indirect Effects

Based on the vegetation map and CWHR model, about 40,935 acres of National Forest System lands in the wildlife analysis provide high nesting capability for the northern goshawk (CWHR size/density classes 4M,4D,5M,5D), and an additional 400 National Forest System acres provide moderate nesting capability (Eastside pine 4M,4D,5M,5D, red fir 4M,4D)(Table 59). The total acres of suitable goshawk habitat in the wildlife analysis area that would remain after implementation of each action alternative is basically the same as presented in Table 61above, with the exception that this table includes an additional 34 acres of red fir 5M and 5D, which is not considered suitable goshawk habitat. The post-project CWHR changes summarized in Table 59 are based on the silviculture prescription assigned to each CWHR stand within treatment units (refer to chapter 2 for prescription details for each alternative). Prescriptions are unique and the variables that change are canopy closure and general retention size for trees.

Changes to suitable goshawk nesting habitat in CWHR size/density classes 4M and 4D as a result of implementing project activities would occur under all action alternatives. Approximately 3,065 acres of 4M and 4D habitat is proposed for treatment under each alternative. Prescriptions that would result in 4M and 4D stands reduced to an unsuitable state (4P or SMC 1) fall within some DFPZ units and all group selection units in alternatives A and E. Alternative A would reduce 818 acres of 4M/4D stands to a 4P state (256 acres from 4D, 562 acres from 4M). Group selection treatments under alternative A would reduce an additional 234 acres to a SMC 1 condition (approximately 82 acres from 4D and 152 acres from 4M). Alternative E would reduce 1,082 4M/4D acres to a 4P state (361 acres from 4D, 721 acres from 4M). Group selection treatments under alternative E would reduce an additional 306 acres to an SMC 1 condition (approximately 85 acres from 4D and 158 acres from 4M). Alternative C would reduce approximately 234 acres of 4M to a 4P state thru thinning 12 inches DBH or smaller trees and creating open (below 40 percent) canopy cover conditions. No stands treated under alternative D would be reduced to an unsuitable state.

The amount of 4D stands reduced to a 4M condition (i.e. canopy closure after treatment would be 40-60 percent) under each alternative would be as follows—alternative A-233 acres, alternatives C and D-553 acres, and alternative E-125 acres.

Under all alternatives, the majority of DFPZ and area thinning treatments applied to CWHR 4M and 4D stands would result in no change to CWHR size class or canopy closure (CC). Of the approximate 3,065 acres of 4M and 4D habitat proposed for treatment, 92 percent and 100 percent under alternatives C and D, respectively, would continue to provide suitable foraging conditions for the northern goshawk. No group selection would occur under these two alternatives and treatments such as light thinning, mastication, hand-thinning, underburning would maintain these stands in a suitable CWHR state. Alternative A and alternative E, which would implement group selection and heavier DFPZ treatments, would maintain 66 percent and 57 percent, respectively, of treated 4M and 4D acres in a suitable condition.

Suitable nesting habitat in CWHR size/density classes 5M and 5D proposed for treatment under all alternatives, with the exception of group selection units, is expected to remain suitable for the goshawk (i.e., no change or reduced to 5M). Approximately 1,303 acres of 5M and 5D is proposed for treatment under each action alternative. Mechanical thinning in 140 acres of 5D, under alternatives A, C, and E, would reduce these stands to a 5M condition. Mechanical treatments under alternative D would reduce 130 acres of 5D to 5M. As stated above under spotted owl effects, a small percentage of GS acres would fall within size and density class 5M stands considered highly suitable for nesting goshawks. GS units under alternative A would treat approximately 34 acres of 5M habitat. Alternative E would treat, thru GS, approximately 60 acres of 5M. Unique prescriptions associated with each alternative more fully identifies the effects of treatments to 5M and 5D structural elements. Alternative E would result in the heaviest treatments, with up to 30 inch DBH trees removed while maintaining a 40 percent CC. Prescriptions under alternative A would adhere to an upper diameter limit of either 20 or 24 inch DBH trees and would maintain a 40-50 percent CC. Alternative D prescribes removal of up to 20 inch trees, leaving 50 percent CC. Alternative C, the noncommercial alternative, would have the lightest treatment, thinning to 12 inches DBH and maintaining 40-50 percent CC in 5M and 5D stands.

Improving forest health is one of the objectives of the Keddie Ridge Project and this includes improving vigor of residual trees by reducing stand density and competition. An important design element common to all action alternatives that would help meet such objectives is biomass (less than or equal to 10-inch trees) removal within mechanical thin units. This size class in a stand provides complexity and structure, as well as the diverse microclimates that goshawks seek to control exposure and changes in ambient temperature for roosting. On average, the following percentage of stand biomass would be retained in mechanical thin units: under alternatives A and E 27 to 30 percent in CWHR size class 4 and 17 to 22 percent in CWHR size class 5. Alternatives C and D would retain, on average, more biomass in these same units; 41 to 48 percent in CWHR size class 4 and 34-44 percent in CWHR size class 5.

Group selection treatments, as proposed under alternatives A and E, would create early seral stages and would contribute to heterogeneous stand structures that may be more resilient to disturbance events (such as fire, drought, and insect and disease infestations) on the landscape scale. The treatment would not result in areas that prevent access to adjoining suitable habitat. By design, group selections make up approximately 11.4 percent of any given stand. The small size of the groups (0.5 acre to 2 acres) would not preclude goshawks from flying over or around the treated areas. While the implementation of the group selections may not result in fragmentation in the classic sense, they would reduce the value of the habitat within the stand and would likely cause changes in the behavioral use of the territory, particularly with respect to foraging. Allowance would be made to retain up to two of the largest snags per acre in Group Selection Units, unless removal would be necessary for safety and operability. Based on past projects and discussions with Occupational Safety and Health Administration safety representatives, it is likely that the majority of snags would be felled, and very few snags would be left in the 284 acres of group selection under alternatives A and the 326 acres of group selection under alternative E

The 6.8 miles of new temporary non-system roads proposed to be constructed for the Keddie Ridge Project would be decommissioned upon project completion. Thus, no long-term increases in human activities are expected as a result of the action alternatives. No roads would be constructed in PACs.

It is an unknown as to how some of the important prey species (small mammals, birds) preferred by goshawks would respond to opening up forested stands with fuel treatments and group selection units. Based on CWHR modeling, it is known that several bird species respond favorably to either opening up forested stands and/or openings, while some do not (USDA 1999a, appendix I). The increased diversity and edges created by groups within forested stands may provide foraging habitat that would increase use of the landscape by goshawks. The response of prey species, including small mammals and passerine bird use of group openings, is one of the main objectives of the HFQLG post-implementation monitoring that would be conducted by the Pacific Southwest Research Station through the Plumas-Lassen Administrative Study.

Cumulative Effects

Cumulative effects on the goshawk could occur with the incremental loss of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-intensity stand-replacing fires, and the means by which land managers control them, have contributed and may continue to contribute to loss of habitat for this species.

Refer to the cumulative effects discussion above for the California spotted owl, as well as cumulative effects discussed in the Keddie Ridge Project BA/BE. Cumulative effects discussion focused on past, present, and future actions as they relate to impacts on suitable owl habitat, more specifically CWHR size/density classes 4M, 4D,5M, and 5D. These same CWHR types are considered to provide suitable goshawk nesting habitat. It is not anticipated that the cumulative habitat reduction would result in loss of occupancy and productivity of known goshawk PACs. This is based on the location of project activities in relation to known PACs, no habitat alteration in PACs, distribution of known PACs, and a minimum of 95 percent retention of available suitable nesting habitat distributed across the wildlife analysis area following project implementation.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Alternative B (No Action)

Direct Effects

There would be no direct effects on the northern goshawk or existing goshawk habitat. No activities would occur that would cause disturbance to nesting or foraging birds.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit the goshawks, as the increased decadence would have a positive effect on prey base numbers and overall habitat values.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn which may result in higher severity effects to forested habitats. Increased rates of spread would result in potential loss of suitable goshawk nesting habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable habitat for productive goshawk sites as a result of fire could become patchy or unevenly distributed, and the abundance of goshawks in the wildlife analysis area could decline.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of northern goshawk habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-severity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA final EIS (USDA 2001a), which could lead to lower goshawk abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. The displacement is usually temporary and seasonal, but if disturbance occurs during critical periods (nesting season, winter), effects can be longer term. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the northern goshawk.

Mesocarnivores

All Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects to mesocarnivores are expected due to the likelihood of no individuals inhabiting the wildlife analysis area. The indirect effects section below discusses potential effects to existing suitable mesocarnivore habitat as a result of implementing Keddie Ridge Project activities.

Indirect Effects

Refer to the indirect effects discussion for the spotted owl for changes to suitable mesocarnivore habitat (CWHR size-density classes 4M, 4D, 5M, and 5D) as a result of implementing fuel treatments, group selection harvests, and area thinning under each action alternative. The number of denning and foraging habitat acres that could be reduced by each alternative is discussed below.

Table 64 summarizes the project effects to denning and foraging habitat for the fisher. As Table 64 shows, alternatives A and E, due to the heavier DFPZ treatments and group selections proposed, would reduce some acres to an unsuitable state (CWHR 4P or SMC 1). Alternative C, as a result of thinning some stands to below 40 percent canopy cover to meet fuel objectives, would reduce approximately 234 acres to an unsuitable (4P) condition. Alternatives C and D would reduce 684 acres and 693 acres, respectively, of denning habitat to a 5M or 4M state. Acres of 4D/5D reduced to 4M/5M under all action alternatives would be considered suitable foraging habitat for the fisher.

Table 64. Keddie Ridge Project Effects to Fisher Denning and Foraging Habitat

	Denning Habitat acres (CWHR 4D/5D)					Foraging Habitat acres (CWHR 4M/5M)		
	5D→5M	4D→4M	4D→4P	GS*→MCP	Total	4M→4P	GS*→MCP	Total
Alt A	140	65	345	82 (4D only)	**615**	562	186 (4M-152, 5M-34)	**808**
Alt C	131	553	0	no GS	**684**	0	no GS	**0**
Alt D	140	553	0	no GS	**693**	0	no GS	**0**
Alt E	140	129	373	85 (4D only)	**717**	721	218 (4M-158, 5M-60)	**954**

*approximation of GS acres only - exact location and acreage yet to be determined. Group selections would primarily be located in size class 4 stands.

In summary, existing fisher denning habitat treated under alternatives A and E would be reduced by 4.6 percent and 5.3 percent respectively. Alternatives C and D would reduce denning habitat by 5 percent. After factoring in the CWHR density class D stands converted to density class M as a result of treatments (Table 64) alternatives A and E would result in a reduction of suitable foraging habitat by 1.3 percent and 2.4 percent respectively. Alternatives C and D would see an increase of approximately 693 foraging acres from existing conditions as a result of thinning treatments within 5D and 4D stands.

Of the CWHR types considered suitable for the American marten in the wildlife analysis area, only Sierra mixed conifer (SMC) habitat is proposed for treatment. Foraging habitat (SMC4M, SMC5M) proposed for treatment is 3,254 acres. Denning habitat (SMC4D, SMC5D) proposed for treatment is 799 acres. Table 65 summarized the project effects to suitable marten habitat. It is estimated that, under alternatives A and E, no group selection would occur within suitable marten denning habitat.

Table 65. Keddie Ridge Project Effects to Marten Denning and Foraging Habitat

	Denning Habitat acres (SMC 4D/5D)				Foraging Habitat acres (SMC 4M/5M)		
	5D→5M	4D→4M	4D→4P	Total	4M→4P	GS*→SMC 1	Total
Alt A	121	241	240	**602**	556	45 (4M-15, 5M-30)	**601**
Alt C	121	481	0	**602**	234	no GS	**234**
Alt D	111	481	0	**592**	0	no GS	**0**
Alt E	121	126	355	**602**	721	66 (4M-12, 5M-54)	**786**

*approximation of GS acres only - exact location and acreage yet to be determined.

In summary, existing marten denning habitat treated under all action alternatives would be reduced by 5 percent (592-602 acres). Existing marten foraging habitat treated under alternatives A, C, and E would see a reduction of 2 percent, 1 percent, and 3 percent respectively. Alternatives C and D would see an increase of approximately 368 and 592 foraging acres, respectively, from existing conditions as a result of thinning treatments within 5D and 4D stands.

Approximately 13,153 acres (3 percent) of the forest carnivore network are within the wildlife analysis area. The Keddie Ridge Project proposes to treat 134 acres of this network. Hand thin/pile/and burn, mastication, or prescribed fire treatments would fall within 115 network acres (85 percent), resulting in little to no change to existing suitable carnivore habitat. Approximately 19 acres of the carnivore network would be mechanically thinned under all alternatives. Alternatives A and E would reduce 3 acres of SMC4M habitat to a 4P state. All action alternatives would treat less than 1 acre of SMC5D that would result in a 5M condition. No group selection acres are proposed in the carnivore network. In summary, the Keddie Ridge Project's effects on the forest carnivore network would be negligible, due to the small amount of acreage proposed for treatment and little to no change to existing suitable habitat post project.

All new roads that would be constructed in support of the Keddie Ridge Project would be closed upon project completion, thus no long-term increases in human activities are expected. The open road density in the Keddie Ridge Project area would remain the same under all action alternatives (approximately 2.4 miles per square mile), which would still provide low habitat capability for forest mesocarnivores. With implementation of the proposed strategic system of DFPZs, the Keddie Ridge Project would help reduce understory fuel buildup and may reduce the potential for high-severity wildfires, which have a great potential to degrade vast tracts of habitat for the marten and fisher.

Cumulative Effects

Refer to the cumulative effects discussion above for the California spotted owl, as well as the cumulative effects discussed in the Keddie Ridge Project BA/BE. The cumulative effects on forest mesocarnivores could occur with the incremental reduction of the quantity and/or quality of habitat for this species. Overall, increases in recreational use of National Forest System lands, and the use of natural resources on state, private, and federal lands, may contribute to habitat loss for this species. High-severity stand-replacing fires, and the means by which land managers control them, have contributed, and may continue to contribute to loss of habitat for these species.

The action alternatives would not increase any large-scale, high-contrast fragmentation above existing levels. The cumulative effect of private land clearcuts and selective thinnings, older National Forest System land plantations, the large brush fields created by past wildfires, together with implementation of DFPZs and group selection (alternatives A and E only) under the Keddie Ridge Project would result in increased “patchwork” of open habitat and young age class vegetation between mature forested stands within the analysis area. This would increase edge effects and possibly increase potential risks to forest interior species movement and use in the wildlife analysis area. Thus the Keddie Ridge Project would act cumulatively with past actions to slightly reduce the connectivity of habitat within the wildlife analysis area, although connectivity would remain and improve over time as conifer cover is restored through natural processes and increased protection from high-severity fire. Connectivity of dense forest habitat (moderate and dense stands in size classes 4 and 5) is shown in Figure 12.

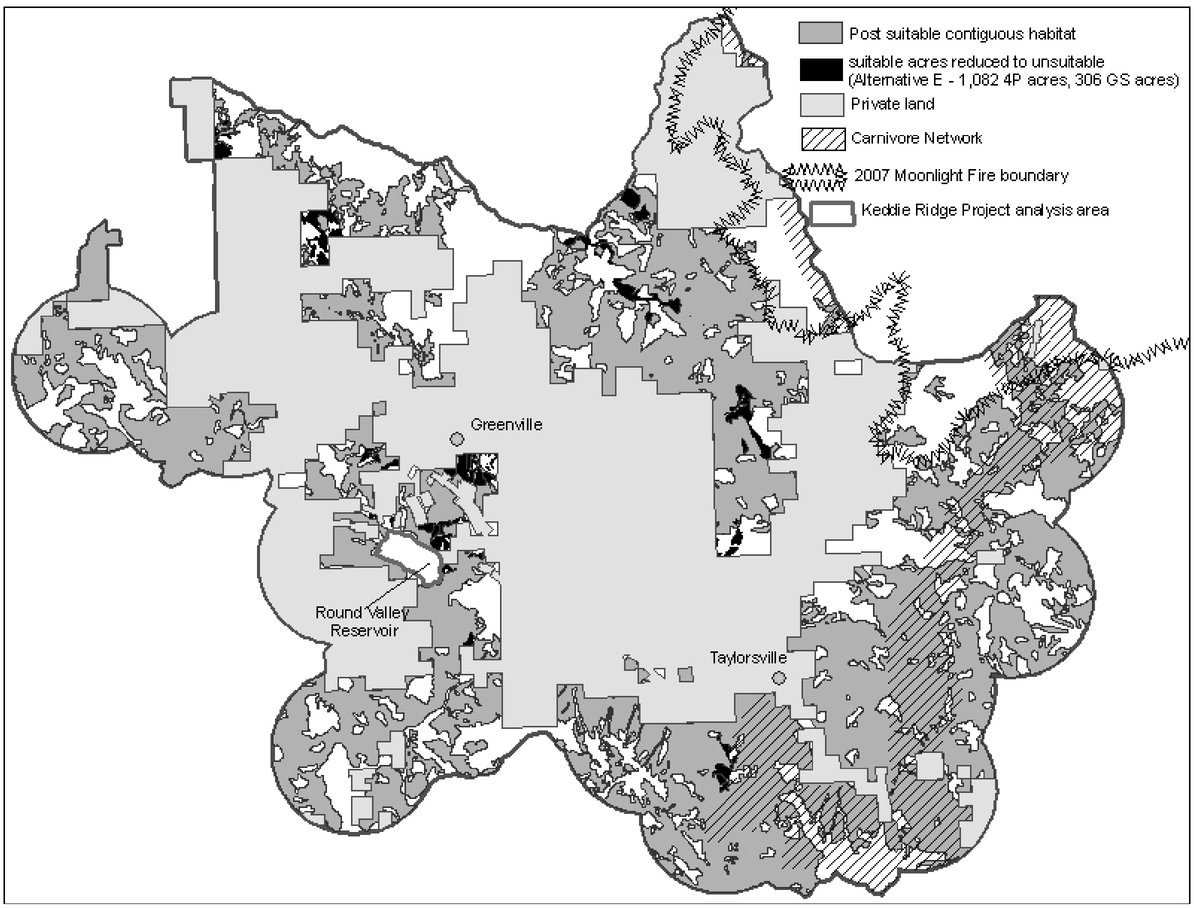


Figure 12. Mesocarnivore Contiguous Suitable Habitat Available (CWHR Size-Density Classes 4M, 4D, 5M, 5D) Following Implementation of the Keddie Ridge Project (Alternative E Effects Shown, Which is Maximum Area Reduced to Unsuitable Compared to All Alternatives)

Figure 12 shows 39 blocks of contiguous habitat ranging in size from 25 acres to 12,470 acres, with the average block size over 1,000 acres. Of all action alternatives, alternative E would have the largest effect on suitable carnivore habitat. Implementation of any of the action alternatives would result in little change to available contiguous suitable habitat.

Based on the direct and indirect effects, implementation of all action alternatives would contribute to cumulative effects on mesocarnivores and mesocarnivore habitat. Post-treatment amounts of suitable mesocarnivore habitat would provide similar numbers and size blocks of contiguous habitat as the existing condition. The reduction of 4.6-5.3 percent of suitable denning habitat and the reduction of 1.3-2.4 percent (alternatives A and E) of suitable foraging habitat for the fisher (table 59) would not cause any large-scale fragmentation of suitable habitat. There would be a cumulative reduction in habitat for the next 50 years in fuel treatments to 50+ years in group selection areas. Implementation of alternatives A and E would result in the highest risk of all alternatives to mesocarnivore habitat in the short-term and greatest uncertainty about future mesocarnivore activity.

Alternative C would reduce suitable foraging habitat by approximately 1 percent. Implementation of alternative D would not result in additional unsuitable habitat. Alternatives C and D would reduce a small percentage of denning habitat to a foraging condition as a result of treatments. Therefore, these alternatives would also present a level of risk to mesocarnivore habitat in the short-term and uncertainty about future mesocarnivore activity but this level of risk would be less than the alternatives A and E. Based on known detections of marten on the Plumas National Forest, no changes in marten occupancy or populations on the Forest would occur.

Determination

The Forest Service has determined that, for all action alternatives, the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the American marten or Pacific fisher.

Alternative B (No Action)

Direct Effects

There would be no direct effects on mesocarnivores or existing mesocarnivore habitat. No activities would occur that would cause disturbance to denning or foraging carnivores.

Indirect Effects

This alternative would have little immediate impact to the species. Stands are currently relatively homogeneous areas typified by small even-aged trees existing at high densities. In the denser stands, habitat values may not reach a point of providing high habitat quality as competition would slow conifer growth and is likely to result in an increase in mortality. Of particular concern is mortality within the larger trees. The development of a multi-storied stand would be slowed and based on the conditions of many stands (single cohorts), that particular habitat feature may not develop without some stand altering activity such as fire or mortality from insects, drought or a combination of factors.

Dense stand conditions may result in an increase in conifer mortality, predominantly among the larger trees that are at a greater risk (due to increased competition for resources). The actual risk is unpredictable as the level of risk is directly tied to stochastic events such a weather and fire. The increase in conifer mortality could indirectly benefit mesocarnivores, as the increased decadence could provide higher quality denning areas, support larger carnivore prey populations, and provide safer movement corridors.

The indirect effects of no action would include an increased risk for future wildfire and related impacts on habitat development and recovery. The fuel loads that would be left by this alternative would make potential wildfires in the area difficult to suppress and could create a more intense burn. Increased rates of spread would result in potential loss of carnivore denning and foraging habitat and other important habitat attributes such as large trees and snags and down woody material. Thus, under alternative B, suitable carnivore habitat as a result of fire could become patchy or unevenly distributed, resulting in less desirable conditions for martens and fishers to become re-established in the wildlife analysis area.

Cumulative Effects

The no action alternative for the Keddie Ridge Project would not provide for the long-term protection of carnivore habitat from catastrophic fire. There would be no actions designed to reduce the risk of high-intensity wildfire. Total wildfire acres and high-intensity wildfire acres are anticipated to increase from current levels under this alternative (based on analysis conducted for the SNFPA final EIS (USDA 2001a), which could lead to lower owl abundance in the wildlife analysis area compared to existing conditions. There would be no thinning to enhance the growth of dominant and codominant trees that may provide future habitat availability.

Recreational activities in the wildlife analysis area contribute to cumulative effects on wildlife in terms of increased levels of human disturbance and noise that can result in displacement of wildlife species from selected habitats. Such displacement is usually temporary and seasonal. Most of the recreation use in the wildlife analysis area consists of dispersed activities (by both individuals and small groups) such as hiking, horseback riding, mountain biking, dirt biking, pleasure driving, ATVs, hunting, fishing, camping, rock hounding, mining, and firewood gathering.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the American marten or Pacific fisher.

Mountain Yellow-legged Frog

All Action Alternatives (A, C, D, and E)

Direct Effects

Potential direct effects from the Keddie Ridge Project include impacts to individual mountain yellow-legged frogs (MYLFs) during activities. Possible direct effects from the proposed actions on Forest Service R5 aquatic sensitive species include crushing of individuals if they are present during project activities. The use of a feller buncher within RHCAs has the potential of directly injuring or killing frogs. Although skyline logging is considered to have minimal ground disturbing effects, falling of trees can result in crushing, injuring, or killing of animals that occur where trees fall. The potential for direct impacts to individuals is greatest during wet periods and in early fall, when frogs are most likely to disperse from aquatic habitats.

A 3-year telemetry study conducted on the PNF found that MYLF have very limited movements into upland habitats or adjacent riparian areas (Wengert et al. 2006). The study concluded that off-stream channel movements were very rare and that in-stream movements within and up and down the wetted stream channel were common and frequent traits of MYLF behavior. Therefore, the Keddie Ridge Project design features and standard management requirements, which include RHCA equipment restriction zones, best management practices (BMPs) to prevent water quality degradation (appendix H) and riparian management objectives standards (appendix E) should provide adequate protection to minimize impacts to MYLFs (if present) within riparian or upland habitats. Potential direct effects are expected to be negligible to MYLFs due to the likelihood, based on survey results, that populations are not present in treatment areas.

Indirect Effects

Riparian habitats would be entered during DFPZ and area thinning treatments for the purpose of restoring, maintaining, or improving riparian habitat conditions. Treatments would include the removal of encroaching conifer vegetation (up to 20 inches in diameter) through mechanical means, hand thinning, mastication, and underburning. Group selection would avoid RHCAs. Approximately 1,279 acres of RHCAs would be entered for treatment under the action alternatives.

Table 66. Approximate RHCA Acres Proposed for Treatment

RHCA Prescription	RHCA acres treated by alternative			
	Alt A	Alt C	Alt D	Alt E
20" UDL*/50% CC	504		281	549
12" UDL/50% CC	45	550	155	
masticate <10" trees	155	133	133	133
underburn	308	308	308	308
HPB* <8" trees	267	288	363	288
Total RHCA acres	1279			

*UDL=upper diameter limit. *HPB=handthin, pile, and burn

"Equivalent Roaded Acres" (ERA) is a conceptual unit of measure used to assess ground-disturbing activities. One acre of road surface equals one Equivalent Roaded Acre or ERA. The proposed fuel treatment and area thinning activities would increase ERA values in the subwatersheds where treatments would occur. Increases in ERA may lead to detrimental effects to MYLF stream habitat, including erosion from treated hillsides and increased delivery of sedimentation into streams. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover. Disturbances are often added together to determine a cumulative ERA for individual watersheds. This is discussed in the following cumulative effects section.

Equipment exclusion zones in RHCAs, based on existing RHCA buffer widths and slope class (Table 9), would lessen the extent of skid trail creation within RHCAs. Areas in which mechanical harvest activities would be allowed within RHCAs have the potential to increase the extent of disturbed, displaced, or compacted soils. Such soil conditions would have a potential adverse effect on watershed conditions by increasing sedimentation delivery into streams. Indirect effects due to skidding would likely not occur or would be minimal. Implementation of design criteria specific to skid trails in RHCAs (Table 9), Standard management requirements, and BMPs would help mitigate and prevent increased compaction, erosion, and sedimentation.

Prescribed fires would not affect canopy cover in RHCAs, but they could remove some ground cover. The implementation of standard protection measures (design criteria, SMRs, BMPs) would help minimize indirect effects on amphibians and reptile species. Burns occurring before the first soaking rains of the fall are least likely to directly affect amphibians because the frogs would be in the RHCAs at that time. Burns occurring during the spring would be more likely to cause direct effects on amphibians and reptiles, as individuals would be more likely to be moving outside the RHCAs at that time.

Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short-term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. In-channel large woody debris (LWD)(trees greater than 12 inches diameter) would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD would be encouraged through release of the existing conifers and snag retention standards.

Table 7 states the design criteria for RHCA treatments under all action alternatives. The retention of 20-inch or larger trees (greater than or equal to 12 inches under alternative C), 50 percent or greater canopy cover, all hardwood and riparian species, and sufficient amounts of residual surface fuels (including large woody debris) within RHCAs would indirectly benefit MYLFs by maintaining suitable habitat values while creating riparian conditions that would be less susceptible to high-severity, stand-replacing fire. Large fires have the potential to create large-scale, high-contrast fragmentation across the landscape, which could remove suitable MYLF habitat, isolates habitat patches, and creates large openings that may prevent species occupancy, emigration, and immigration. The action alternatives would reduce the long-term threat of stand-replacing fires, which would offset their short-term minor effects (USDA 2003).

Herbicide Hazard Analysis

An herbicide is a pesticide that kills plants or inhibits their growth. To evaluate the effects of herbicides on wildlife, it is critical to consider several factors such as toxicity, exposure, dose, and the biology and behavior of species that could potentially be exposed to the herbicide. Toxicity is the potential a pesticide has for causing harm to a specific species or group of species.

Alternatives A and D propose to treat three noxious weed species (starthistle, Canada thistle, hoary cress) with herbicides. Two herbicides would be used: aminopyralid (i.e. Milestone® or an equivalent formulation) to treat dry and upland sites greater than 15 feet from the water’s edge and the aquatic formulation of glyphosate (i.e. Accord™ or an equivalent formulation) for lowland treatments (between 0-15 feet from the water’s edge). Aminopyralid would be applied to approximately 61.5 acres infested with Canada thistle and starthistle. A backpack sprayer would be used to spray upland infestations along roads, skid trails, and landings. Glyphosate would be applied to approximately 1 acre to control Canada thistle and hoary cress. A wick applicator (in riparian areas) or backpack sprayer (on roads and landings) would be used to selectively apply this herbicide. The following additives would likely be added to herbicide formulations to increase efficacy of treatments: non-ionic modified vegetable oil surfactant (i.e. Competitor® or an equivalent) and water soluble colorant [c] (i.e. Hi-Light™ Blue or an equivalent). The Keddie Ridge Project also proposes to apply a registered borax fungicide (i.e. Sporax or Cellu-treat) to pine stumps greater than 14 inches in diameter in units 45, 46, 49, and 50.

Wildlife may be exposed to herbicides if they are in the vicinity of contaminated surface waters or treated vegetation. The routes of exposure include oral, dermal, and inhalation. Oral exposures might occur through ingestion of contaminated food (such as insects) or water (small puddles during application) or incidental ingestion of contaminated plants during foraging or other activities. Dermal exposures are likely to be most important for burrowing mammals (through contact with contaminated soils) and animals that spend considerable amounts of time within ground vegetation.

Fish and invertebrate exposure rates are based on water contamination rates. Syracuse Environmental Research Associates, Inc. (SERA), under contract to the Forest Service, provides very few studies related to the effects of herbicides on amphibian species. There is extremely limited published data on the relationship of herbicides on mountain yellow-legged frogs. The risk to a variety of aquatic, amphibian, and reptilian species varies with the chemical(s), rate(s), timing, and other factors, which can vary by site condition (Syracuse Environmental Research Associates (SERA) 2003, 2007).

The Syracuse Environmental Research Associates, Inc. risk assessment worksheets for aminopyralid and glyphosate (ibid) evaluated toxicity, dose, and biology of a species and developed a “Hazard Quotient” for a number of scenarios. A hazard quotient is basically a mathematical calculation that is expressed numerically in terms of risk, where neutral risk is equal to 1, and the risk of toxicity increases as the value rises above 1 and decreases as the value drops below 1. For the application rates and application methods (backpack) proposed for noxious weeds under the Keddie Ridge Project, all hazard quotients for the two herbicides are below 1 for all terrestrial and aquatic vertebrate species and aquatic invertebrate species evaluated in the SERA worksheets. There is the potential for an herbicide spill into streams or other bodies of water directly affecting fish and aquatic invertebrates with the potential of a chronic exposure. A spill plan would be followed for herbicide application within the project area. The hazard quotient for wicking application is assumed to be even lower than the backpack sprayer application due to the more direct application and control.

Surfactants are used to facilitate or enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Competitor® is a non-ionic modified vegetable oil. The assessments of hazards related to surfactants is limited by the proprietary nature of the formulations. Surfactants, by their very nature, are intended to increase the effect of a pesticide by increasing the amount of pesticide that is in contact with the target. This is not synergistic, but more accurately a reflection of increased dose of the herbicide active ingredient into the plant. The “Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides” (Bakke 2003) sites technical references which indicate a lack of synergistic effects between surfactants and pesticides which suggest that surfactants don’t increase the toxic effects of herbicides. This paper also listed the results of standard acute aquatic species toxicity testing which indicated that any potential effects to aquatic species would be unlikely under normal application rates.

The colorant Hi-Light™ Blue will be added to the herbicide mixtures prior to the application so that the actual treated area can be readily determined. This helps to prevent skips and overlaps. Hi-Light™ Blue is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems. The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lakes and ponds (Syracuse Environmental Research Associates (SERA) 1997).

Under alternatives A and D, in units 45,46,49, and 50, Borax (Sporax) would be applied to all cut stumps greater than 14 inches DBH. to minimize the susceptibility to *Heterobasidion* root disease. In the most recent risk assessment for Borax (SERA 2006), Boron, the agent of toxicological concern in Borax, was further evaluated. The focus of the evaluation was wildlife's direct consumption from the stump and ingestion of contaminated water. The assessment concluded that the use of Borax on stumps does not present a significant risk to wildlife species under most conditions of normal use, even under the highest application rates.

There is little chance that either glyphosate or aminopyralid is expected to reach streams because of their limited transport mobility, relatively short half-lives, and application criteria, which takes into account the time of year, wind velocity, and period to the next rainfall). Application methods would be aimed specifically to individual noxious weed plants and not applied at a broadcast scale. No change in nontargeted plants and vegetative succession would occur as a result of herbicide application on noxious weeds. The noxious weeds proposed for treatment are highly unpalatable and are not consumed by herbivores, but seed-eating birds, such as goldfinches and pine siskins, could possibly feed on the seeds. In conclusion, no significant adverse wildlife effects associated with the herbicide application alternatives are expected.

Cumulative Effects

The following discussion on watershed conditions within the analysis area is drawn from the cumulative watershed assessment under the Hydrology and Soils section found in this DEIS chapter.

The area defined for the cumulative watershed assessment encompasses 12 sub-watersheds, which are contained in 10 HUC 6 watersheds, all of which contain varying degrees of suitable habitat for MYLFs. The Wolf Creek, Lights Creek, and Indian Creek systems converge in the Indian Valley basin and flow south west draining the assessment area. Indian Creek joins Spanish Creek at the boundary of the assessment area to form the East Branch North Fork Feather River.

The threshold of concern (TOC) is an indicator used to assess the risk of cumulative watershed effects. The TOC is generally expressed as a percentage of watershed area. When the total ERA in a watershed exceeds the TOC, susceptibility for significant adverse cumulative effects is high. The cumulative ERA in a watershed is often expressed as a percent of the TOC. For example, in a 1,000-acre watershed where the

TOC is 12 percent of the watershed area, 100 percent of the TOC represents a condition where the amount of disturbance is similar to 120 acres of road surface.

Following implementation of any of the action alternatives, no subwatersheds would be at or exceed the TOC and only one subwatershed (Upper Cooks) would approach the TOC. The Moonlight Fire and subsequent private salvage harvest activities raised the ERA value in the Upper Cooks Creek subwatershed to 90.2 percent of TOC, and the Keddie Ridge project would raise it another 8 percent. The Round Valley Reservoir subwatershed, the municipal water supply for Greeenville, is projected to experience the greatest increase in ERA—16.3 percent, bringing the ERA value up to 6.83 which equates to 57 percent of the TOC. The increase in ERA values under all alternatives is predicted to range from .01 to 16.3 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 12.8 to 97.6 percent of the TOC. ERA values under alternatives C and D would be slightly less than alternatives A and E due primarily to the no group selection proposed.

The HFQLG Act Record of Decision, and its associated Scientific Analysis Team guidelines for DFPZ construction, and the SNFPA Record of Decision’s aquatic strategy for DFPZ maintenance, would not only prevent or strictly control any additional impacts on frog habitat, but would result in actual habitat restoration and enhancement for some streams (USDA 1999b). It is unlikely that the proposed activities would be a significant addition to cumulative effects on the frog species, and habitat characteristics would not change to a degree that these effects would limit populations; therefore, there would be very few cumulative effects.

Determination

The Forest Service has determined that the action alternatives of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog. This determination is based on project design features that would lessen and minimize impacts to the MYLF and suitable habitat which include: 1) incorporation of RHCA equipment restriction zones, 2) implementation of best management practices, and 3) implementation of soil and water standards (riparian management objectives).

Alternative B (No Action)

Direct Effects

There would be no direct effects on MYLF habitat because no activities would occur to cause disturbance to individual frogs or to impact existing habitat conditions.

Indirect Effects

The DFPZ, group selection, and area thinning treatments would not occur under the no action alternative, so there would be no exacted effects on the channel network. The fuel loads left by alternative B could make potential wildfires in the area difficult to suppress and create a more intense burn, which could lead in a potential loss of RHCAs. There would be the potential for RHCAs with high fuel loads to act like chimneys and carry fire up and down the watershed. Typically, burn severity and the effects of wildfire disturbance are often limited in near-stream areas compared to upland areas. The effects of fire adjacent to channels can be devastating to the integrity of stream proper function and condition. Channel degradation, erosion, and sedimentation and the resulting effects on stream and riparian habitats and water quality would likely increase following a stand-replacing fire. Roads in the Keddie Ridge Project area would not be improved for drainage and aquatic species habitat connectivity. Sedimentation from road runoff into the drainages and fragmentation of aquatic habitats would continue.

Cumulative Effects

Cumulative effects from private land use (timber and gravel extraction, livestock grazing, and urbanization) would continue to create water quality problems, including sedimentation and bank cutting.

Determination

The Forest Service has determined that the no action alternative of the Keddie Ridge Project may affect individuals but is not likely to result in a trend toward federal listing or loss of viability for the mountain yellow-legged frog.

USDA Forest Service R5 Management Indicator Species

Hairy Woodpecker

The direct, indirect, and cumulative effect of the Keddie Ridge Project in terms of changes in medium-sized and large-sized snags per acre within green forest habitat would not change from the existing condition, as snags in green forested habitat would only be minimally impacted by DFPZ and Area Thinning Treatments. The primary proposed action that would likely remove snags would be group selection. Alternative A proposes 284 acres of groups selection. Alternative E proposes 326 acres of group selection. Medium (15-30 inches DBH) to large (greater than 30 inches) snags within these group selection acres may or may not remain due to required removal to allow for operability. Additional snag removal that may be required for operability reasons along haul routes and on landings is expected to be minimal. On average, the amount of snags greater than 15 inches DBH existing and that would remain post-treatment within units is 3 per acre. Snag amounts (existing and post-treatment) range from 0 in some units to 12 per acre in others. The design criteria for all action alternatives (chapter 2, tables 5, 6, 7) states that, where available, four of the largest snags (15 inches DBH and 20 feet in height) per acre will be retained. It is determined that the Keddie Ridge Project actions will not alter the existing trend in the ecosystem component for this species, nor will it lead to a change in the distribution of hairy woodpeckers across the Sierra Nevada Bioregion.

Aquatic Macroinvertebrates

Treatments under all action alternatives within RHCAs have the potential to increase the extent of disturbed, displaced, or compacted soils. Such soil conditions would have a potential adverse effect on watershed conditions by increasing sedimentation delivery into streams. Short-term decreases in channel shading and ground cover could occur as well. The implementation of standard protection measures (design criteria, SMRs, BMPs) would help minimize these indirect effects.

Despite the risk of potential adverse effects, the greater long-term benefit of treating RHCAs under the Keddie Ridge Project would be the potential increased protection from catastrophic wildfire. Other effects would include increasing the size of residual trees within RHCAs, preventing potential catastrophic wildfire, reducing future losses of large diameter trees and large woody debris (LWD) to fire, and increasing future LWD recruitment of intermediate to large logs. In riverine systems, debris would help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg 1998). Within the immediate riparian areas, the physical effects derived from in-channel LWD would be retained because no natural debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers. The increase in subwatershed ERA values as a result of project activities proposed under all alternatives (refer to the Hydrologyand Soils section of this DEIS for further discussion of ERA) is not likely to result in noticeably changes to stream flow or sedimentation delivery. As well, based on incorporation of RHCA equipment restriction zones and implementation of best management practices existing water surface shade conditions and riparian LWD is expected to be maintained following treatments.

The Keddie Ridge Project cumulative watershed effects analysis concluded that, following implementation of any of the action alternatives, no subwatersheds would be at or exceed the threshold of concern (TOC). Thus, suitable riparian conditions for aquatic species would not be susceptible to significant adverse cumulative effects as a result of fuel reduction activities implemented under the Keddie Ridge Project. It is determined that the Keddie Ridge Project’s cumulative impacts are too small to have any affect at the larger scale and thus will not alter the existing trend in the habitat or aquatic macroinvertebrates across the Sierra Nevada bioregion.

Hydrology and Soils

Introduction

A cumulative impact, as defined in 40 CFR 1508.7 is

> *the impact on the environment which results from the incremental impact of the action when added to other past, present, and foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ 1971).*

Cumulative impacts may occur off-site and, in the case of the water resource, may affect downstream beneficial uses of water. Effects can be either beneficial or adverse and result from the synergistic or additive effects of multiple management activities within a watershed (USDA 1988).

Cumulative watershed effects (CWE) analyses have traditionally focused on impacts to downstream beneficial uses. These include aquatic habitat, hydroelectric power generation, and domestic water supplies. New information has come to light that places considerable emphasis on near-stream disturbances and their site-specific biological effects (Menning 1996, McGurk and Fong 1995), as well as the downstream physical effects.

Soil quality analysis standards presented in the Region 5 Forest Service Soil Management Handbook provide threshold values that indicate when changes in soil properties and soil conditions would potentially result in long-term losses to inherent productivity or hydrologic function of the soil (USDA 1995). When threshold values are exceeded for certain soil properties, the resulting condition is termed “detrimental soil disturbance.” This analysis addresses downstream cumulative watershed effects as well as site-specific impacts that relate to changes in long-term soil productivity.

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Direction Relevant to the Project as it Affects Soil Resources

National Forest Management Act (NFMA) of 1976 (which amended The Forest and Rangeland Renewable Resources Planning Act of 1974)

As described in Forest Service Manual Chapter 2550 (USDA 2009b), this authority requires the maintenance of productivity and protection of the land and, where appropriate, the improvement of the quality of soil and water resources. NFMA specifies that substantial and permanent impairment of productivity must be avoided.

National Soil Management Handbook

Forest Service Handbook 2509.18 (USDA 1991) defines soil productivity and components of soil productivity, establishes guidance for measuring soil productivity, and establishes thresholds to assist in forest planning.

Region 5 Soil Management Handbook Supplement

This supplement (R5 FSH Supplement 2509.18-95-1) establishes regional soil quality analysis standards which provide threshold values to indicate when changes in soil properties and soil conditions would potentially result in a significant change in soil productivity, soil hydrologic function, or soil buffering capacity (USDA 1995). The analysis standards are to be used for areas dedicated to growing vegetation. They are not applied to lands with other dedicated uses, such as system roads and trails or developed campgrounds.

The soil quality analysis standards provide for consistent project analyses across the region. These thresholds are used for project analysis but are not a set of mandatory project standards or requirements. When a soil quality indicator exceeds the stated threshold, the result is termed detrimental soil disturbance. The handbook advises that detrimental soil disturbance that affects soil productivity shall not be of a size or pattern that would result in significant change in production potential for the activity area. Analysis threshold indicators for soil productivity include:

- A 10 percent or more reduction in total soil porosity, from that found under natural conditions, corresponds to a threshold soil bulk density that indicates detrimental soil compaction.
- Surface organic matter is to be maintained in amounts sufficient to prevent nutrient cycle deficits and to avoid detrimental physical and biological soil conditions. Fine organic matter (material up to 3 inches in diameter) is to occur over at least 50 percent of the area.

- The threshold for large woody material (logs at least 10 feet long and 12 inches in diameter) is at least 5 well distributed logs per acre.
- Project levels of surface organic matter, including fine organic and large woody material, should not elevate wildfire risk or severity and may be reduced to meet management objectives in fuel breaks.

The R5 Handbook advises that soil hydrologic function is to be analyzed using the R5 Cumulative Watershed Effects Analysis and/or the R5 Soil Hazard Erosion Rating system (USDA 1995). Soil buffering capacity analysis should determine whether materials added to the soil significantly alter soil reaction class, buffering or exchange capacities, or microorganism populations.

Plumas National Forest Land and Resource Management Plan (LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA 1988) establishes standards and guidelines to prevent significant or permanent impairment of soil productivity, including:

- During project activities, minimize excessive loss of organic matter and limit soil disturbance according to Erosion Hazard Rating (EHR): for EHR of 4-8, conduct normal activities; for EHR of 9-10, minimize or modify use of soil disturbing activities; for EHR of 11-13, severely limit soil-disturbing activities.
- Determine adequate ground cover for disturbed sites during project planning on a case-by-case basis. Suggested levels of minimum effective cover are: for EHR of 4-5, 40 percent; for EHR of 6-8, 50 percent; for EHR of 9-10, 60 percent; for EHR of 11-13, 70 percent. These suggested levels are adopted as the LRMP ground cover standard for the Keddie Ridge Hazardous Fuels Reduction Project.
- To avoid land base productivity loss due to soil compaction, dedicate no more than 15 percent of timber stands to landings and permanent skid trails. Permanent landings and skid trails do not exist within the project area and the Keddie Ridge Project does not propose such permanent features.

Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)

The SNFPA ROD (USDA 2004b) amends the Plumas National Forest LRMP and includes a standard and guideline for down wood and snags:

- Determine retention levels of down woody material on an individual project basis. Within westside vegetation types, generally retain an average over the treatment unit of 10-15 tons of large wood per acre. Within eastside vegetation types, generally retain an average of three large down logs per acre. For the Keddie Ridge Project, the retention level of down woody material is 10-15 tons of large wood per acre (refer to the Affected Environment or Existing Condition sections below).

Direction Relevant to the Project as it Affects Water Resources

Clean Water Act of 1948 (as amended in 1972 and 1987)

The Clean Water Act of 1948 establishes as federal policy the control of both point and non-point pollution and assigns to the states the primary responsibility for control of water pollution.

State Water Quality Management Plan

Non-point source pollution on Plumas National Forest is managed through the water quality management program contained in *Water Quality Management for Forest System Lands in California* (USDA 2000). This document describes Forest Service practices and procedures for protection of water quality and also contains the 1981 Management Agency Agreement (MAA) between the California State Water Resources Control Board and the USDA, Forest Service. The State Board has designated the Forest Service as the management agency for all activities on National Forest lands and the MAA constitutes the basis of regional waivers for non-point source pollution. The Forest Service water quality protection program relies on implementation of prescribed best management practices (BMPs). Best management practices are procedures and techniques that are incorporated in project actions and have been determined by the State to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. BMPs applicable to the Keddie Ridge Project are presented in appendix H of this DEIS.

Section 303(d) of the Clean Water Act

This section requires the identification of water bodies that do not meet, or are not expected to meet, water quality standards or are considered impaired. The list of affected water bodies, and associated pollutants or stressors, is provided by the State Water Resources Control Board and approved by the United States Environmental Protection Agency. The most current list available is the 2006 303(d) list (SWRCB 2006). No water bodies on this list are located within the Keddie Ridge Project area. However, principal watersheds (at the HUC-5 scale) affected by the project are Lights Creek, Lower Indian Creek and Wolf Creek—these watersheds comprise a sizable portion of the East Branch North Fork Feather River watershed. The North Fork Feather River is included on the 2006 303(d) list for mercury and water temperature impairments. The Keddie Ridge Project would not affect legacy deposits or concentrations of mercury in the North Fork Feather River. The 303(d) list describes hydropower modifications and flow regulation/modification as the potential sources for water temperature impairments.

Beneficial Uses identified by the CA Regional Water Quality Control Board (Central Valley Region)

Beneficial uses are defined under California State law in order to protect against degradation of water resources and to meet state water quality objectives. The Forest Service is required to protect and enhance existing and potential beneficial uses (CRWQCB 1998). Beneficial uses of surface water bodies that may be affected by activities on the Forest are listed in Chapter 2 of the Central Valley Region's Water Quality Control Plan (commonly referred to as the "Basin Plan") for the Sacramento and San Joaquin River basins (CRWQCB 1998) and are described below for the Keddie Ridge Project area.

California Regional Water Quality Control Board Conditional Waiver of Waste Discharge

In January of 2003, the Regional Water Quality Control Board (RWQCB)—Central Valley Region adopted Resolution No. R5-2003-005 that provides for a conditional waiver of the requirement to file a report of waste discharge and obtain waste discharge requirements for timber harvest activities on National Forest System lands within the Central Valley Region. Additional provisions were added in the 2005 Resolution No. R5-2005-0052. This project complies with the Clean Water Act through use of "Best Management Practices" designed to minimize or prevent the discharge of both point and non-point source pollutants from National Forest System roads, developments, and activities. Prior to initiation of any of the Keddie Ridge Project action alternatives, the Plumas National Forest would comply with RWQCB permit requirements per Resolution R5-2005-0052.

The Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (ROD)

Appendix E of the SNFPA ROD (USDA 2004b) describes management direction applicable to the Herger-Feinstein Quincy Library Group (HFQLG) Pilot Project area. The ROD directs that Scientific Analysis Team (SAT) Guidelines (USDA 1999b) be applied to vegetation management projects in the Pilot Project area per the HFQLG FEIS and ROD (USDA 1999a,b). No standards and guidelines specific to riparian areas, hydrology, or water resources are presented in Appendix E of the SNFPA ROD.

Herger – Feinstein Quincy Library Group (HFQLG) Forest Recovery Final Environmental Impact Statement (FEIS) and Record of Decision (ROD)

The HFQLG ROD changed direction in the Plumas NF LRMP by requiring application of specific SAT guidelines for riparian management. These SAT guidelines include:

- Application of the following minimum buffer widths for riparian protection and delineation of riparian habitat conservation areas (RHCAs): 300 feet for perennial, fish-bearing streams and lakes; 150 feet for perennial, non fish-bearing streams, ponds and wetlands greater than 1 acre, and lakes; and 100 feet for intermittent and ephemeral streams and wetlands less than 1 acre.
- Prohibition of scheduled timber harvest in RHCAs except for salvage harvest or to meet SAT guidelines for resource management objectives.
- Management of fire and fuel treatments to meet resource management objectives and minimize disturbance of riparian ground cover and vegetation.

The SAT guidelines include ten riparian management objectives (RMOs) for RHCAs. To describe how this project's proposed timber harvest and fire and fuel treatments meet these objectives, an RMO analysis is provided in appendix E of this DEIS.

Plumas National Forest Land and Resource Management Plan (PNF LRMP)

Forest Plan standards and guidelines provide the relevant substantive standards to comply with NFMA. The 1988 LRMP (USDA 1988) establishes standards and guidelines for protection and maintenance of Forest watersheds, water quality, and water supply, including:

- Implementation of BMPs.
- Establishment of Streamside Management Zones (SMZs) per guidelines in Appendix M of the LRMP. These guidelines were mostly replaced by the SAT guidelines, RHCA width requirements mandated by the HFQLG ROD. However, ephemeral channels without evidence of annual scour and deposition are not addressed by the SAT guideline buffer widths. Therefore, SMZ widths defined in Appendix M of the LRMP are applied to these channels. Recommended SMZ widths for these ephemeral swales range from 0 to 50 feet, depending upon the stability of the swale channel and sideslope.

An SMZ plan is necessary for any activities that will occur within an SMZ, including a description of vegetation management objectives, needed erosion control measures, and an analysis of SMZ areas with over-steepened slopes or very high EHR. The SMZ plan for this project is included in appendix H of this DEIS.

Effects Analysis Methodology

Cumulative Watershed Effects analysis methods and assumptions

There are numerous methods for assessing the effects of land use activities on the landscape (USDA 1988, Berg 1996, Reid 1998). For the purpose of this CWE analysis, the effects of past, present, and reasonably foreseeable future actions were assessed using the Region Five Cumulative Off-site Watershed Effects Analysis (USDA 1988). Under this approach, the effects of land management activities were evaluated on the basis of Equivalent Roaded Acres (ERA). These ERA values serve as a “common currency” to describe effects from a wide range of management activities. The wide use of this model in Region 5 allows for comparisons among projects across both space and time.

Within each subwatershed in the watershed assessment area, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to a theoretical area of road surface, resulting in a measure of ERA. Numeric disturbance coefficients were used to convert these management effects to ERA effects in terms of the pattern and timing of surface runoff. Coefficients vary by management activity, silvicultural prescription, site preparation methods, type of equipment utilized, and fireline intensity (refer to Appendix D – Cumulative Off-site Watershed Effects Analysis Methodology of the Hydrology and Soils Specialist Report).

Dividing the total ERA by the size of the watershed yields the percent of the watershed in a hypothetically roaded condition. ERA model values are used to track general changes to hydrologic function of watersheds in terms of alteration of surface runoff patterns and timing. In this way, ERA values can serve as an index to assess effects on downstream water quality. An increase in ERA for a watershed could result in detrimental changes to sedimentation rates and stream channel condition and subsequently have effects on downstream water quality and beneficial uses.

As the amount of anthropogenic landscape manipulation increases within a watershed, the susceptibility of that watershed to cumulative watershed effects (CWE) increases. There is a point where additive or synergistic effects of the land use activities will cause the watershed to become highly susceptible to CWE. Natural watershed sensitivity is an estimation of a watershed’s natural ability to absorb land use impacts without increasing CWE to unacceptably high levels. Watersheds and their associated stream systems can tolerate some level of land disturbance, but there is a point at which land disturbances begin to substantially affect downstream channel stability and water quality. Upper limits of watershed “tolerance” to land use are estimated for the ERA model, this upper limit is called the threshold of concern (TOC).

For the ERA model analysis, the TOC for each subwatershed is expressed in terms of the percent of the area in a hypothetically roaded condition. The TOC does not represent the exact point at which cumulative watershed effects will occur. Rather, it serves as a “yellow flag” indicator of increasing susceptibility for significant adverse cumulative effects occurring within a watershed. As ERA disturbances approach the TOC, there is an increased risk that soil hydrologic function, downstream water quality and beneficial uses would be impaired. For example, stream channels can deteriorate to the extent that riparian and meadowland areas become severely damaged.

A closer look at the activities planned within an analyzed watershed would be important where ERA values exceed or are approaching the TOC. The TOC for this project was developed by considering the natural sensitivity of the Keddie Ridge Project subwatersheds and the sensitivity of downstream beneficial uses to changes in watershed hydrologic function. Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in Appendix N the HFQLG Forest Recovery Act Final Environmental Impact Statemen t (USDA 1999a). The majority of HFQLG Pilot Project watersheds applicable to this project received moderate sensitivity ratings. Examples given in the R5 Soil and Water Conservation Handbook estimate the TOC for watersheds of moderate sensitivity to be 15 to 16 percent. For this project, the TOC is conservatively estimated to be 12 percent of the watershed area. For additional information, refer to the "Watershed Sensitivity" section below.

Assumptions: In calculating the ERA contribution by the proposed harvest activities, all areas of the treatment units were assumed treatable. For example, no compensations were made for rock outcrops, roaded areas, or small-scale slope limitations that would restrict harvest activities. In most cases, such site-specific information was not available. Coefficients were applied to similar activities regardless of soil type, slope conditions, season of operation, or specific equipment characteristics. In calculating ERA contributions due to roads, all roads were considered equally, regardless of surface material (pavement, gravel, or native soil surface). Acres of roads were calculated by assuming that temporary and unclassified roads are 20 feet wide, and all other roads are 25 feet wide. The linear recovery curve (Figure 13) used in this analysis is not necessarily reflective of recovery patterns on the ground. Linear recovery models tend to under-predict effects in the very early stages of recovery, and over-predict effects in later stages of disturbance recovery.

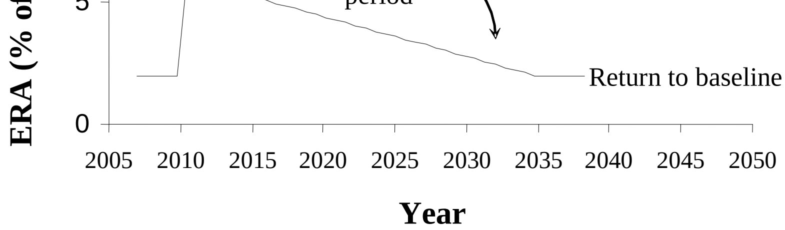


Figure 13. Conceptual Disturbance and Recovery Model for a Harvest Activity.

Soil Assessment Analysis Methods and Assumptions

In the summer of 2007, the soil and hydrology field crew, under the direction of the District soil scientist, assessed soil productivity measures for all soil types in the proposed treatment units. Though not all units were quantitatively surveyed, site visits were made to all units to verify existing conditions and confirm that the survey units chosen as surrogates had similar soil texture, cover, and condition. The fuel treatment units and area thinning units were sampled using similar methods. Due to the potential ground disturbance, units proposed for mechanical harvest treatment were given the highest priority for soil assessment. Soil-related information was collected in 29 of the proposed Defensible Fuel Profile Zone (DFPZ) units and three of the area thinning units described in the proposed action. The fuel treatment units were sampled more intensively because the proposed treatments are expected to affect a larger proportion of each treatment unit and there are substantially more of them. The proposed treatments in the area thinning units are expected to be more dispersed. When implementing group selection, the typical management unit or stand in which growth is regulated consists of an aggregation of groups, not individual groups. To assess soil conditions at an appropriate scale for group selection management, soil surveys were conducted at the scale of the area thinning unit.

The R5 Soil Quality Analysis Handbook states that a 10 percent reduction in total soil porosity corresponds to a threshold soil bulk density that indicates detrimental soil compaction (USDA 1995). To assess for detrimental soil compaction, the “spade method” was used which consists of measuring compaction from the resistance felt from sticking a spade shovel at the transect point into the ground. Per Exhibit 01 of the R5 Soil Quality Analysis Handbook, soil bulk density samples were collected and analyzed on soils similar to soils found in the project area to calibrate the spade method and assure that the person performing the test properly correlated the resistance felt with threshold soil bulk densities. Subsequently, a 12-16 inch deep and 6-12 inch wide hole was excavated with the spade to assess whether detrimental compaction exists based upon field indicators of soil compaction.

Watershed and Soil Indicators

Direct and Indirect Effects of DFPZ and WUI Fuels Reduction Treatments

Soil productivity indicators consist of the soil properties required for analysis by the PNF LRMP and the R5 Soil Management Handbook: soil cover, soil porosity, and soil organic matter. Organic matter levels are used as indicators of soil productivity. Effective soil cover is used to evaluate the potential for accelerated erosion. Effective soil cover consists of material that impedes rain drop impact and overland flow of water, including organic residues 0.5-inch thick, exposed roots, stumps, surface gravels more than 0.75 inch, and living vegetation. Minimum effective ground cover for the Keddie Ridge Project is prescribed at 40, 50, 60, or 70 percent on areas with maximum Erosion Hazard Ratings of low, moderate, high, and very high, respectively.

A 10 percent reduction in total soil porosity corresponds to a threshold soil bulk density that indicates detrimental soil compaction. Reductions in soil porosity correspond with increases in soil bulk density. The extent of detrimental soil disturbance shall not be of a size or pattern that would result in a significant change in production potential for the activity area. Organic matter losses are assessed by measuring the surface fine organic matter and large woody material. The threshold value for surface fine organic matter is at least 50 percent cover over the activity area, and includes plant litter, duff, and woody material less than 3 inches in diameter. Desirable large woody material is composed of logs at least 20 inches in diameter and 10 feet long. The recommended threshold for logs is 5 logs per acre (which could range from 3 to 10 tons per acre depending on decay class and size), representing the range of decomposition classes. Levels of fine organic matter and large woody material may be reduced to meet fuel management objectives, except when needed for essential erosion control.

Water quality indicators include potential for increased sedimentation rates. The effectiveness rate from Best Management Practice (BMP) monitoring informs this indicator.

Cumulative Effects Analysis

As described above, for the cumulative watershed effects model, past management activities were analyzed to account for the cumulative amount of land disturbance that has occurred within each subwatershed. The area of land manipulated by each past management activity was converted to Equivalent Roaded Acre values and the total ERA, expressed as a percentage of subwatershed area, was compared to the threshold of concern. Subwatersheds that exceed or are approaching the TOC are indicated to be at a higher risk of cumulative detrimental effects to downstream beneficial uses. A closer look at the activities proposed within those subwatersheds is necessary.

Table 67. Summary of Environmental Indicators and Measures Examined in this Assessment

Key ecosystem element	Environmental indicators	Variable Assessed
Water Quality	Chronic sedimentation, accelerated hillslope erosion	BMP effectiveness rate, Equivalent roaded acres (ERA), threshold of concern (TOC)
Soil Productivity	Soil loss Detrimental compaction Organic matter losses	Effective soil cover Soil porosity as indicated by soil bulk density, large down wood, surface fine organic matter

In order to understand the contribution of past actions to the cumulative soil productivity effects of the Proposed action and alternatives, this analysis relies on current soil conditions as a proxy for the impacts of past actions. This is because existing soil conditions reflect the aggregate impact of prior human actions and natural events that have affected the environment and might contribute to cumulative effects. Water quality and soil productivity variables are summarized in Table 67.

This cumulative soil effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to. Current soil conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual soil impacts would be nearly impossible. Second, focusing on individual actions would be less accurate than looking at existing soil conditions, because there is limited information on the soil impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focus on the soil impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we capture the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

Soils

Soil Assessment Area

The soil assessment area (Figure 14) consists of the defensible fuel profile zone (DFPZ) fuel treatment units, area thinning units, and noxious weed treatment units described in the Proposed action. Note that Figure 14 shows the soil assessment area boundary for reference.

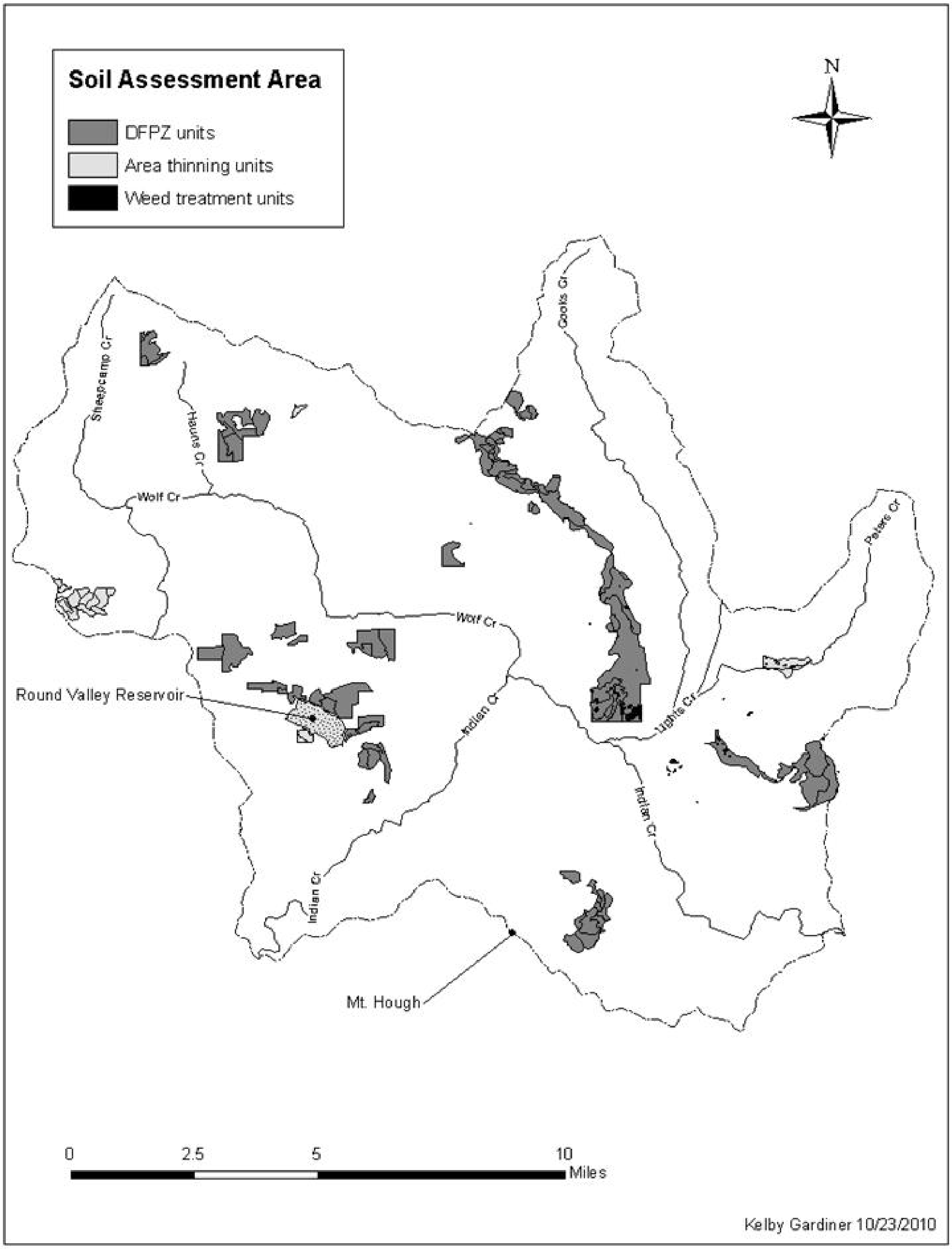


Figure 14. Soil Assessment Area

Soil Condition

Forest productivity in the assessment area ranges from low productivity to non-productive sites (USDA 1988). Forest survey site class (FSSC) is a measure of site productivity in cubic feet of wood per acre per year. Site class 1 is the most productive, while FSSC 7 is the least. Site class 7 lands are considered non-productive, and occur in 148 acres of treatment units along ridgetops and steep rocky slopes. Both site class 5 and 6 lands are interpreted as having low productivity (USDA 1999a), while site class 4 is slightly more productive. Round Valley reservoir and the Hauns Creek area possess most of the site class 4 lands, which make up 21 percent of treatment units. Site class 5 lands are found throughout the project area and make up roughly 24 percent of treatment units. The majority (53 percent) of soils found within the assessment area are site class 6 lands. Site class 7 lands account for 2 percent of treatment units, most of which occur in the Peters Creek area.

The maximum erosion hazard ranges from moderate to very high in the soil assessment area (Table 68). This erosion hazard rating (EHR) predicts the potential for sheet, rill, and gully erosion under existing conditions if vegetation and litter are removed. Moderate EHR exists on 2,376 acres of DFPZ and area thinning units, high EHR makes up 3,418 acres, while 148 acres are rated as having a very high EHR.

Soils in the project area are derived from both igneous and metamorphic parent material. Igneous rock can be formed in two ways; below ground as an intrusive or plutonic occurrence, or at the earth’s surface as an extrusive or volcanic formation. Metamorphic parent material was igneous, metamorphic, or sedimentary rock that has been subjected to extreme heat and pressure causing physical and or chemical changes.

Parent material in the western portion of the project area, near the community of Canyon Dam, is comprised of andesite, schist, greenstone, peridotite, and andesitic tuff breccias. These geologic occurrences weather to form soils generally classified as loam with several site dependent modifiers including; cobbly, gravelly, sandy, silty or clay loam.

Table 68. Soil Productivity Results from Field Surveys

Geographic area	Average percent soil cover	Average areal extent of detrimental compaction	Average number of down logs per acre	Average percent cover of fine organic matter	Unit Number(s)	Erosion Hazard Rating
Taylorsville/ Peters Creek	84	20	16	81	89 & 93	M, H, & VH
Keddie Ridge	95	15	20	74	2, 4, 9,12, 14, 15, 18, 20-28, 60, 68, 69, & 83	M, H, & VH
Canyon Dam/ Hauns Creek	96	13	40	52	10, 11, 56-58	M & H
Round Valley Reservoir	95	15	28	91	74, 78, 79, 82, & 85	M & H
China Grade	92	0	24	87	98 & 106	M & H

Effective Soil Cover—LRMP Standard

Effective soil cover is necessary to prevent accelerated soil erosion. Soil cover ranges from 77 to 100 percent for the surveyed units. PNFLRMP standards and guidelines for effective ground cover vary by the soil erosion hazard rating. Effective ground cover should be maintained at 60 percent for soils with a high erosion hazard rating (EHR), and 50 percent for soils with a moderate EHR.

Soil Compaction—LRMP Standard and Region 5 Guidance

The R5 Soil Management Handbook provides a soil porosity threshold to determine the intensity of compaction that is deemed detrimental. The extent of detrimental soil compaction shall not be of a size or pattern that would result in a significant change in production potential for the activity area. The spatial extent of detrimental compaction that would cause a significant reduction in productive capacity would likely vary by local factors such as soil type and climate. Table 68 summarizes the average existing spatial extent of detrimental compaction measured during field evaluations. The area of detrimentally compacted ground is primarily occupied by skid trails and landings, although not all skids and landings were deemed compacted.

Down Woody Material—LRMP Standard and Region 5 Guidance

The applicable standard for large down wood is in the PNF LRMP as amended, which states that down woody material retention levels should be determined on an individual project basis. For the Keddie Ridge Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained. The Region 5 guidance provides a threshold for large woody material, recommending retention of 5 logs per acre (3 to 10 tons per acre) representing the range of decomposition classes. The existing average number of large down logs per acre in the surveyed units ranged from 23 to 32.

Fine Organic Matter—Region 5 Guidance

The Region 5 guidance provides a threshold for surface fine organic matter, recommending retention of 50 percent cover in all stands. Organic cover helps maintain site fertility and prevent soil loss from erosion. Fine organic matter consists of plant litter, duff, and woody material less than three inches in diameter. Average cover of fine organic matter ranged from 61 to 82 percent in surveyed units Table 68.

Watershed

Watershed Assessment Area

The area defined for the watershed assessment encompasses 12 sub-watersheds, which are contained in 10 HUC 6 watersheds. The Wolf Creek, Lights Creek, and Indian Creek systems converge in the Indian Valley basin and flow southwest, draining the assessment area (Figure 15). Indian Creek joins Spanish Creek at the boundary of the assessment area to form the East Branch North Fork Feather River.

Watershed Condition

The existing conditions reflect the aggregate impact of prior human actions and natural events such as wildfire that have affected the environment and might contribute to cumulative effects. The ERA model attempts to accurately account for the cumulative effects of past, present, and reasonably foreseeable actions and combine such effects into a single aggregate ERA value that represents the current condition of each subwatershed. The following discussion does not attempt to recount all possible factors that contributed to the cumulative watershed effects (CWE) ERA analysis or list all human or natural impacts that occurred within the soil assessment area during the analysis timeframe (35 years). Instead, it simply focuses on some of the major contributing factors used to calculate the current condition ERA values and assess future effects. The current conditions in the analysis subwatersheds have been impacted by many actions over the last century— specifically mining, grazing, and timber harvesting.

Tractor logging during the 20th century has left noticeable effects on the composition of the timber stands remaining today, including effects on tree species composition, age, and diameter classes. From 1980 to 2010, scheduled timber harvests and associated activities on NFS lands treated approximately 35,000 acres in the analysis subwatersheds. In some cases, individual stands were treated multiple times, so the actual number of affected acres is slightly less. Silvicultural prescriptions included clear cutting, overstory removal, group selection, sanitation, shelterwood, and area thinning, as well as associated activity fuel burning. Between 1997 and 2010, proposed harvest activities on private lands called for harvests on approximately 9,670 acres of timberland in the analysis subwatersheds.

There are 9,399 acres in the analysis subwatersheds that were burned in wildland fires between 1964 and 2010. Large wildfires (the Moonlight Fire burned 4,994 acres within the Keddie Ridge watershed assessment area) have resulted in severe impacts on soil productivity and subwatershed condition in these areas, but conditions will continue to improve as soil cover and organic matter accumulate.

Historically, livestock grazing occurred throughout a large portion of the watershed assessment area, especially on the private land that makes up the majority (8,400 acres) of Indian Valley. Today, there are still portions of two allotments on National Forest System lands within the watershed assessment area—Taylor Lake and the Lights Creek allotments—though the majority of grazing impacts to date are most visible along the banks of Lights and Indian Creeks in the valley bottom private lands.

Historic logging, mining, and grazing have also influenced the hydrologic and vegetative characteristics of the analysis watersheds. Such historic legacy effects are common to many of California's forested watersheds (Cafferata et al. 2007). More recent forest activities, including fire suppression and development of the transportation system, continue to affect the watershed conditions in this area. Unpaved roads are often considered the primary source of sediment to stream channels (MacDonald and Coe 2007).

Generally, recreational activities occur throughout the entire Keddie Ridge Project area, with concentrated use around the communities of Taylorsville and Greenville. Round Valley Reservoir, the municipal water supply for Greenville, is a popular boating and fishing destination. Dispersed recreational impacts of undeveloped camping areas, firewood cutting, user-created roads and trails are evident. Off-highway vehicle (OHV) use may contribute to compacted soil conditions where these activities occur. The locations of many user-created features have recently come to light under the national OHV route designation process. The selection of alternative 5 of the Travel Management EIS allows many of these routes to be incorporated into the ERA assessment for future projects, with actions planned to improve and maintain selected trails (USDA 2010b). Other recreational activities, such as Christmas tree cutting, hiking and hunting, have negligible effects on the soils or ERA assessment.

Data obtained from the California Department of Pesticide Regulation identified approximately 1,200 pounds of glyphosate (isopropylamine salt) applied to 345 acres in the watershed assessment area (at varying application rates) between 2004 and 2008 (CDPR 2009). There was no reported use of aminopyralid within the Keddie Ridge watershed assessment area.

Beneficial Uses

Existing beneficial uses of surface waters in the Keddie Ridge Project area are found in the Central Valley Region Water Quality Control Plan (CRWQCB 2004). The Keddie Ridge Project drains to the North Fork Feather River, for which existing beneficial uses include municipal and domestic water supply, hydropower generation, recreation, freshwater habitat, habitat suitable for fish reproduction and early development, and wildlife habitat.

Forest Vegetation

A mixed conifer forest type dominates the watershed assessment area, though several pine plantations and oak woodlands are established in burned areas and clear cut units. Much of the existing forest contains dense ladder fuels and fuel loading up to 100 tons per acre. High fuel loads occur in stands that experienced deadfall of mortality due to a region-wide drought in the late 1980s. High densities of small trees and high fuel loads contribute to high accumulations of ladder fuels and canopy fuels. These fuel conditions are conducive to crown fire initiation and propagation, and increased potential for stand-replacing high-severity fire events. Conditions within riparian habitat conservation areas (RHCAs) are similar to those described above. This includes conifer encroachment within the RHCAs, which has lead to a decline in riparian species that cannot tolerate a completely shaded environment. The high density of small trees makes many RHCAs within the Keddie Ridge Project area vulnerable to the effects of severe wildfire because drainages can rapidly funnel hot air upslope, contributing to fire spread. For example, thousands of acres of RHCAs within the Stream Fire of 2001 and the Moonlight Fire of 2007 were severely burned.

Stream condition

According to the PNF corporate GIS stream layer, there are nearly a 1,000 miles of stream in the Keddie Ridge watershed assessment area (Table 69); approximately 53 percent of the stream miles are ephemeral, 32 percent are intermittent, and 15 percent are perennial. Ephemeral and intermittent streams are seasonal—they run water during some portion of the year but are typically dry by late summer. Ephemeral streams only flow in response to storm events or snowmelt, and do not necessarily flow every year. Intermittent streams are seasonally connected to the surrounding water table and may flow during all but the driest months, whereas perennial streams typically flow year round. Streams are further classified by their slope—response reaches have low-gradient (less than three percent slope) alluvial conditions. The morphology of response channels reflects depositional processes associated with flowing water. Transport reaches have higher gradient (3 to 12 percent slope), non-alluvial conditions and the morphology of transport channels is generally resilient to change.

As mentioned in the “watershed condition” section above, historic land management activities have noticeably impacted the landscape. This is evident in many of the stream channels that drain the Keddie Ridge Project area. The headwaters of Wolf Creek are home to Calgom mine, where over 80 acres of hydraulic mining has occurred. Active placer mining claims are also present along much of Wolf Creek between the community of Canyon Dam and Greenville. This stretch of creek is closely paralleled by Highway 89 on the north and a railway on the south, confining stream flows to the active channel and contributing above normal amounts of sediment to the system during and after precipitation events. Riparian vegetation is well established and has excellent diversity: willow, black cottonwood, big-leaf maple, red-osier dogwood, and alder are all abundant with the occasional aspen stands present as well. Hauns and Sheepcamp Creeks flow through a considerable amount of private land in a southerly direction and are tributary to Wolf Creek. A significant amount of historic private timber harvest and road construction has occurred in this area, greatly contributing to the cumulative watershed effects of Wolf Creek. It is noteworthy to mention that the Mt. Hough Ranger District completed a multi-year stream restoration project on Wolf Creek in 2010. Over a quarter mile of vertical stream banks were laid back to form a new flood plain which was stabilized with erosion cloth and native vegetation. Log and rock veins were placed in the active channel to encourage deposition of bedload material mobilized by the aforementioned actions.

The portion of the Lights Creek watershed that is considered in this analysis encompasses Cooks Creek, Peters Creek, and the lower portion of Lights Creek that flows through Indian Valley—approximately one quarter of the entire Keddie Ridge watershed assessment area. The 2007 Moonlight Fire burned just over 900 acres of RHCA in the Cooks and Peters Creek subwatersheds—most of which occurred at the headwaters of these basins. Field surveys by district watershed staff show that channels are well armored by rock and large woody debris, with vigorous growth of riparian and upland vegetation present in the years following the fire. Improved effectiveness of stream buffers to filter sediment is apparent. Willow, big-leaf maple, and alder are the dominant riparian species present in the eastern portion of the Keddie Ridge Project. Aspen are established in the headwaters of Peters Creek and have benefited from the Moonlight Fire, where the fire has consumed encroaching conifers, consequently opening the canopy and improving the potential for aspen to further colonize. The Lucky S mine, a historic mining area that was thoroughly exploited for gold, is located in the headwaters of Peters Creek. Lower Peters Creek is the site of a hydropower special use permit maintained by a local resident, but operations generally cease in late summer when stream flow begins to subsurface.

Tributaries in the Lower Indian Creek watershed are comparable to those of the Lights Creek drainage system. Riparian vegetation is composed of willow, big-leaf maple and alder, but many of the steep ephemeral and intermittent streams lack vegetation due to the extremely rocky, well-drained soil, and the dense overstory canopy of confers. Indian Creek merges with the two previously mentioned drainages, Lights and Wolf Creeks, and continues to flow in a westerly direction through the project area as a low gradient response reach. As Indian Creek exits Indian Valley, downstream of the community of Crescent Mills near the Arlington Bridge, its gradient begins to increase and it is considered a transport reach. Geologic historian Cordell Durrell speculates that Indian Valley was once inundated in nearly a thousand feet of water. Arlington Bridge is thought to be the site of the outlet of the, now completely sediment filled, lake (Durrell 1988).

There are over 650 miles of existing roads within the watershed assessment area. Although the road network is generally in good condition, a number of poorly located roads contribute to substantial resource damage. These roads generally run parallel to and extremely close to stream channels. Rainfall can run off of road surfaces, carrying sediment into the stream network thus reducing water quality. Culverts can prevent fish from accessing upstream habitat by creating depth, leap, and velocity barriers.

Thousands of Canada thistles (*Cirsium arvense*) are present within the Keddie Ridge Project area. Many of these are located in riparian habitat conservation areas (RHCAs). Canada thistle is a noxious, invasive weed that can spread rapidly and potentially displace native plant species. The presence of Canada thistle is a high management concern due to its distribution and abundance within the Keddie Ridge Project area. As a noxious weed, it poses a threat to biological plant diversity in RHCAs. Affected streams include: South Fork Foreman Ravine, Cooks Creek, Peters Creek, and several unnamed seasonally flowing tributary channels.

Table 69. Miles of Stream Type and Stream Density in the Watershed Assessment Area

Drainage system	Drainage area (ac)	Miles of stream by type			Total stream miles	Stream density[1] (mi per mi²)
		Ephemeral	Intermittent	Perennial		
Lights	26,198	119	65	41	224	5.5
Lower Indian	32,883	175	115	40	330	6.4
Wolf	46,818	232	142	56	430	5.9
Total	105,899	526	322	137	984	5.9

[1]Stream density is determined as the miles of stream per square mile of drainage area. Drainage area is shown in acres to be consistent with other area representations in this document.

Watershed Sensitivity

Watershed sensitivity analyses for the HFQLG Pilot Project watersheds were reported in Appendix N the HFQLG Forest Recovery Act Final Environmental Impact Statement (USDA 1999a). The sensitivity ratings were based on the erosion potential, slope steepness, amount of alluvial channels, risk of rain-on-snow and/or thunderstorm events, and on revegetation potential. Of the 12 HFQLG Pilot Project watersheds applicable to this project, 10 received moderate sensitivity ratings. Based on these ratings, most subwatersheds analyzed in this assessment were considered to have moderate sensitivity and were assigned a “threshold of concern” (TOC) value of 12 percent of the subwatershed area. Lower Cooks Creek watershed is more susceptible to cumulative effects, with a TOC value of 10 percent based on road and channel conditions and a higher sensitivity rating. Peters Creek watershed has been only somewhat disturbed by land uses, has fewer steep slopes and a lower road density—all of which lead to a slightly higher TOC value of 14 percent.

Precipitation

The Keddie Ridge Project is situated at the northern edge of the Sierra Nevada, with the Lake Almanor basin marking the transition into the Cascade mountain range and the northwestern edge of the watershed assessment area for the proposed hazardous fuels reduction project. Average annual precipitation data from the Rattlesnake Hill weather station, located 5 miles west of Round Valley Reservoir at an elevation of 6,100 feet, averaged 37 inches of rain between 2004 and 2010 and is representative of the western side of the Keddie Ridge watershed assessment area. The Kettle Rock rain gauge, 18 miles east of Rattlesnake Hill, sits 7,800 feet above sea level at the eastern boundary of the watershed assessment area and reflects the rain shadow effect that the Sierra Nevada experiences. Over the same seven-year period (2004-2010), average annual precipitation was approximately 30 inches (DWR 2010).

Precipitation falls primarily as snow above 6,500 feet and as a combination of snow and rain below that elevation. The majority of annual rainfall is characteristic of the Mediterranean climate, with most precipitation occurring between October and May with isolated thunderstorms common during the summer months. Surface runoff depends upon the snowmelt regime, which normally extends into late spring and early summer.

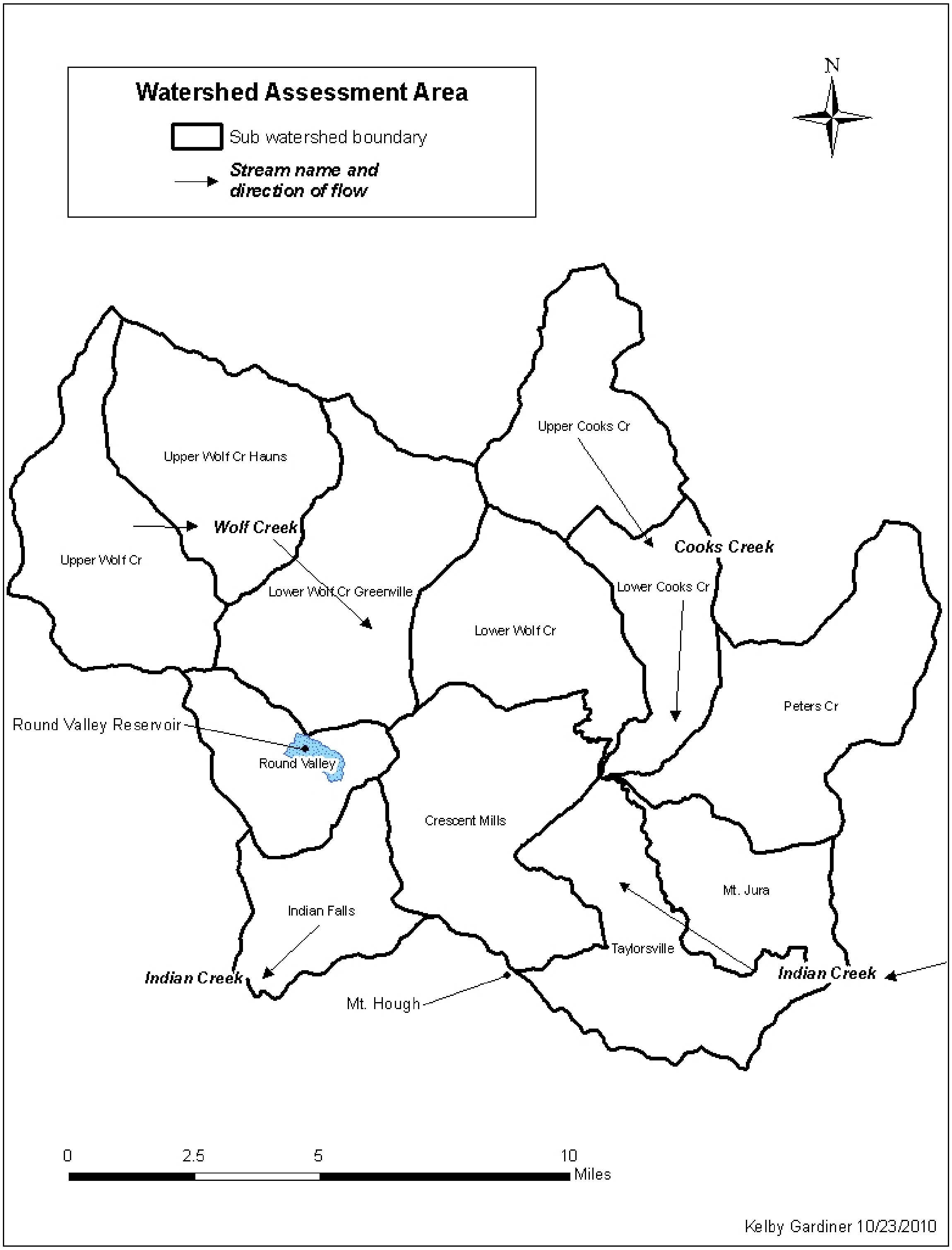


Figure 15. Watershed Assessment Area

Environmental Consequences

Design Criteria

Chapters 1 and 2 of the DEIS provide detailed information about the design criteria for each alternative. All mechanical harvest operations would adhere to standards and guidelines set forth in the timber sale administration handbook (Forest Service Handbook [FSH] 2409.15) and the best management practices as delineated in the “Water Quality Management for Forest System Lands in California: Best Management Practices” (USDA 2000). Timber sale contracts contain many standard provisions that help ensure protection of soil and water resources. These include provisions for an erosion control plan, road maintenance, and skid trail spacing.

Proposed management activities in RHCAs are expected to contribute to improving or maintaining watershed and aquatic habitat conditions described in the riparian management objectives (refer to Appendix C – RHCA Treatment; riparian management objectives (RMOs) of the Hydrology and Soils Specialist Report). RHCA widths are consistent with the Scientific Analysis Team (SAT) guidelines set forth in Appendix L of the HFQLG Final EIS. Where RHCAs would be treated, prescriptions and protection measures have been designed to address the RMOs. Where RHCAs would be mechanically treated, ground-based equipment would only be used on slopes less than 25 percent and on stable soils. To provide a buffer between streams and mechanically treated areas, an equipment exclusion zone would be established. The buffer width would vary by stream type and the steepness of the side slope, as shown in Table 70. For example, all mechanical equipment would be excluded from within 100 feet (horizontal) of perennial fish-bearing streams with sideslopes of 0 to 15 percent, and 150 feet from perennial fish-bearing streams with sideslopes between 15 and 25 percent. These streamside zones would serve as effective filter and absorptive zones for sediment originating from upslope treatment areas. Fuel reduction in these equipment-exclusion zones would be allowed and would be determined on a site-by-site case to protect the sensitive attributes associated with the riparian area.

Table 70. Equipment Restriction Zones and Burn Pile Restriction Zones in RHCAs

Stream Type	Equipment Restrictions by Slope Class			Burn pile restrictions by Slope Class[a]	
	0–15%	15–25%	>25%	0–15%	>15%
Perennial, fish bearing	100 ft	150 ft	No mechanical treatment	25 ft	40 ft
Perennial, no fish	50 ft	100 ft	No mechanical treatment	25 ft	40 ft
Intermittent	25 ft	50 ft	No mechanical treatment	15 ft	25 ft
Ephemeral	25 ft	25 ft	No mechanical treatment	15 ft	15 ft
Reservoirs/wetlands greater than 1 acre	50 ft	75 ft	No mechanical treatment	15 ft	25 ft

[a] Where feasible, burn piles would not be placed any closer to streams than the distances shown

Soil Analysis

This section is organized by the four soil indicator measures: effective soil cover, soil compaction, down woody material, and fine organic matter. Effects to each measure are first discussed for alternative B, the no action alternative, followed by a section titled, "Effects common to the action alternatives". In terms of the soil indicator measures, effects to each individual action alternative are very similar, the effective difference between action alternatives being the number of units and total acres to be treated. However, these differences would exist at small, localized scales and differences in effects to soil productivity, hydrologic function, and buffering capacity at the scale of the project area would be difficult to discern. Effects from the herbicide treatment are discussed separately above.

Effective soil cover—Alternative B

Direct Effects

Under the no action alternative, soil cover can be expected to increase as organic materials accumulate on the forest floor. Existing levels of soil cover are shown in Table 68. Soil cover ranges from 77 to 100 percent for the surveyed units and will likely develop increased cover under the this alternative.

Indirect Effects

As a result of increased soil cover, the risk of soil erosion may decline on forested hill slopes. Soil cover dissipates the energy of falling raindrops by intercepting them before they strike the soil surface. Reduced soil erosion would help retain soil nutrients and a favorable growth medium on site. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Cumulative Effects

Due to fuel reduction treatments proposed for the action alternatives, the risk of a high-intensity wild fire occurring in the near future would be higher under alternative B. If soil cover were reduced to bare soil following a wildfire, the soil would be more susceptible to erosion. In addition, fire can create a non-wettable layer below the surface known as hydrophobicity (Everett et al. 1995). During a precipitation event, soil above the non-wettable layer can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a moderate-intensity wildfire, the affected stand would likely not meet the PNF LRMP standards for effective soil cover. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk and Robichaud 2003).This needlefall effect has been observed by district watershed staff following numerous recent fires including: Cold, Rich, and Moonlight.

Effective Soil Cover—Effects Common to the Action Alternatives

Direct Effects

Harvest operations may increase soil cover by adding activity fuels to the forest floor, but can also decrease cover due to organic displacement during yarding operations. Mastication would generally increase soil cover because materials are shredded and then broadcast into the unit away from the machine. Prescribed fire activities, including pile burning and underburning, would consume organic materials and reduce the amount of effective soil cover. Recent BMP evaluations demonstrate that prescribed fires on the Plumas National Forest are effective in terms of leaving sufficient soil cover after implementation (USDA 2009a). Pile burning would remove soil cover locally, and underburning is expected to occur under prescribed conditions that would not result in complete consumption of the duff and litter layers.

Beginning in 2001, effective soil cover has been monitored on HFQLG project units for both the pre- and post-project condition per the Monitoring Plan prescribed in the 1999 HFQLG FEIS. Post-project monitoring began in 2004. For the 75 sets of data for pre- and post-harvest units, large differences between silviculture methods are apparent as the 51 thinning units averaged approximately 80 percent soil cover post-project and the 24 group selection units averaged approximately 60 percent effective cover post-project (USDA 2010b).

Statistical analysis of the thinning and group selection data sets available in 2007 determined statistically significant ($P < 0.05$) differences between pre- and post-project soil cover condition. For the 39 thinned units, the 95 percent confidence level described a post-project reduction in the areal extent of soil cover ranging from 9 percent to 15 percent. Average existing effective cover for thinning units proposed by the Keddie Ridge Project ranges from 84 percent to 96 percent. Since existing effective cover exceeds 75 percent for all of the units proposed for thinning, even the higher end of the 95 percent confidence range for decrease in soil cover (a 15 percent decrease) would leave the units with sufficient cover to meet the project standard of 50-60 percent.

For the group selection units, the 2007 HFQLG soil monitoring data indicated a statistically significant and more dramatic reduction in post-project ground cover. The average decrease in the areal extent of effective ground cover was 48 percent, with a 95 percent confidence interval ranging from -36 percent to -62 percent (USDA 2008e). Group selection (GS) units would occur within thinning units so existing soil cover reported above is applicable for GS units. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to assure project compliance with soil standards (USDA 2008f). These techniques include utilization of post-logging slash and designation of skid trails in group selection units. These techniques would result in a decrease for soil cover in group selection units that is much less substantial than the 48 percent decrease (on average) observed in the 2007 HFQLG monitoring report.

Indirect Effects

Increases in effective soil cover due to mastication or other operations would further reduce the risk of erosion by providing a physical buffer against wind and rain displacement of soil. A reduction in effective soil cover would increase the risk of erosion in affected areas. The amount and type of erosion depends on the character of the area. For example, patches of forest floor or other cover material across a large area would be more effective at intercepting surface water than large areas devoid of cover. The effect of short-term reductions in soil cover for action alternatives would generally be well distributed across treated units. Concentrated removal of soil cover is most likely to occur in areas such as landings, skid trails, temporary roads, and equipment tracks. Soil erosion will be minimized by the installation of erosion control structures (cross ditches and waterbars) which are standard timber sale contract practices.

After the initial reduction in effective soil cover due to mechanical treatments, effective soil cover would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Local reductions in soil cover may have local effects on soil temperature. Larger reductions may result in greater temperature extremes in the soil. Removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson et al. 1985).

Cumulative Effects

The treatments proposed in the action alternatives are generally expected to reduce effective soil cover, with the exception of the mastication treatment. The cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in soil cover conditions that remain in compliance with the PNFLRMP standards. A reduction in ground cover would likely be short lived if nearby overstory trees remain intact. Over time, litter from trees and shrubs would contribute to the development of effective ground cover in bare areas. Due to proposed fuel reduction treatments proposed, the risk of a high-intensity wild fire occurring in the near future would be less under the action alternatives than under alternative B. A wildfire entering a treated area may result in a greater reduction in ground cover than the proposed treatments alone. Following the proposed treatments, forest floor material would decrease in some areas due to mechanical displacement or consumption by fire, and would increase in other areas due to additions of masticated material. Patches of bare areas would be susceptible to local erosion.

Soil Compaction—Alternative B

Direct Effects

Table 68 shows the extent of detrimental compaction assessed in the field. Under this alternative, the extent and degree of compaction are expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals, would contribute to an increase in soil porosity and decrease compaction. In addition, incorporation of organic matter into the soil by biological processes, such as invertebrate and vertebrate soil mixing and decomposition, would help reduce soil bulk density and the degree of compaction in affected areas over time.

Indirect Effects

As the degree and extent of soil compaction is reduced slowly over time, soil physical conditions would return to their pre-compacted state. Soil infiltration would be enhanced as porosity is increased. Increased infiltration may reduce surface runoff and subsequent erosion and sedimentation.

Cumulative Effects

In the absence of future timber harvests, road construction, or other compacting activities, soil compaction is expected to decline as described above. In the event of a future wildfire, severe soil heating may cause physical changes in soils, including a reduction in soil porosity.

Soil Compaction—Effects Common to the Action Alternatives

Direct Effects

Timber harvest and biomass removal would require the use of skid trails and landings. A number of skid trails and landings exist within the treatment units, and it is predicted that some of these will be re-used to implement the proposed activities. The use of heavy forestry equipment and frequent stand entries would increase the potential for soil compaction (Powers et al. 1998). Mastication operations are not expected to result in increases in the extent of detrimental compaction. For any mechanical harvest, the extent and degree of compaction would depend on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations, and harvest equipment features. Project design criteria include implementation of BMPs and other soil protection measures, such as wet weather standards, to minimize soil compaction. Erosion control and compaction remediation measures for landings and skid trails are addressed by BMP 1-16 (“log landing erosion prevention and control”) and BMP 1-17 (“erosion control on skid trails”).

Soil porosity and compaction monitoring results reported in the 2007 HFQLG Soil Monitoring report stated that a review of monitoring data indicates that legacy compaction is commonplace. Most of the detrimental compaction observed post-project also existed pre-project (USDA 2010c). Statistical analysis for 40 thinned units and 11 group selection units determined that the mean post-project areal extent of detrimental compaction as not statistically different from the pre-project mean. Confidence intervals indicated broad ranges that suggested both a trend toward increasing the extent of detrimental compaction and a trend toward decreasing extent.

Indirect Effects

A growing body of recent research suggests that compaction is not always detrimental to forest productivity. For example, after 10 years of growth, the North American Long-Term Soil Productivity (LTSP) experiment has found that soil productivity was both positively and negatively affected by compaction treatments (Powers et al. 2005). In this comparison of 26 study sites, the effects of compaction depended on soil texture. In general, sandy soils showed improved productivity in compacted soil, clayey soils had reduced growth, and loams showed no apparent trend. Soils in the Keddie Ridge treatment units are largely dominated by loamy soil textures, often with a high component of coarse fragments. The risk of compaction in these texture classes is generally moderate. However, compaction of soils in these texture classes may not necessarily reduce site productivity. The wet weather operation soil protection measure would reduce compaction effects. It is important to note that the LTSP study utilizes extreme levels of soil compaction; a mechanical roller, typically used for compaction of highway subgrades, was used to compact the test plots at optimum moisture for compaction. Tree growth is influenced by many factors, including the climate regime, soil aeration, moisture and nutrient availability, soil strength, root-soil interactions, soil mass flow and diffusion properties, and numerous other factors.

Compaction may influence some of these characteristics and thereby influence plant growth and soil productivity.

Cumulative Effects

The extent of detrimental compaction, as defined by the R5 guidance, is difficult to predict due to the environmental and operational variables discussed above. With the incorporation of the design criteria for this project, and the fact that a large number of the units have a moderate compaction potential, it is reasonable to expect that only a portion of the new skid trails would contribute to the cumulative amount of detrimental compaction. Monitoring of detrimental soil compaction has occurred within the HFQLG Pilot Project area. These data suggest that each harvest entry into an area will add a little bit of compaction (USDA 2006e). The cumulative effect of the mechanical operations proposed in the Keddie Ridge Project is likely an increase in the extent of detrimental compaction. This increase, however, may not result in any measurable change to soil productivity for the reasons discussed above. In the LTSP study, an extraordinary effort was used to compact the soil for research purposes. The expected extent of detrimental soil compaction for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential for the activity area.

Down Woody Material—Alternative B

Direct Effects

The applicable standards for large down wood are in the LRMP as amended, which states that down woody material retention levels should be determined on an individual project basis. For the Keddie Ridge Project, 10 to 15 tons per acre of the largest down logs, where they exist, will be retained. The Region 5 Soil Handbook provides a threshold for large woody material, recommending retention of 5 logs per acre representing the range of decomposition classes. Table 68 shows the level of down woody material measured during field sampling. Many units have well over the recommended threshold level. Under the no action alternative, snags are expected to fall, and down wood loads (in terms of tons per acre) and the number of logs per acre are expected to increase. However, in the event of a future wildfire, some down logs are likely to be consumed, particularly those in later decay stages. While rotten logs can retain moisture late in the summer season, some years are quite dry and rotten logs could easily be consumed by fire.

Indirect Effects

In the absence of fire, the increase in down woody material could alter the microclimate and microhabitat at the forest floor. If down wood does retain moisture late in summer (compared with litter and duff materials), this could result in very small-scale changes in nutrient cycling and microbial activities. For example, rates of net nitrogen mineralization may be increased near the logs due to the increased moisture. However, these changes are unlikely to have significant influences over stand productivity because down wood generally covers only a very small proportion of the forest floor.

Cumulative Effects

Under the no action alternative, down wood would continue to accumulate. Overall, levels of down wood are currently very high in the sampled units. This is due largely to heavy deadfall following a drought period. At a localized scale, the wood load may alter nutrient cycling, but this is likely inconsequential in terms of soil productivity. Large amounts of down wood contribute to a heavy fuel load in many units. If a wildfire were to enter the units, much of the wood may be consumed. Heavy fuels such as logs contribute large amounts of heat to the soil during the glowing combustion phase of a fire. In the event of a fire, this intense heat load could produce localized areas of non-wettable soils and strong alterations of mineral soil properties (Moghaddas and Stephens 2007). This could result in long-term reductions in soil carbon and other stored nutrients that contribute to long-term soil productivity.

Down Woody Material—Effects Common to the Action Alternatives

Direct Effects

Mechanical operations would likely rearrange down woody material on the forest floor. Some new woody debris may be created if hazardous snags are felled and left on site. Mastication would add woody material to the forest floor, but these would occur as shredded materials and not logs, as recommended by the R5 guidance. Prescribed burning would consume some of the heavy wood loadings known to exist in the project area. If prescribed burning occurs in the fall, rotten logs may be more susceptible to consumption by fire compared to spring burning, however this would largely depend on the precipitation patterns preceding the burn period.

Large woody material monitoring results from the 2007 HFQLG Soil Monitoring report stated that large woody material decreased from levels observed during pre-treatment monitoring. Only 62 percent of the thinning units and 18 percent of group selection units met the recommended guideline of 5 large down logs per acre under the post-project condition, whereas 85 percent of the thinning units and 73 percent of the group selection units met the guideline under the pre-project condition. The 2009 HFQLG Soil Monitoring Report states that some of this wood was likely removed to meet fuel reduction objectives. A 2008 letter from the three Supervisors of the HFQLG Forests describes management techniques to bring Forests into compliance with soil standards, including the standard for large down wood (USDA 2008f). These techniques include coordination between sale administration personnel and fuel treatment personnel to reduce the loss of large down wood during harvest and burning operations and would be applied on the Keddie Ridge Project to assure that the project standard for large down wood would be achieved under action alternatives.

Indirect Effects

Reductions in large woody material would cause minor, localized changes to soil microhabitat. As described for alternative B, rotten logs can retain moisture longer during the summer season compared with litter and duff materials. A loss of logs and subsequent change in moisture conditions could result in changes in nutrient cycling and microbial activity at the location of the log. This change is expected to be insignificant at the stand scale. Areas of high wood loads in the Keddie Ridge Project are often “jack-strawed,” with woody materials accumulated atop each other. When wood is not in direct contact with the ground, its decomposition rate is greatly reduced. As a result, areas with heaviest wood loads are unlikely to have a large increase in moisture-retention abilities because much of the wood is relatively sound and elevated off the soil surface. Underburning areas of heavy wood loadings could result in localized effects to the underlying soils. The underlying soils are heated during combustion of woody materials. Prescribed burning is designed to occur when soils are moist, which reduces heat transfer and the resulting changes to soil chemical and biological properties.

Cumulative Effects

Reductions in large woody material are expected as a result of the treatments. Currently, many units have wood loadings that are well above the R5 recommended levels 5 logs per acre. The Keddie Ridge landscape likely supports a much higher level of large wood now than during the pre-fire suppression era. In the Keddie Ridge landscape, these woody fuels currently contribute to a heavy fuel loading and increased potential severity during a wildfire. Wildfires tend to occur during late summer when fuels and soils are at their driest. These conditions result in high levels of heating and chemical, physical, and biological alterations of the soil environment, and high losses of large wood. The proposed treatments are designed to reduce fire behavior in the event of a wildfire. By reducing the heavy wood fuel load during prescribed conditions, the resulting changes to the soil will be greatly reduced. Where it exists, 10-15 tons per acre of the largest woody materials would be retained by the project activities.

Fine Organic Matter—Alternative B

Direct Effects

Under the no action alternative, fine organic matter can be expected to increase as organic materials accumulate on the forest floor. Existing levels of fine organic matter are shown in Table 68 and are expect to steadily accumulate over time.

Indirect Effects

As a result of increased cover of fine organic matter, the risk of soil erosion may decline on forested hill slopes. Fine organic matter functions as effective soil cover, which was discussed above. The continued accumulation of organic matter on the forest floor would contribute to increased ground and surface fuel loads, which may lead to increased fire severity and intensity during a fire event.

Cumulative Effects

If fine organic matter were consumed during a wildfire, the soil would be more susceptible to erosion. During a precipitation event, soil can become saturated and erode downslope due to rill formation and raindrop splash. Immediately following a fire, the affected stand may not meet the R5 guidance that recommends 50 percent cover of fine organic matter. However, within several months, a thin layer of needles dropped from scorched trees would likely increase surface cover of organic matter (Pannkuk and Robichaud 2003).

Fires short circuit the decomposition pathway, rapidly oxidizing organic matter and releasing available nutrients to plants and soil organisms. Terrestrial cycling pathways return some nutrients relatively quickly. Compared to the pre-burn condition, a large reduction in the organic matter covering the soil would reduce the insulating effect this layer has on soil temperature. Under a reduced organic layer, soils would experience greater temperature extremes. In addition, a blackened surface, due to partially combusted organic materials, would absorb more light and become warmer than a soil without a dark surface (Ahlgren and Ahlgren 1960). Soil temperatures may be elevated for months or years depending on the degree of organic matter consumption (Neary et al. 1999). Such changes in the soil temperature regime would affect the rates of biological activity in the soil, resulting in altered nutrient cycling regimes.

Fine Organic Matter—Effects Common to the Action Alternatives

Direct Effects

Pre-existing organic matter would be rearranged due to harvesting and yarding equipment. Accurate prediction of treatment effects on surface fine organic matter is difficult but trends would likely be consistent with those observed for effective soil cover in the 2007 HFQLG Soil Monitoring Report (described above). For example, the 2007 HFQLG Soil Monitoring Report presented a statistically significant difference between the pre- and post-project means for effective soil cover on 39 mechanical thinning units, with the 95 percent confidence level describing a post-project reduction in the areal extent of soil cover ranging from 9 percent to 15 percent. A similar reduction of fine organic matter can be expected for the thinning units under this project, indicating that some of the units may, in the short-term, be below the Handbook’s recommended threshold of 50 percent. After the initial reduction in fine organic matter due to mechanical thinning treatments, fine organic matter would increase over the years due to needle cast and leaves falling from coniferous and deciduous trees that remain. Mastication would contribute to fine organic matter increases because shredded materials are broadcast into the unit away from the masticator. Pile burning and underburning would reduce cover of fine organic matter. Pile burning would remove forest floor materials locally, and underburning is expected to occur under prescribed conditions that would not result in complete combustion of the duff and litter layers.

Indirect Effects

Changes in the cover of fine organic matter will affect the risk of erosion, as discussed for effective soil cover, discussed above. Increases in fine organic materials, where units are not subsequently underburned, would add to the total nutrient pool stored in the forest floor. These nutrients are largely unavailable to plants in their organic forms, and are slowly decayed and recycled by soil organisms. As a result of the decomposition process, nutrients are released in available form for uptake by plants and other organisms. When prescribed burning activities consume fine organic matter, essential nutrients can be transferred downward into the soil (Moghaddas and Stephens 2007) or to the atmosphere through volatilization and ash convection (Khanna and Raison 1986). Terrestrial cycling pathways return some nutrients relatively quickly. Burn prescriptions are designed to prevent total consumption of fine organic materials. For example, district watershed staff observed that during underburn operations on the Green Flat Project, the duff layer was left largely intact despite the prescribed fires. As discussed above, scorched needles contribute new inputs of fine organic matter shortly after prescribed fire operations.

The Long-Term Soil Productivity study described above is investigating how substantial removal of forest organic matter affects site productivity. The national ten year results indicate that bole only and whole tree organic matter removals, similar to the thinning treatments proposed for this project, have had no detectable effects on soil nutrition or biomass productivity. Significant reductions in soil carbon and nutrient availability were observed only for the extreme case of whole tree removal plus complete removal of all surface organic matter on the forest floor. However, the data trend indicated no general decline in biomass productivity across any of the organic matter removal levels. Given the modest and short-term reductions of fine organic matter that are expected due to the proposed treatments, those reductions would not significantly change the soil production potential within the proposed units.

Cumulative Effects

The mechanical harvest treatments proposed in the action alternatives and the prescribed burning activities would cause reductions in fine organic matter. Overall, the cumulative effects of the proposed activities, when considered with the past, present, and future activities, are expected to result in fine organic matter conditions that meet the R5 recommended levels. Increases in fine woody materials on the forest floor due to mastication may cause short-term changes in decomposition and carbon and nutrient dynamics in affected areas. Microorganisms that decompose wood would immobilize nitrogen and other nutrients while decaying the woody material. As the wood decomposes, those nutrients would be released and made available to plants and other organisms (Swift et al. 1979). Microclimate changes at the forest floor due to reduced canopy cover could alter rates of decomposition and nutrient turnover in the surface fine organic matter of harvested stands (Erickson et al. 1985). Any reductions below the 50 percent recommended levels are only expected in the underburn units, however these would also be expected to quickly increase due to litter inputs from scorched vegetation. The extent of fine organic matter reductions due to proposed activities for each of the action alternatives would not be of a size or pattern that would result in significant change in production potential for the activity area.

Hydrology Analysis

Effects Common to Alternatives A, C, D, and E

Direct and Indirect Effects

Harvest activities with heavy equipment can result in the creation of new skid trails and an increase in the extent of compacted soil. Prescribed burning would reduce the amount of ground cover. The additional effects of entering RHCAs with vegetative treatments would include increasing the size of residual trees within RHCAs. In order to help maintain favorable microclimates in RHCAs, hardwoods would be retained in all units. This is especially important in the known trout fishery streams, including Wolf Creek, Lights Creek, and Indian Creek. In-stream flows would be assessed during equipment operations, with respect to drafting requirements. Harvest activities may locally alter soil moisture regimes and subsequent water yield due to altered interception and evapo-transpiration due to the decrease in canopy cover.

Prescriptions for the Keddie Ridge Project include product removal, underburning, and mastication. The harvest operations (product removal) would cause associated disturbance from skid trails, site preparation, and transportation needs, such as temporary roads. Underburning would result in reduced ground cover and increased exposure of bare soil. Following implementation, the remaining canopy and vegetative recovery would contribute to rebuilding forest floor materials. Erosion and sedimentation that may result from the activities could decrease the quality of coldwater fish habitat by infilling pools and embedding spawning gravels. Due to ground disturbance, harvested areas would be more susceptible to erosion and sediment transport to the channel network. However, implementation of best management practices would help mitigate and prevent increased compaction and recent results of BMP monitoring on the Plumas Nation Forest demonstrate that BMPs are effective at preventing erosion and sedimentation (USDA 2009a). Over the past three monitoring seasons (2007-2009), 186 evaluations of BMPs were conducted for practices associated with timber and fuel management activities. BMPs were rated as effective for over 88 percent of those evaluations (USDA 2009a). The BMP deficiencies observed were predominantly due to legacy effects associated with the original design or location of system haul roads.

Legacy road designs often incorporated in-sloped road surfaces that drained to an inside ditch rather than current design practices that utilize, as often as practicable, out-sloped road surfaces that disperse runoff. In-sloped designs concentrate road runoff in the inside ditch and the legacy design roads—most constructed prior to existence of the Federal Clean Water Act—did not include sufficient frequency of drainage structures to disperse road runoff and prevent the ditches from delivering sediment to streams at road crossings. Legacy designs that located roads at mid-slope locations typically have higher road-intercepted runoff volumes than roads near ridgetops and mid-slope locations also result in frequent stream crossings. When the 2007-2009 timber BMP evaluations are considered without the road evaluations, the resulting set of 67 evaluations had a 95 percent effectiveness rate. Road reconstruction activities are proposed for all action alternatives to reduce sedimentation impacts associated with legacy road designs.

The road treatments consist of measures to improve road drainage, reduce erosion caused by road drainage, and reduce sedimentation from roads into the stream network. Most roads in the affected subwatersheds have an in-sloped roadbed that is drained by an inside ditch. Culverts occur at varying intervals to drain the ditch, resulting in concentrated flows from the culvert outlets. The road treatments largely include obliterating the ditch, where possible, and reshaping the roadbed so that it is out-sloped. This would allow for dispersed road drainage that is not concentrated by culverts. Where ditch obliteration is not possible, armored rolling dips will be constructed to somewhat disconnect the inside ditch from stream crossings. Culvert outlets will be armored as needed to reduce erosion downstream of the culvert. This armoring will provide roughness to reduce the energy of the water flowing from the culvert and will encourage sediment deposition near the culvert, rather than traveling on toward a stream channel.

Proposed mechanical noxious weed treatments include hand pulling, weed-whacking, and pulling individual plants with a weed wrench. Ground disturbance due to these activities would be negligible—weed pulling may loosen the soil at a local scale. Treatment of noxious weeds with herbicide would occur in all action alternatives and is discussed in a separate section below.

Short-term sediment delivery to streams could potentially occur after prescribed burning due to loss of ground cover. Based on 28 prescribed fire BMP evaluations completed on the Plumas National Forest over the last three years, no short-term sediment delivery to streams after prescribed burning was documented (USDA 2009a). Scorched conifers often drop needles following low or moderate-severity fires and this needle cast would provide ground cover that may help reduce rill and inter-rill erosion and sediment delivery (Pannkuk and Robichaud 2003). Treatments in RHCAs may increase the vigor of riparian vegetation due to increased water yield and reduced competition by conifers. By removing conifers from RHCAs, short-term decreases in channel shading may occur that could affect stream temperatures until riparian vegetation fills these voids. The main objective is to reduce the potential for catastrophic wildfire, and thus, retain the RHCA's desired riparian and aquatic habitats, effective stream channel function, and the ability to route flood discharges.

Road construction would create new sources of sediment and disrupt the hydrologic continuity on affected hillslopes. However, state-of-the-art road design BMPs would be followed for new road construction, including out-sloping of the road template and installation of frequent road drainage structures to minimize delivery of sediment to adjacent streams. Road reconstruction would consist of brushing, blading the road surface, improving drainage, and replacing or upgrading culverts where needed. Road drainage improvements would be designed to disperse runoff and eliminate the occurrence of road drainage being hydrologically connected to adjacent stream channels. Short-term increases in sediment during road reconstructions would be minimized by BMPs and would be offset by long-term improvements to water quality as a result of amelioration of hydrologically connected road segments. Road decommissioning may entail culvert removal, subsoiling of the roadbed, recontouring the hillslope, and/or seeding the affected area. Road decommissioning would promote vegetative recovery, which can decrease compaction, increase infiltration into the roadbed, and increase soil stability and limit concentrated flow as well as surface erosion. Over time, decommissioned roads would produce less sediment and surface runoff to adjacent watercourses. Kolka and Smidt (2004) reported that recontouring hillslopes significantly reduced soil compaction, surface runoff, and sediment production compared to subsoiling or cover cropping.

Cumulative Effects

ERA model values and a discussion of the ERA results relative to TOC for each of the action alternatives is presented below in the section titled "Differences in Effects Analysis Across Action Alternatives." Higher ERA values are generally associated with higher peak flows that are more erosive and can lead to increased channel scour and higher sediment loads off-site. Stream channels in poor condition tend to be more sensitive to increases in peak flows because the channels frequently lack an effective root mass to bind streambanks and large organic debris to retain bedload materials. These channels are frequently downcut (have eroded down into the bottom of their channels), and all flow is confined to the channel rather than to a broader floodplain. Given these conditions, sediment is more readily eroded from these channels with subsequent deposition of sediment downstream. Increases in ERA may lead to detrimental effects, including erosion from treated hillsides and chronic sedimentation. Primary factors leading to this would include a reduction of canopy cover, ground disturbance (particularly due to road effects), and loss of ground cover. Road construction would temporarily increase ERA values due to the addition of roaded acres on the landscape, but all new roads constructed for the Keddie Ridge Project would be decommissioned after implementation. Road decommissioning would reduce ERA contributions by roads, and result in long-term beneficial effects on water quality.

The effects of entering RHCAs with vegetative treatments would be similar to those described directly above. Despite the risk of erosion, the greater long-term benefit of treating the RHCAs would be the potential protection from catastrophic wildfire. Other effects would include increasing the size of residual trees within RHCAs, preventing potential catastrophic wildfire, reducing future losses of large diameter trees and large woody debris (LWD) to fire, and increasing future LWD recruitment of intermediate to large logs. In forested stream systems, debris would help maintain channel stability, decrease flow velocity, trap sediment, and protect banks from erosion (Berg et al. 1998). Within the immediate riparian areas, the physical effects derived from in-channel LWD would be sustained because no natural in-channel debris would be removed. Future recruitment of LWD, which is structurally important for channel morphology, channel function, and bank stability, would be encouraged through snag retention requirements and release of existing live conifers. Canada thistle has the potential to replace many grasses and forbs in the riparian zone, thereby reducing species diversity, but treatment of Canada thistle would help control this invasive noxious weed and protect riparian species diversity. Herbicide effects are discussed below.

Alternative B – No Action Alternative

Direct and Indirect Effects (Alternative B)

Under the no action alternative, all subwatersheds would continue to recover, and ERA values would slowly decline to a baseline level over time. In alternative B, surface, ladder, and crown fuels would not be treated on upslope areas or in RHCAs. Noxious weeds would not be treated. Road drainage improvements and decommissioning activities would not occur, so watershed benefits and reductions in ERA values due to road decommissioning would not be realized. Fuel treatment activities would not occur. A future severe wildfire could greatly increase ERA values within and across subwatersheds.

In the short-term, water quality and downstream beneficial uses would remain unchanged. As watersheds recover from past management activities, there may be small improvements in water quality. However, in the absence of road improvements, decommissioning, or obliteration, the transportation system would continue to be a large contributor of sediment to the stream network. The high density of roads and road/stream crossings would continue to affect the hydrologic regime in these subwatersheds.

Cumulative Effects (Alternative B)

None of the subwatersheds that are contained by the greater watershed assessment area exceed the threshold of concern (TOC). Private harvests are expected to continue within the overall watershed assessment area, though it is difficult to predict the location, type of harvest treatments, or number of acres that would be affected. In alternative B, surface, ladder, and crown fuels would not be treated on upslope areas or in RHCAs. Historically, fire has been an integral disturbance agent in riparian systems (Dwire and Kauffman 2003, Everett et al. 1995, Skinner 2003). However, fire suppression has reduced the influence of fire, resulting in fuel accumulation and increased likelihood of large, severe wildfires (Taylor and Skinner 1998). During wildfires, drainages can behave like chimneys, rapidly directing fire upslope through the drainage area. Under alternative B, watersheds would remain vulnerable to the effects of a future severe wildfire. In the event of a future severe wildfire, affected areas may be highly susceptible to erosion, and generate large pulses of sediment to stream channels (Elliot and Robichaud 2001). Sediment may be stored in channels for many years until peak flows mobilize the materials and move them downstream. Large runoff events often follow severe wildfires, resulting in increased peak flows.

Noxious weeds would not be treated in alternative B. As a result, these weeds may spread over time. As above, many occurrences of the noxious weed Canada thistle are located within RHCAs, and pose a potential threat to biological plant diversity in riparian communities. The spread of Canada thistle could decrease the diversity and productivity of native and desired nonnative riparian plant communities.

Direct, Indirect, and Cumulative Effects of Herbicide Application (Alternatives A and D)

Aminopyralid (i.e. Milestone® or equivalent formulation) herbicide treatments would be performed by manual ground application using backpack sprayers at an application rate of 0.05 to 0.11 pounds acid equivalent per acre (lbs a.e./ac). The formulation would also include a surfactant (Competitor® (Wilbur-Ellis Company) which is a non-ionic modified vegetable oil), and a marker dye (Hi-Light™ Blue (Becker-Underwood, Inc.) which is a water-soluble colorant). Aminopyralid would be used to treat dry and upland sites greater than 15 feet from the water's edge. The aquatic formulation of glyphosate (i.e. Accord® or equivalent formulation) is proposed for lowland treatments (between 0-15 feet from the water's edge) and would be applied selectively by hand using a wick applicator at an application rate of 1-3 lbs a.e./acre. The Keddie Ridge Project also proposes to apply a registered borax fungicide (i.e. Sporax or Cellu-treat) to pine stumps greater than 14 inches in diameter in units 45, 46, 49, and 50. The average application rate for borax in thinning areas would be less than 1 pound per acre (approximately 0.5 pounds per acre) with a range of 0.1 lbs/acre to 1.1 lbs/acre. Group selection units within units 45, 46, 49, and 50 could have as much as 2.7 pounds/acre applied.

There is a considerable body of information describing the potential effects on soil and water resources associated with using each of the proposed herbicides. Much of this information is contained in the risk assessments completed by Syracuse Environmental Research Associates, Inc. (SERA 2007, 2003, 2006), under contract to the Forest Service, and in the HFQLG Act Final Supplemental EIS (USDA 2003a). These documents are incorporated by reference into this effects analysis for the Keddie Ridge Project.

The HGQLG Final Supplemental EIS analyzed the likelihood of detection of glyphosate in surface waters following backpack spray application methods and with full implementation of all water quality best management practices. The HFQLG Final Supplemental EIS concluded that it was unlikely that glyphosate would be detected in forest streams in the pilot project area when streamside buffers and ground applications are used. This conclusion was partially based on the white paper, "A Review and Assessment of the Results of Water Monitoring for Herbicide Residues For The Years 1991 to 1999" (Bakke 2001), which compiled and summarized the results from 15 separate water monitoring reports written by hydrologists and geologists on the Angeles, Eldorado, Lassen, Sierra, and Stanislaus National Forests. These reports documented the results of over 800 surface- and ground-water samples taken for reforestation and noxious weed eradication projects that used three herbicides (glyphosate, hexazinone, and triclopyr).

According to “A Review and Assessment of the Results of Water Monitoring for Herbicide Residues for the Years 1991 to 1999” (Bakke 2001), detections of glyphosate have been associated with its use in riparian areas or applications that did not follow established best management practices. The only sited occurrence of a detection occurred in only 1 of 12 samples. The detection was low (15 parts per billion), and the application was by spray in the actual stream channel at greater than 1.5 lbs/acre. In the Proposed action, glyphosate would only be applied by wick application which would effectively eliminate the chance of drift because herbicide is not emitted by spray, and the buffer would be 15 feet from the water’s edge. The incorporation of these design elements would greatly reduce the risk of indirect effects due to drift.

The proposed use of herbicides includes the additional use of a surfactant (Competitor®) and a marker dye (Hi-Light™ Blue). Surfactants are used to facilitate or enhance the absorbing, emulsifying, dispersing, spreading, sticking, wetting, or penetrating properties of herbicides. Competitor® is a non-ionic modified vegetable oil. The assessment of hazards related to surfactants is limited by the proprietary nature of the formulations. Surfactants, by their very nature, are intended to increase the effect of a pesticide by increasing the amount of pesticide that is in contact with the target. This is not synergistic, but more accurately a reflection of increased dose of the herbicide active ingredient into the plant. The “Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides” (Bakke 2003) sites technical references which indicate a lack of synergistic effects between surfactants and pesticides which suggest that surfactants don’t increase the toxic effects of herbicides. This paper also listed the results of standard acute aquatic species toxicity testing which indicated that any potential effects to aquatic species would be unlikely under normal application rates. Studies have shown that mobility of materials throughout the soil profile is a function of the concentration of the surfactants in the soil solution. For this to occur, concentrations of surfactant must be high, in the range of 1,000 ppm or more(Bakke 2003). This level is unlikely to be reached under normal application rates as proposed by this project, which would likely have concentrations considerably, less than 12 ppm. “Although the potential exists for surfactants to affect the environmental fate of herbicides in the soil, any potential effects would be unlikely under normal conditions because of the relatively low concentration of surfactants in the soil/water matrix. Localized effects could be seen if a spill occurred on the soil, so that concentration of surfactant approached or exceeded about 1,000 ppm” (Bakke 2003).

The colorant Hi-Light™ Blue will be added to the herbicide mixtures prior to the application so that the actual treated area can be readily determined. This helps to prevent skips and overlaps. Hi-Light™ Blue is a water-soluble dye that contains no listed hazardous substances. It is considered to be virtually non-toxic to humans. Its effect on non-target terrestrial and aquatic species is unknown, however its use has not resulted in any known problems. The dye used in Hi-Light™ Blue is commonly used in toilet bowl cleaners and as a colorant for lake and ponds (SERA 1997).

Unlike the other two pesticides proposed, the agent of toxicologic concern in borax (i.e. boron), occurs naturally and exposures to this element are unavoidable. The use of borax is not expected to substantially contribute to concentration of boron in water or soil beyond those that are associated with the normal occurrence of boron in the environment (SERA 2006).

Direct Effects

No direct effects on soil productivity are predicted from the proposed herbicide treatment in alternatives A and D. The potential for adverse effects of herbicide residues in soil and water would be minimized or eliminated by incorporating the proposed design criteria and applying BMPs for herbicide application. Design criteria include carefully planned herbicide use according to the label and other relevant requirements, spill contingency plans, proper disposal of containers and cleaning equipment, adequate buffer strips, spray drift control, and restricted use of herbicides near water bodies with sensitive amphibian species.

Drift calculations from the SERA risk assessments (SERA 2003, 2007) analyzed the potential for herbicide drift during applications of glyphosate and aminopyralid. Backpack sprayers were analyzed under two wind speed conditions: (1) 0 to 5 miles per hour (mph) winds in which droplets could drift as far as 23 feet and (2) 15 mph winds with the potential to drift up to 68 feet. Based on these calculations and a 10 mph maximum wind speed for application using a backpack sprayer, the proposed stream buffers would reduce the potential for the herbicide to reach water due to drift. Refer to appendix B of the final EIS for a list of the proposed design criteria for noxious weed treatments.

Mobility and Persistence of Glyphosate

Glyphosate has limited mobility because it tends to adsorb strongly to soil particles, especially to clay and to iron and aluminum ions. While it has high water solubility, it does not tend to leach through the soil profile in most soils. Although glyphosate has a relatively short half-life in soil (25–130 days) (USDA 2003a), adsorption to soil can create an herbicide sink, which may take longer to dissipate. In soils with high sand content (about 80 percent), leaching and longer persistence have been observed (Smith 1996, Eberbach and Douglas 1983). Generally, glyphosate is degraded in soils within three months (USDA 1988). A study in the Journal of Agricultural and Food Chemistry indicated that glyphosate desorbed (the compound detaches from the soil particle) at a higher rate than had been indicated by previous research(Piccolo 1994). The results, however, were obtained by laboratory experiments and were not taken under natural conditions. The compound only detached after several hours of severe mechanical shaking. These conditions do not occur in the natural system.

Mobility and Persistence of Aminopyralid

According to the aminopyralid report completed by SERA in 2007, aminopyralid is quite soluble, and its persistence in soil can vary depending on soil type and other environmental conditions—its half-life can range from 14 to 343 days. Although aminopyralid does not bind readily in soil, it dissipates rapidly in some common soil conditions. No known metabolites of aminopyralid have been identified.

The SERA risk assessment (2007) states that aminopyralid or any other herbicide may be transported to off-site soil by runoff or percolation. Runoff and percolation are both considered in estimating contamination of ambient water. For assessing off-site soil contamination, however, only runoff is considered. This approach is reasonable because off-site runoff will contaminate the off-site soil surface. Percolation, on the other hand, represents the amount of the herbicide that is transported below the root zone and may thus impact water quality.

The probability is very low that a detectable level of either of the two proposed herbicides would reach surface water (flowing streams, springs, seeps, and riparian areas). The probability of the Keddie Ridge Project violating a water quality standard would be very small—this is based on the glyphosate and aminopyralid risk assessments (SERA 2003, 2007) and on the results of over 12 years of monitoring glyphosate in Region 5. At the levels proposed for application, neither aminopyralid nor glyphosate is expected to have direct detrimental effects on water quality.

Mobility and Persistence of Borax

The borax risk assessment states "in water, boron compounds transform rapidly into borates, no further transformation is possible, with borate speciation dependent upon pH. Those compounds may be transported by percolation, sediment, or runoff from soil to ambient water. Borate compounds are adsorbed to soils to varying degrees, depending on several factors, including soil type and water pH" (SERA 2006). A study by the Southeastern Forest Experiment Station in 1971 showed that borax "persisted uniformly at a toxic concentration 5.1 cm below the stump surface for at least 8 weeks. Twenty six months after treatment, borax had leached to subtoxic levels throughout the upper 0.3 cm of stumps, but toxic amounts were measured at a depth of 1.2 cm" (Koenigs 1971).

Soil Microorganisms

According to the SERA (2003) risk assessment, glyphosate is readily metabolized by soil bacteria with aminomethyl phosphonic acid as a major metabolite. In addition, many species of soil microorganisms can use glyphosate as sole carbon. There is very little information suggesting that glyphosate is harmful to soil microorganisms under field conditions, and a substantial body of information indicates that glyphosate would likely enhance or have no effect on soil microorganisms.

In application rates of 1.2 lbs a.e./acre (0.54 kilograms per hectare), a transient decrease in populations of soil fungi and bacteria was noted after 2 months but no effect was apparent after 6 months. Similarly, at an application rate of 7.12 lbs a.e./acre (3.23 kilograms per hectare), no effect was seen on soil fungi and bacteria after 10 to 14 months. A transient decrease in soil microbial activity was also noted after the application, but no lasting effects on soil have been reported (SERA 2003).

Several field studies involving microbial activity in soil after glyphosate exposures note an increase rather than decrease in soil microorganisms or microbial activity. Application of glyphosate may cause transient increases in soil fungi that may be detrimental to some plants, and some studies have shown that inoculation of soil with various pathogenic soil fungi may result in an apparent enhancement of glyphosate toxicity (SERA 2003).

Aminopyralid toxicity data on soil organisms are limited, but the projected maximum concentrations under normal application rates would be far below potentially toxic levels. A study by (McMurray 2002) showed modest increases in nitrate and total mineral nitrogen concentrations in soil directly following application but no statistically significant effects were noted thereafter. The information on soil organisms is limited and consists only of a no-observed-effect concentration (NOEC) value for earthworms reported as 5,000 ppm (mg a.e./kg soil). The proposed maximum application rate of .11 lbs a.e./acre corresponds to a concentration of about 0.05 ppm and "indicates inconsequential risks to earthworms" (SERA 2007). Consequently, this information does not provide any basis for asserting that adverse effects on soil organisms are plausible.

Borates are effective fungicides and some nontarget soil microorganisms could be affected by exposure to boron in soil. "However, information to adequately assess risk in this class of organisms is not available" (SERA 2006). Due to the application method and rates, widespread exposure to soil microorganisms are not likely.

Indirect Effects

Based on a review of the literature and monitoring reports from other Region 5 herbicide projects, the proposed spray treatments are not expected to significantly increase the potential for erosion. Reducing the amount of ground cover protecting the soil, and thus increasing erosion rates, is a potential indirect effect. However, it is expected that none of the action alternatives would significantly reduce existing ground cover in treated areas. Litter and duff inputs may be reduced slightly, due to the reduction in shrub canopy, but existing litter and duff would continue to provide an adequate amount of ground cover. Vegetation killed by herbicides would continue to provide a canopy cover until the leaves fall, which would then add to the existing ground cover.

Cumulative Effects

Glyphosate and aminopyralid are not expected to accumulate in the soils within the project area. According to the HFQLG Final Supplemental EIS, "Surface water concentrations of glyphosate and aminopyralid are anticipated to be undetectable, assuming backpack application using BMPs, and no cumulative effects are anticipated from application of these herbicides, because their delectability is anticipated to be zero" (USDA 2003a). A cumulative watershed effects analysis explores the potential for possible cumulative indirect effects on hydrologic function as a result of removing vegetative cover, ground disturbance, and soil compaction. Since the proposed herbicide treatments would not result in additional bare or compacted soil, the proposed herbicide treatments would not result in new ERAs that would change the results of the cumulative watershed effect ERA analysis. In fact, the HFQLG Final Supplemental EIS determined through modeling that the watershed effects of herbicide maintenance treatment would be small, relative to other disturbances within watersheds of the HFQLF pilot project area, and would not significantly increase cumulative watershed effects (USDA 2003a).

Previous discussion reveals that there is little chance that either glyphosate or aminopyralid is expected to reach streams because of their limited transport mobility; relatively short half-lives; buffers along streams; application criteria, which takes into account the time of year, wind velocity, and period to the next rainfall; and other BMPs for herbicide application. In conclusion, no significant adverse cumulative watershed effects associated with the herbicide application alternatives are expected.

Effects Analysis – Action Alternatives

Cumulative Effects

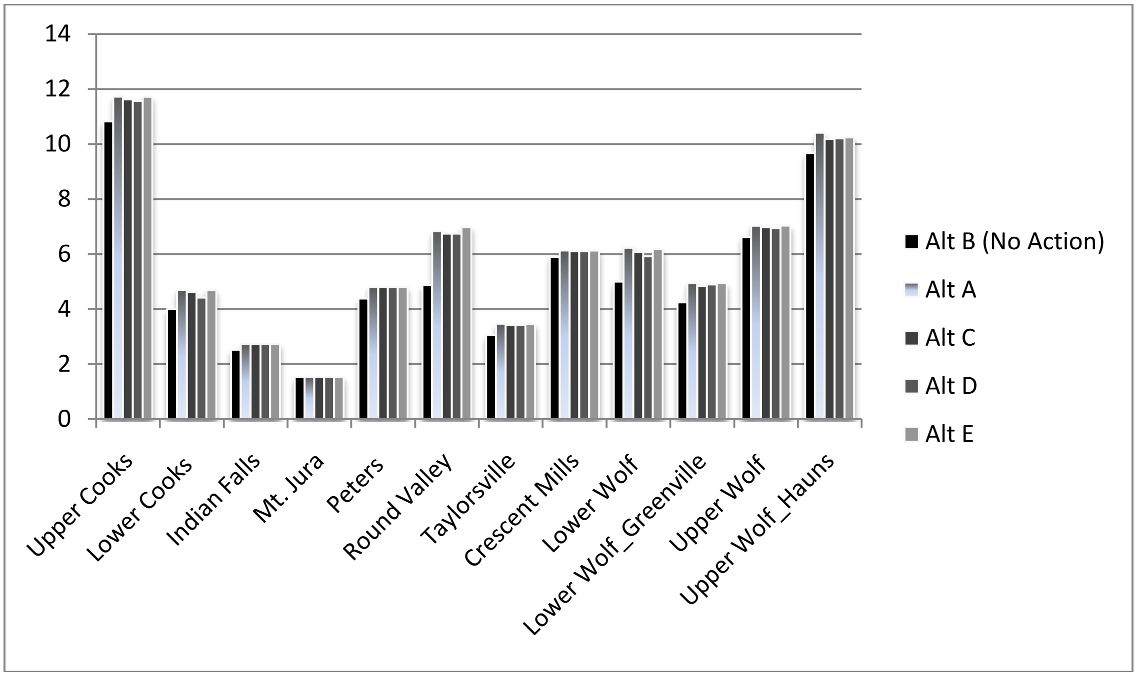


Figure 16. ERA Comparison by Alternative

Alternative A—Cumulative Watershed Effects, ERA Analysis

Direct, indirect, and cumulative effects of activities proposed in alternative A are discussed above in the section subtitled, “Effects Common to Alternatives A, C, D, and E”. Alternative A, the Proposed action, would construct 5,175 acres of Defensible Fuel Profile Zones (DFPZs); implement 494 acres of area thinning (AT) outside of DFPZs; implement 284 acres of group selection (GS) within DFPZ and AT units. This alternative would also hand thin, pile, and burn within 9 acres of clustered lady’s slipper habitat and 76 acres of Constance’s rock cress habitat. Alternative A would additionally treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, late spring underburning and direct flaming with a backpack propane torch, and revegetation in select areas using native seed.

Under alternative A, the project-induced increase in ERA values were predicted to range from .01 to 16.3 percent of the TOC, depending on the subwatershed. This would result in cumulative ERA values ranging from 12.8 to 97.6 percent of the TOC. Riparian area ERA value increases induced by alternative A would range from 0 to 1.5 percent depending on the subwatershed. Treatment activities would not cause any subwatersheds to exceed the TOC (Figure 16) and only one subwatershed (Upper Cooks) would approach the TOC. The Moonlight Fire and subsequent private salvage harvest activities raised the ERA value in the Upper Cooks Creek subwatershed to 90.2 percent of TOC, and the Keddie Ridge

Project would raise it another 8 percent. Consequently, it is at a high risk for detrimental watershed effects.

A closer look in the field at riparian areas for the Upper Cooks watershed indicate that these areas are stable and well-vegetated and would provide effective buffers for any potential project-generated sediment delivery. Proposed road reconstruction within this watershed would eliminate occurrences where road drainage enters stream courses. The observed existing condition of stream channels and adjacent riparian buffers, along with implementation of project BMPs and design features, assure that significant impacts to water quality and beneficial uses would not occur in this subwatershed. An adverse cumulative watershed effect due to implementation of alternative A is not expected for any of the project subwatersheds.

The Round Valley Reservoir subwatershed, the municipal water supply for Greeneville, is projected to experience the greatest increase in ERA—16.3 percent, bringing the ERA value up to 6.83 which equates to merely 56.9 percent of the 12.0 ERA threshold. This subwatershed is also projected to experience the highest riparian area ERA increase, 1.5 percent above existing condition and therefore pose a greater risk for cumulative effects. However, for purposes of the CWE analysis, it is important to mention that the internal equipment exclusion zones of RHCAs and were not removed from the total treatment acreage proposed in action alternatives. Therefore, ERA values for sensitive areas are conservative estimates within the analysis subwatersheds. Field surveys of the watersheds and associated stream systems that are above or near the TOC were conducted to verify stream channel and hillslope conditions and properly select project design elements that would reduce the risk of detrimental effects to the soil and water resources. RHCA and SMZ equipment exclusion zones would be delineated out and avoided in accordance to the equipment restriction zones defined in Table 70. Refer to appendix H of the final EIS for a complete list of standard management requirements associated with RHCAs.

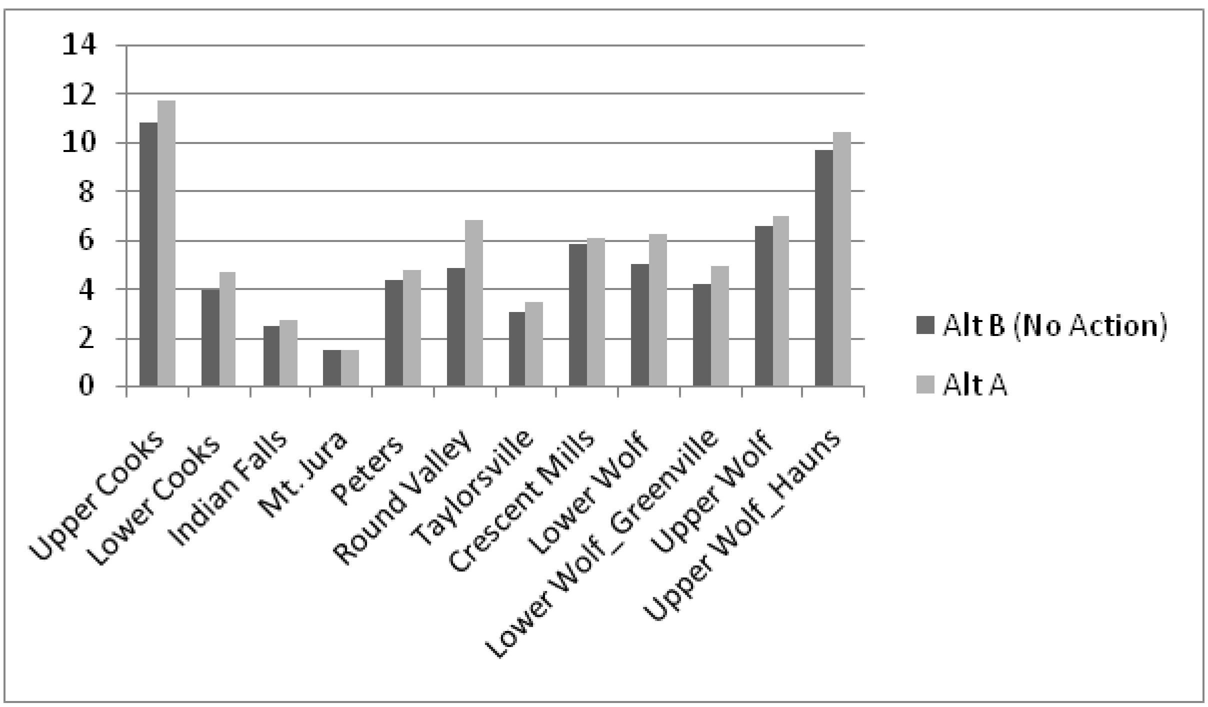


Figure 17. ERA of Alternative A Compared to the No Action Alternative

Alternative B—Cumulative Watershed Effects, ERA Analysis

Consequences of the no action alternative are thoroughly covered in the “Direct, Indirect, and Cumulative Effects of DFPZ and WUI Fuels Reduction Treatments (alternative B)” section above.

Alternative C—Cumulative Watershed Effects, ERA Analysis

Direct, indirect, and cumulative effects of activities proposed in alternative C are discussed above in the section subtitled, “Effects Common to Alternatives A, C, D, and E”. Alternative C, the non commercial funding alternative, is required in all projects with purpose and needs that include fuels reduction and excludes any activities other than fuels reduction to meet the project purpose and needs. Alternative C proposes 5,431 acres of DFPZ construction and 522 acres of AT outside of DFPZs, while retaining all live trees greater than or equal to 12 inches in both DFPZs and AT units.

ERA values for this alternative (Figure 18) are only slightly less than the Proposed action (alternative A) primarily due to the lack of the group selection (GS) prescription. The project-induced increase in ERA values were predicted to range from .01 to 15.6 percent of the TOC depending on the subwatershed. Riparian area ERA value increases induced by alternative C would range from 0 to 1.5 percent of the land area, also depending on the subwatershed (refer to “Alternative A—Cumulative Watershed Effects, ERA Analysis” for an explanation of the greater risk of cumulative effects).

Subwatershed cumulative ERA values would range from 12.8 to 96.8 percent of the TOC. The Upper Cooks Creek subwatershed is the only one that approaches TOC, and is discussed in the “Alternative A—Cumulative Watershed Effects, ERA Analysis” section above. Alternative C also neglects to treat noxious weeds with herbicides, which could allow for the spread of noxious weeds over time. In particular, the spread of Canada thistle in riparian areas could decrease the diversity and productivity of native and desired nonnative riparian plant communities.

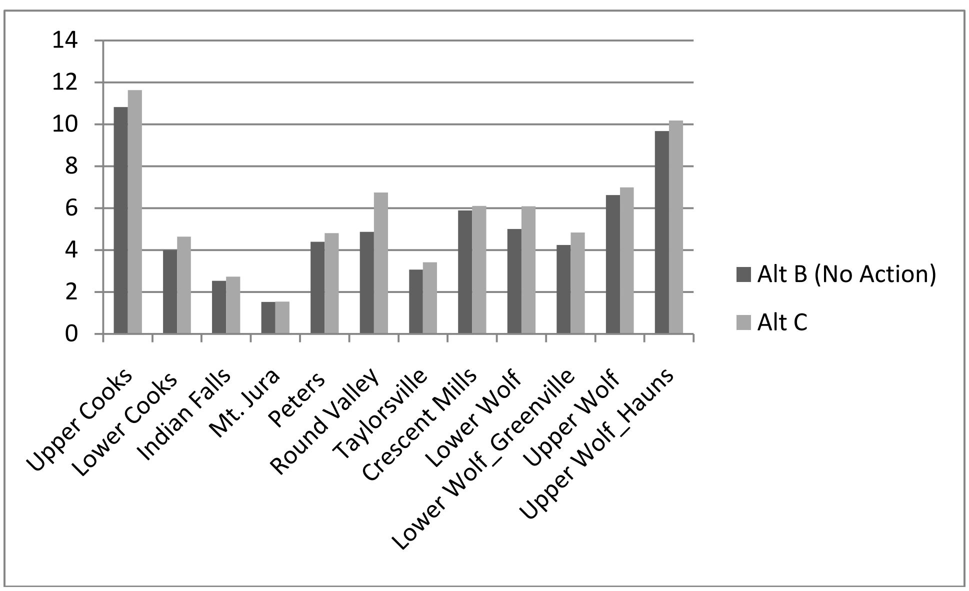


Figure 18. ERA of Alternative C Compared to the No Action Alternative

Alternative D—Cumulative Watershed Effects, ERA Analysis

Alternative D (2001 SNFPA Framework alternative) was requested for analysis during the scoping process. This alternative would construct 4,976 acres of DFPZ; implement 467 acres of AT outside of DFPZ units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory. This alternative would also treat 107 acres of noxious weed infestations using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. With respect to cumulative watershed effects, alternative D is most similar to alternative C—neither proposes group selection (GS) units and ERA values (Figure 19) consequently are similar and are discussed in the previous alternative. Riparian area ERA value increases induced by alternative D would range from 0 to 1.48 percent of the land area, depending on the subwatershed. These increases are slightly lower than RHCA ERA values for the other action alternatives due to fewer proposed acres of RHCA treatment (refer to "Alternative A—Cumulative Watershed Effects, ERA Analysis" for an explanation of the greater risk of cumulative effects).

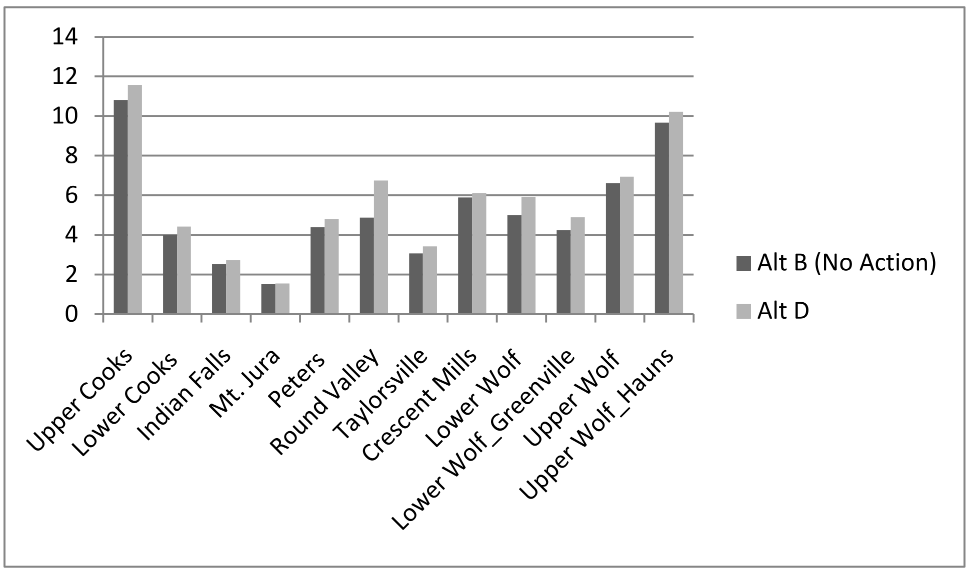


Figure 19. ERA of Alternative D Compared to the No Action Alternative

Alternative E—Cumulative Watershed Effects, ERA Analysis

Alternative E (2004 SNFPA ROD consistent alternative) was also requested for analysis during scoping and analyzes the maximum treatment allowed under the Herger-Feinstein Quincy Library Group Act. It would construct 5,112 acres of DFPZs; implement 513 acres of AT outside of DFPZ units; implement 328 acres of GS within DFPZ and AT units; and hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat and 76 acres of Constance's rock cress habitat. Alternative E would treat 90 acres of noxious weed infestations using a combination of hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. No herbicide use is proposed under alternative E. Cumulative watershed effects are expected to mirror those of alternative A, with a higher ERA value (Figure 20) in the Round Valley Reservoir subwatershed due to a larger amount of group selection (GS) acres proposed in alternative E. A discussion of activities affecting Round Valley Reservoir can be found in the “Alternative A—Cumulative Watershed Effects, ERA” analysis above. Riparian area ERA value increases induced by alternative E would range from 0 to 1.5 percent of the land area, also depending on the subwatershed (refer to “Alternative A—Cumulative Watershed Effects, ERA Analysis” for an explanation of the greater risk of cumulative effects).

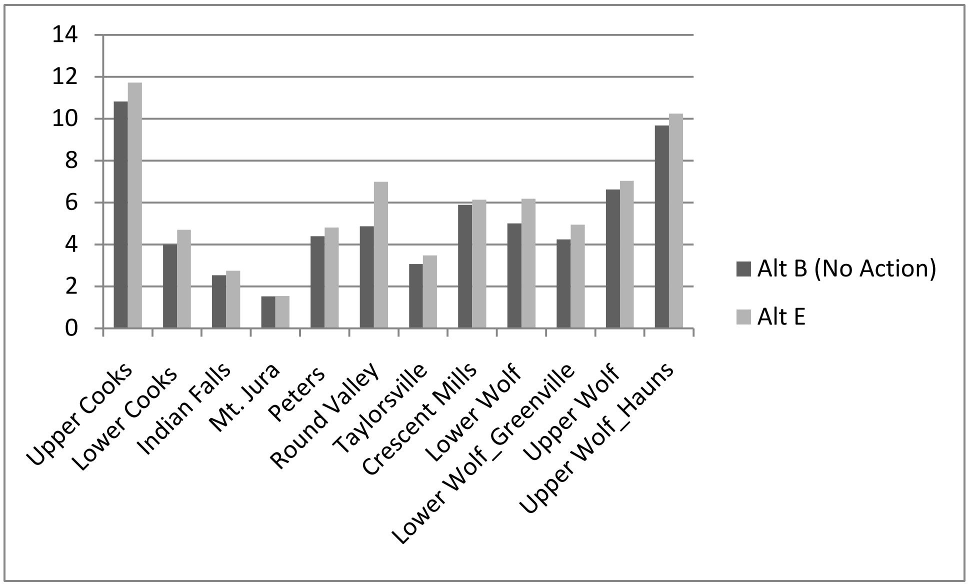


Figure 20. ERA of Alternative E Compared to the No Action Alternative

Botanical Resources

Introduction

The purpose of this section is to present a summary of the effects of the proposed project on botanically sensitive resources within the Botany analysis area. Throughout this section, the term “rare species” is used to refer to federally Endangered, Threatened, and Candidate plant species and Forest Service Region 5 Sensitive species. A complete discussion of effects to these species, as well as to Plumas National Forest special interest species, is provided in the “Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species” (USDA 2011f), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

Federal Laws

Endangered Species Act (16 USC 1531 et seq.): Under this act, federal agencies must ensure that any action authorized, funded, or carried out by the agency is not likely to (a) jeopardize the continued existence of any listed species or (b) result in the destruction or adverse modification of a listed species’ designated critical habitat. Section 7 of the act requires federal agencies to consult the U.S. Fish and

Wildlife Service concerning listed (i.e. threatened or endangered) plant species that fall under their jurisdiction.

Forest Service Manual (FSM) Direction

FSM Section 2670 (USDA 2005a): provides policy for the protection of sensitive species and calls for the development and implementation of management practices to ensure that species do not become threatened or endangered because of Forest Service actions. It requires a review of all activities or programs that are planned, funded, executed, or permitted for possible effects on federally listed or U.S. Forest Service sensitive species (FSM 2672.4, USDA 2005a).

Forest Plan

Plumas NF Land Management Plan (USDA 1988, 1999b, 2004b): provides management direction for all Plumas NF Sensitive plants; that direction is to "maintain viable populations of sensitive plant species" (USDA 1988). The 1988 Forest Plan also provides forest-wide standards and guidelines to:

- protect Sensitive and Special Interest plant species as needed to maintain viability;
- inventory and monitor Sensitive plant populations on an individual project basis; and
- develop species management guidelines to identify population goals and compatible management activities / prescriptions that will maintain viability.

Management direction for sensitive plant species on the Plumas NF is also provided in the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (USDA 1999a) and the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental Environmental Impact Statement (USDA 2004a). The standards and guidelines provided in the SNFPA include conducting field surveys, minimizing or eliminating direct and indirect impacts from management activities, and adhering to the Regional Native Plant Policy (USDA 2004a).

Interim Management Prescriptions

Individual species conservation strategies, or species management guidelines, for the Plumas NF have not been completed for most of the Forest's Sensitive species. Until these conservation strategies have been completed, the Plumas NF has developed Interim Management Prescriptions (USDA 2007c) that will be followed to ensure compliance with the Plumas LRMP.

Effects Analysis Methodology

Geographic Area Evaluated

The area analyzed in this document is referred to as the "Botany analysis area"; it encompasses approximately 64,000 acres and consists of all proposed treatment units and the area within one mile of treatment unit boundaries. This area was chosen to capture all rare plants that occur (a) within the proposed treatment units or (b) have suitable habitat within the Keddie Ridge Project area as well as a source population (i.e. potential for seed dispersal) located within close proximity to the proposed activities.

Species Analyzed

Those species present within the Botany analysis area were considered to have the highest potential to be impacted by the proposed project activities. Conversely, species outside of the analysis area were not considered to have a high likelihood of being impacted by the proposed project either directly, indirectly, or cumulatively. Table 71 lists all of the rare species that have been documented within the Botany analysis area. A detailed analysis of effects to these species is provided in the Biological Evaluation (USDA 2011f), which is included in the Keddie Ridge Project record. This document presents the analysis for only those rare species that occur within the proposed treatment units (Table 71).

Table 71. Rare Species Known within Proposed Treatment Units and the Keddie Ridge Botany Analysis Area

Species	Common Name	Listing Status	Known within the Analysis Area	Known within the Treatment Units
Arabis constancei	Constance's rock cress	Sensitive	X	X
Astragalus webberi	Webber's milkvetch	Sensitive	X	
Cypripedium fasciculatum	clustered lady's-slipper	Sensitive	X	X
Cypripedium montanum	mountain lady's-slipper	Sensitive	X	
Lupinus dalesiae	Quincy lupine	Sensitive	X	X
Oreostemma elatum	Plumas alpine-aster	Sensitive	X	X
Penstemon personatus	closed-throated beardtongue	Sensitive	X	

Specific Methodology

The analysis of effects on rare plant species was a three-step process (FSM 2672.43; USDA 2005a). In the first step, all listed or proposed rare species that were known or were believed to have potential to occur in the analysis area were identified. This list was developed by reviewing the U.S. Fish and Wildlife List for the Plumas NF (U.S. Fish and Wildlife 2010), USDA Forest Service Region 5 Sensitive Species List (USDA 2006a), Plumas NF rare plant records and vegetation maps, and California Natural Diversity Database records (CNDDB 2010).

The second step was field reconnaissance surveys. To date, field surveys have been conducted on approximately 16,500 acres within the Botany analysis area; this includes all of the proposed vegetation and noxious weed treatment units. For those areas outside of the surveyed areas, but within the Botany analysis area, species occurrence information was compiled using the California Natural Diversity Database (2010), Plumas NF rare plant records, and past survey reports.

Field surveys were designed around the flowering period and ecology of the rare plant species identified in step one. For each rare plant site found, information was collected that described the size of the occurrence and habitat characteristics and identified any existing or potential threats. Location information was collected using a Global Positioning System (GPS).

All of this information was used in step three of the analysis—effects analysis. Data were imported into a Global Information System (GIS) and used to analyze proximity to the proposed treatments and identify direct and indirect effects.

Data Sources

Basic information describing the life history, ecology, pollination biology, and specific habitat requirements is lacking for most of the Sensitive species that occur within the Botany analysis area. The scientific literature and internal government documents (i.e. species-specific Conservation Assessments) were utilized for the analysis whenever available; however more frequently the analysis of effects was based on observations by qualified individuals, field experience, unpublished monitoring results, and studies of comparable species.

Botany Indicator Measures

The indicator measures used in the effects analysis for rare plant species included the number of occurrences and the amount of suitable habitat impacted; these measures were similar across all of the action alternatives.

Types and Duration of Impacts

Direct Effects

Direct effects occur when plants are physically impacted. Examples of proposed treatment activities that have the potential to directly affect rare plants include timber falling; crushing by vehicles or equipment; application of borax or herbicides; temporary road and landing construction; and prescribed fire treatments. These actions can result in death, altered growth, or reduced seed set through physically breaking, crushing, burning, scorching, or uprooting plants.

Indirect Effects

Indirect effects are separated from an action in either time or space. These effects, which can be beneficial or detrimental to rare species, may include changes in vegetation composition, successional patterns, fire regimes, or the distribution and abundance of noxious weeds. Adverse indirect effects are more likely to occur to those species that are intolerant of disturbance and tend to occupy interior forest habitats with high canopy cover. In contrast, for those species that tolerate or are dependent upon some level of disturbance and inhabit gaps and forest openings, treatments may have beneficial indirect effects. For all rare species, negative effects may occur if prescribed burns are too hot; this has the potential to kill the seedbank and sterilize the soil. Burning hand or machine piles can also alter soil biotic and chemical properties for a number of years (Korb et al. 2004), which in turn greatly influences the degree and type of plant colonization into the fire-scarred site. Other indirect effects that are associated with herbicide treatments may include impacts to pollinators or mycorrhizae (fungi) that are associated with rare species.

Cumulative Effects

A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of land ownership on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 section 15.1).

One crucial step in assessing cumulative impacts on a particular resource is to compare the current condition of the resource (i.e. rare plants) and the projected changes as a result of management activities (i.e. timber harvest) to the natural variability in the resources and processes of concern (MacDonald 2000). This assessment is particularly difficult for rare plant species because long-term data are often lacking. In addition, the habitats in which many rare plant species are presently found have a long history of disturbance, making an undisturbed reference difficult to find. For some rare plants, particularly those that do not tolerate disturbance or are found under dense canopy conditions, minimizing on-site change is an effective way of reducing the potential for larger-scale cumulative impact (MacDonald 2000). If the greatest impact on a rare species is both local and immediate, then this is the scale at which the effect is easiest to detect (MacDonald 2000).

Undeniably, past, present, and future activities have and will continue to alter rare plant populations and their habitats to various degrees; however, the approach taken in this analysis is that, if direct and indirect adverse effects on rare plant species in the Keddie Ridge Project are minimal or would not occur, then they would not contribute substantially to cumulative effects on the species. In addition, the effects of future projects would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place

Duration of Effects

It is difficult to state with certainty when the effects of the proposed treatments would no longer be altering the life history dynamics (i.e. germination, seed production, etc.) of the rare species considered in this analysis. One method to estimate duration of effects is to assume that the effects of the action alternatives last as long as they are, singly or in combination with other anticipated effects, distinguishable from the effects of the no action alternative. Using this as an assumption, the duration used to estimate effects in this analysis is the recovery time of the vegetation to near baseline (current) conditions, which is approximately 100 years for group selection treatments and 50 years for fuel treatments.

The additive effects of past actions (such as wildfires, wildfire suppression, timber harvest, mining, nonnative plant introductions, and ranching) have shaped the present landscape and corresponding populations of rare plants; however, data describing the past distribution and abundance of rare plant species is extremely limited, making it impossible to quantify the effects of historic activities on the resources and conditions that are present today. Undoubtedly, some plant species have always been rare due to particular ecological requirements or geographic isolation. It is also likely that past actions have caused some species to become rarer and encouraged others to become more common. Within the Botany analysis area, documentation of rare plant surveys began in the early 1980s; therefore, the baseline used for the effects analysis of past activities is 30 years.

Affected Environment

Rare Plant Species

Constance’s rock cress (*Arabis constancei)*

Constance's rock-cress is a strict serpentine endemic (Safford et al. 2005) that is considered to be seriously threatened in California (List 1B.1; CNPS 2010). It is known from 55 occurrences, which are scattered throughout several parallel bands of serpentine in Plumas and Lassen Counties. All but one of these occurrences are located on the Plumas NF; the occurrence outside of the Plumas NF is in the southernmost part of the Lassen NF (CNDDB 2010).

Occurrences are found primarily in undisturbed sites that are situated between 3,200 and 6,600 feet in elevation. They range in size from a few individuals on small serpentine outcrops to hundreds of individuals within larger areas of more productive serpentine soils. Occurrences that have not been impacted by management activities appear relatively stable over time; however analyses of monitoring data collected over a 20 year time period suggest that the number of plants can fluctuate from year to year, possibly in response to variation in precipitation or other climatic variables (USDA 2007b, 2008b).

Six occurrences of Constance’s rock cress, covering approximately 162 acres, have been documented within the Botany analysis area. Two occurrences, covering approximately 72 acres, are within treatment units 64 and 71 (Table 72). Hand thinning treatments, which have been designed to enhance Constance’s rock cress habitat, are proposed within these two occurrences. Constance’s rock cress does not occur within any of the proposed noxious weed treatment units.

Table 72. Comparison of Constance's Rock-Cress Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Arabis constancei	G3[1]	55	54	6	2

[1] G3 = vulnerable to extirpation or extinction; 21 to 80 occurrences, OR 3,000 to 10,000 individuals, OR 10,000 to 50,000 acres (NatureServe 2009)

Clustered lady’s-slipper (*Cypripedium fasciculatum)*

This orchid has a wide distribution that extends from British Columbia, south to the Sierra Nevada and Coast Ranges of California, and east to the Rocky Mountains. While the distribution of this species is broad, occurrences are often small and widely scattered. In California, the highest distribution of clustered lady’s-slipper is on the Klamath and Plumas National Forests. There are 148 occurrences on the Plumas NF; these range in size from one to over 3,000 stems. A total of 200 occurrences have also been recorded on the Six Rivers, Shasta-Trinity, Klamath, Mendocino, and Tahoe National Forests (Kaye and Cramer 2005).

In California, clustered lady’s-slipper is most commonly associated with mixed conifer forests in the mid-to-late stages of successional development. On the Plumas NF, plants most frequently occur in microsites with moist soils, steep slopes, sufficient dogwood (*Cornus nuttallii*) cover, and a relatively open overstory canopy (Brown 2008). Clustered lady’s-slipper orchids lack physiological adaptations to regulate and tolerate drought and heat stress; therefore they depend on species, such as dogwoods, to limit the amount of direct solar radiation that reaches the forest floor (Brown 2008). Mycorrhizal fungi play a pivotal role in the biology of orchids and several stages in the orchid's life-cycle, particularly the early stages of seedling development, depend on mycorrhizal fungal symbioses.

Clustered lady's-slipper appears intolerant of disturbances that directly reduce the duff layer and expose or damage the plant's rhizomes (underground stems) or mycorrhizal symbionts. It is usually found in areas that have not been disturbed, or in areas where the disturbance was light or in the distant past. Clustered lady's-slipper orchids appear to tolerate, and in some cases even benefit from, low severity fires. In contrast, high severity fires that eliminate the duff layer or destroy the overstory canopy have been shown to severely impact or kill individuals (Vance 2005).

The overall trend for this species is thought to be declining. In a recent population viability analysis of Oregon occurrences, Thorpe et al. (2010) determined that 59 percent of clustered lady's slipper populations had declined in size and 31 percent fell to zero. They also determined that smaller populations (less than 10 individuals) had a higher rate of extinction compared to larger populations. The primary threat to this species is disturbance that severely alters the light and soil moisture regime at the microsite level. Examples of other threats include: timber harvest activities that remove most of the overstory canopy; soil compaction from equipment and vehicles; high intensity, stand-replacing wildfires; and illegal collection (Vance 2005). Clustered lady's-slipper orchids can also be negatively impacted by dense, homogenous stand conditions where fire has been excluded for over a century (Brown 2008).

Seven occurrences of clustered lady's-slipper, covering approximately 7.6 acres, fall within the Botany analysis area. Of these, five occurrences (covering less than 0.5 acre total) are within treatment units (Table 73). These sites are proposed for habitat enhancement treatments, which include hand thinning of small diameter trees (i.e. those less than 8 inches DBH) in close proximity to orchids and underburning. No occurrences are within any of the proposed noxious weed treatment units.

Table 73. Comparison of Clustered Lady's-Slipper Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Cypripedium fasciculatum	G4[1]	348	148	7	5

[1] G4 = apparently secure; factors exist to cause concern, such as limited habitat or population threat (NatureServe 2009)

Quincy lupine (*Lupinus dalesiae)*

This perennial lupine species is known to occur in Plumas County and in isolated occurrences in Sierra and Yuba counties in California. Within this limited range, Quincy lupine is locally abundant. There are currently 255 occurrences documented on the Plumas NF. Outside of the Plumas NF, there are 22 occurrences, all of which occur on lands adjacent to the National Forest.

Quincy lupine is found in a variety of habitats that include undisturbed and disturbed sites (such as old skid trails and road cut banks), openings in chaparral, cismontane woodlands, and mixed conifer forests. Recent visits to old project areas have shown that this species tolerates and even thrives on disturbance;

however the intensity, extent, or frequency of the disturbance associated with these occurrences has not been quantified in a manner that facilitates the development of prescriptions that consistently mimic historical disturbance regimes.

The trend for this plant is stable. Threats include road construction and maintenance; timber harvest, release, and site preparation activities; mining; off-highway vehicle use; and development on private lands. The California Native Plant Society recently lowered the listing status of Quincy lupine (from List 1B to List 4) based on the number of mapped occurrences in the California Fish and Game's California Natural Diversity Database (CNDDB).

Three occurrences of Quincy lupine, covering approximately 45 acres, have been documented within the Keddie Ridge botany analysis area; one occurrence, comprised of six sub-occurrences and covering less than a tenth of an acre, is within proposed treatment units 78 (a and b) and 89 (Table 74). No occurrences are within any of the proposed noxious weed treatment units.

Table 74. Comparison of Quincy Lupine Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Lupinus dalesiae	G3[1]	277	255	3	1

[1] G3 = vulnerable to extirpation or extinction; 21 to 80 occurrences, OR 3,000 to 10,000 individuals, OR 10,000 to 50,000 acres

Plumas alpine-aster (*Oreostemma elatum*)

Plumas alpine-aster occupies wet meadows, fens, and seeps within the upper montane coniferous forests of Plumas, Lassen, and Sierra counties. This perennial plant is known from 17 occurrences in California, 14 of which are located on the Plumas NF (CNDDB 2010). The California Native Plant Society lists Plumas alpine-aster as a 1B.2 species, which indicates that it is fairly endangered in California (CNPS 2010).

Plumas alpine-aster is found between 3,300 and 6,900 feet in elevation. Occurrences, which range in size from 25 square feet to over four acres, are typically found in undisturbed sites that have open overstory canopies and high soil moisture. Threats from management activities include mining, road building, livestock grazing, and recreation activities.

Six occurrences of Plumas alpine-aster, covering approximately 9.4 acres, have been documented within the Keddie Ridge botany analysis area; a small portion (0.05 acre) of two occurrences, fall within proposed treatment units 6 and 11 (Table 75). No occurrences are within any of the proposed noxious weed treatment units.

Table 75. A Comparison of Plumas Alpine-Aster Abundance at the Global, State, Forest, and Project Scale

Species	Global Ranking	Number of Occurrences			
		California	Plumas NF	Keddie Analysis Area	Treatment Units
Oreostemma elatum	G2 [1]	17	14	6	2

[1] G2 = imperiled; 6-20 viable occurrences, OR 1,000 to 3,000 individuals, OR 2,000 to 10,000 acres (NatureServe 2009).

Environmental Consequences

General Effects on Rare Plant Species

The following provides a discussion of the direct, indirect, and cumulative effects that are applicable to all rare plant species considered in this analysis. A general discussion of cumulative effects (for all action alternatives) on rare plant species is also provided. Species-specific effects are discussed in the section titled "Environmental Consequences: Effects on Specific Rare Plant Species". The effects of the vegetation, fuels, and noxious weed treatments on rare species were similar across all action alternatives; therefore, this discussion is organized to *highlight differences* between the no action alternative and action alternatives A, C, D, and E.

Alternative B (No Action)

Direct Effects

No direct effects are anticipated because no project-related activities would be implemented.

Indirect Effects

Stands would continue to grow and become more dense, resulting in increased shading, duff, fuels accumulation, and canopy closure. These conditions could negatively impact the rare plant species that have been documented within the Botany analysis area by reducing the quality of existing habitat as well as the amount of suitable, but unoccupied habitat. These stand conditions and the continued exclusion of fire would also increase the risk of catastrophic wildfire, which could have detrimental effects on all of the rare species within the Botany analysis area.

Under this alternative, the existing noxious weed infestations would continue to expand along roadsides, in forest openings, along riparian corridors, into meadows, and within other areas of suitable habitat. Noxious weed species pose a serious threat to ecosystem function because of their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed establishment and spread in the Botany analysis area has the potential to negatively affect suitable habitat, not only for rare species, but also for all native plant species.

Alternatives A, C, D, and E (Action Alternatives)

Direct Effects of Vegetation and Fuel Treatments

Direct effects would be avoided or reduced for rare plant species to a level compatible with each species' ecology by incorporating the protection measures for individual species found in Appendix H – Standard Management Requirements and Monitoring.

Direct Effects of Herbicide Treatments

The direct effect of herbicides on rare species is considered negligible due to a combination of factors. First, all of the rare plant occurrences are greater than 0.9 miles from any of the proposed herbicide or fungicide (i.e. borax) treatment locations (Table 76). Second, with the exception of Plumas alpine-aster, the rare plants discussed in this analysis are found in upland habitat types. The herbicide proposed for treatment in these areas is aminopyralid, which is a relatively selective herbicide that affects broadleaf species, particularly those in the sunflower family. Third, the methods proposed for application (wick and backpack) would greatly reduce the possibility of any direct effects on rare and non-target native species. These factors all drastically reduce the risk of direct effects from the proposed herbicide applications.

Table 76. Estimated Distances between Region 5 Forest Service Sensitive Plant Species and Proposed Herbicide Treatments

Sensitive Species	Distance (miles) to nearest:	
	proposed herbicide treatment	proposed Borax treatment
Arabis constancei **(Constance's rock cress)**	4.2	4.2
Cypripedium fasciculatum **(clustered lady's-slipper)**	3.1	4.4
Lupinus dalesiae **(Quincy lupine)**	4.1	4.1
Oreostemma elatum **(Plumas alpine-aster)**	0.9	5.7

The ecological effects of aminopyralid, glyphosate, and borax are discussed in detail in the SERA Risk Assessments (2003a, 2006, 2007) and the HFQLG Final Supplemental EIS (USDA 2003); this analysis tiers to these documents. In general, information regarding the direct effects of the fungicide, the two proposed herbicides, surfactant, and marker dye on rare plant species is almost nonexistent (USDA 2003a).

Both of the proposed herbicides are highly effective at killing target species. Aminopyralid is a selective herbicide that affects target (and some non-target) species by disrupting the plant's metabolism and growth. In contrast, glyphosate is a nonselective herbicide that has the potential to affect both target and non-target plant species by inhibiting or halting growth and disrupting cellular processes (SERA 2003). Although the primary component in borax (i.e. boron) is an essential trace element for terrestrial plants, excessive quantities can lead to adverse effects in plants including chlorosis of leaves, leaf necrosis, and decreased germination (SERA 2003).

The proposed surfactant (i.e. Competitor® or an equivalent formulation) is a modified vegetable oil, which is very unlikely to produce secondary breakdown products that would act as toxins to rare plant species. In addition, the proposed marker dye (i.e. Hi-light® Blue or an equivalent formulation) is a water-soluble dye that contains no listed hazardous substances (SERA 1997) and is unlikely to cause adverse effects on rare plant species.

For the remainder of this analysis, the discussion of effects resulting from herbicide application takes into consideration the effects of the herbicide's active and inert ingredients (the latter of which is water), metabolites, surfactant, and marker dye.

Indirect Effects of Vegetation and Fuel Treatments

The proposed treatments would have a minor but beneficial indirect effect on rare plant species in the Botany analysis area. Implementation of the action alternatives would result in reduced forest canopy and stand density, increased light to the forest floor, and reduced risk of high-intensity wildfire. These conditions would result in larger areas of suitable habitat for rare plant species across the Keddie Ridge Project area.

Noxious weed species are oftentimes classified as "pioneer" species or invaders. Disturbance, whether it is natural (i.e. a lightning-caused fire) or associated with project activities, often creates ideal conditions for weed introduction and establishment. Although rare plant species would be buffered from the direct effects of project activities, there is still the risk of an indirect effect from weed invasion from adjacent areas that have been disturbed. Under Alternatives A and C this risk is greatly reduced through implementation of the proposed noxious weed treatments.

Indirect Effects of Herbicide Treatments

The indirect effects of herbicides on rare plant species can include accidental spills, spray drift, surface runoff, or a combination of these factors. In general, the primary hazard to non-target terrestrial plant species is herbicide drift, which can be minimized by implementing the following design features: (1) avoidance through buffers, (2) spraying when the wind is absent or blowing away from the plants, and/or (3) using an application method other than spraying (USDA 2003a).

Applications of glyphosate in 0 to 5 mile per hour (mph) winds using a backpack sprayer have demonstrated that droplets can drift as far as 23 feet; applications made in a 15 mph wind have the potential to drift up to 68 feet (SERA 2003). Based on these calculations, the geographic distance between rare species and the proposed herbicide treatments (Table 76) is sufficient to significantly reduce the risk of indirect effects due to drift.

Another potential indirect effect on rare plant species would be if an herbicide treatment were to negatively impact pollinator species. To quantify the potential impact on pollinator species, a scenario was analyzed to examine the effect of directly spraying a honey bee (assuming 100 percent absorption and over 50 percent of the body surface) with both of the proposed herbicides (SERA 2003, 2007). The level of risk was determined using the "Hazard Quotient." A Hazard Quotient less than "1" is considered to be a low risk. The results of this analysis, which are presented in Table 77, indicate that there would be a low risk to honey bees using the chemicals, rates, and volumes proposed under alternatives A and D.

Table 77. Analysis of a Scenario Involving 100 Percent Absorption of Aminopyralid and Glyphosate by a Honey Bee [Data from SERA Risk Assessments (2003, 2007)]

Herbicide Scenario (100% absorption)	Hazard Quotient
Aminopyralid	0.02
Glyphosate	0.6

There has also been some concern regarding the toxicity of surfactants on terrestrial insects. This is primarily due to the effective spreading ability of these surfactants, which may amount to the physical effect of drowning (rather than any toxicological effects). Studies have indicated that the effect on terrestrial insects is highly dependent upon the dose (Bakke 2007). Surfactants are usually applied at very low rates and, because they are very effective, are usually not applied at high spray volumes (Bakke 2007); therefore, it is unlikely that insects would be exposed to the rates and doses of concern presented in the literature.

Under alternatives A and D, there would be a low risk that the proposed herbicides or surfactant would cause widespread effects on terrestrial insects due to (1) the need for a relatively high dose for a lethal effect, and (2) the fact that individual insects, rather than entire colonies or nests, would most likely be impacted (Bakke 2007).

Indirect Effects of Borax Treatments

The SERA risk assessment for borax indicates that there is a negligible risk of borax exposure to non-target plant species, even when applied at the maximum application rate used by the Forest Service (SERA 2006). In all of the exposure scenarios for terrestrial plants, including pesticide-sensitive species, the level of risk was found to be low (that is, a Hazard Quotient of less than one).

All Action Alternatives: Cumulative Effects on Rare Plant Species

The effects of past activities on rare plant species in the Botany analysis area are largely unknown. On the Plumas NF, rare plant surveys did not begin until the early 1980s. In many cases, even when project-level surveys were conducted, there is very little documentation that describes whether past projects avoided or protected rare plant species during project implementation. In addition to these unknowns, changes have been made to the Plumas NF Sensitive species list. Therefore, in order to incorporate the contribution of past activities into the cumulative effects of the proposed Keddie Ridge Project, this analysis uses the current abundance and distribution of rare plant species as a proxy for the impacts of past actions.

Over the past 30 years, the landscape in the Botany analysis area has experienced high levels of past activity and, consequently, high levels of past disturbance. For those species that occupy open habitats and are tolerant of some level of disturbance, it is possible that past activities in the Botany analysis area have had a beneficial effect by creating openings and areas of suitable habitat across the landscape. However, these activities have also created a highly disturbed landscape, which has increased the susceptibility to noxious weed introduction and spread and increased the overall risk to native plant communities and rare species. The data presented in Figure 21was used as a contextual framework for the analysis of cumulative effects; it presents the proportion of occurrences (both in California and on the

Plumas NF) that have the potential to be affected by the proposed treatments. Overall, less than 25 percent of the known rare plant occurrences fall within the Botany analysis area and less than 15 percent fall within proposed treatment units. Under all of the action alternatives, negative cumulative effects are minimized through implementation of species-specific design criteria.

If existing management guidelines (such as field surveys, protection of known rare plant locations, and implementation of noxious weed standard management requirements) remain in place, the effects of future projects are likely to be minimal or similar to those described in this analysis. Ongoing activities, such as woodcutting, hunting, and dispersed recreation activities, are not likely to make a significant impact on rare plant species; however, these activities may act as vectors for weed spread.

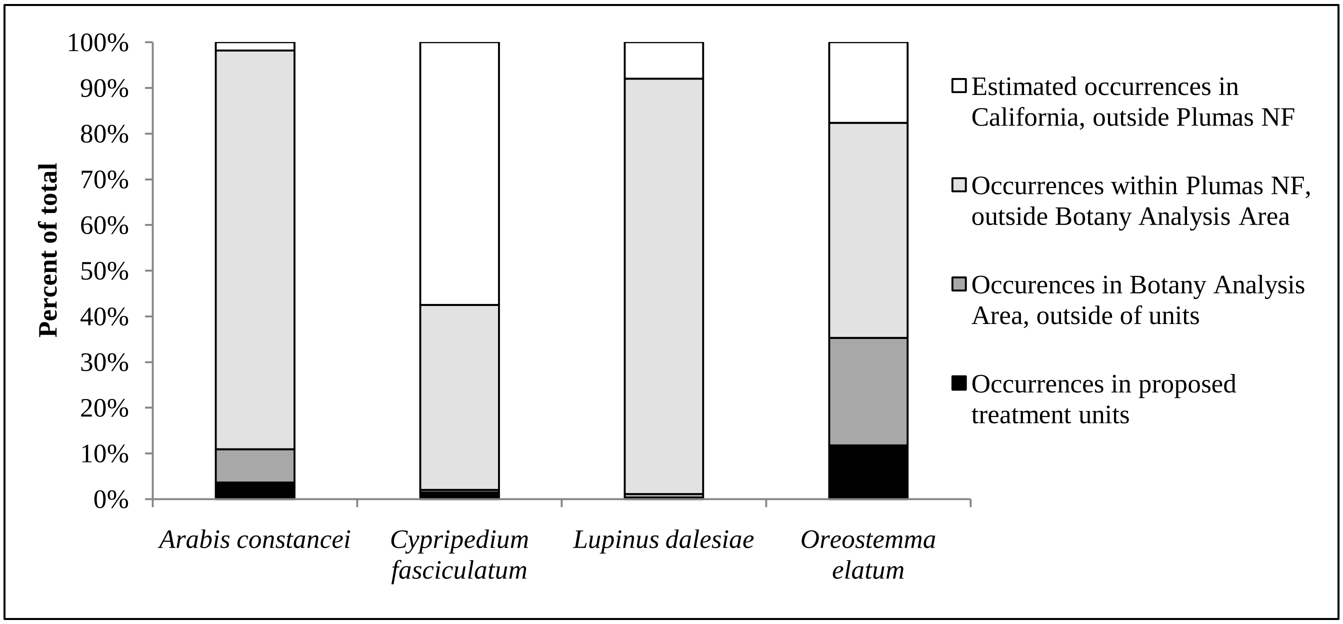


Figure 21. The Percentage of Total Known Occurrences (in California) Potentially Impacted by the Proposed Keddie Ridge Treatments

Effects on Specific Rare Plant Species

The following section provides a discussion of the direct, indirect, and cumulative effects specific to the four Sensitive species that are within the proposed treatment units. These effects are in addition to those discussed in the sections above. The effects of the vegetation, fuels, and noxious weed treatments on rare species were similar across all action alternatives; therefore, this discussion is organized to *highlight differences* between the no action alternative and the action alternatives A, C, D, and E.

Constance's Rock Cress (*Arabis constancei)*

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Under the no action alternative, small trees would not be hand thinned within the two Constance's rock cress occurrences. This could have two possible indirect effects on the species: (a) it may reduce the amount of suitable habitat within occurrences and (b) it could increase the risk and severity of wildfire.

The exclusion of fire for over a century within the rock cress occurrences has resulted in scattered areas with high concentrations of small conifer trees. Conifers on serpentine have been shown to modify the physical characteristics of their immediate surroundings by increasing the soil depth, organic matter, calcium to magnesium ratio, and lowering the pH (Chiarucci and DeDominicis 1995, Barton and Wallenstein 1997). These types of changes can result in the exclusion of rare serpentine species such as Constance's rock cress, which is most commonly found in open, sparsely vegetated areas with shallow serpentine soils. Under this alternative, areas with high concentrations of small trees, which have greater canopy cover, increased duff depth, and potentially altered soil characteristics, will continue to be marginal habitat for this rare species.

Although many serpentine species rely on fire to maintain the vegetative characteristics of their habitat, very few of the serpentine endemic plants in California are believed to be fire-dependent (Safford and Harrison 2004). In fact, many rare serpentine species are thought to be restricted to these harsh soils as a result of their intolerance to frequent or high intensity fires (Safford and Harrison 2008). Constance's rock cress appears to be no exception; monitoring data suggest that this species is tolerant of low intensity fire, but is intolerant of high intensity fire (USDA 2008c). Under the no action alternative, the risk of negative impacts from high-severity wildfire would not be reduced.

Cumulative Effects

Over the past 100 years, Constance's rock cress has undoubtedly lost individuals and areas of suitable habitat as a result of ground disturbing activities such as gold and gravel mining, timber harvest, road construction, and recreational off-highway vehicle use. Constance's rock cress has been on the Plumas NF Sensitive species list since at least 1979; therefore it is expected that projects implemented over the past 30 years would have avoided or mitigated negative effects to known occurrences. A review of past projects (appendix F) indicates that this has generally been the case. Five of the six occurrences in the Botany analysis area fall within the boundary of a past timber sale and all were avoided during project implementation. One exception to this was a mining operation expansion that occurred in the early 1980's. This project likely impacted both individuals and areas of suitable habitat within this occurrence, which occurs in the Botany analysis area but outside of the proposed Keddie Ridge Project units.

Although there may be some negative indirect effects from the no action alternative, the overall cumulative effects are expected to be minor. Even though existing occurrences would not be enhanced or protected from high-severity wildfire, the effects from the no action alternative would not be significant enough to reduce the overall viability of Constance's rock cress.

The effects of future projects on Constance's rock cress would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects are anticipated from mechanical thinning, group selection harvest, mastication, or noxious weed treatment because these activities will be prohibited within Constance's rock cress occurrences. The direct effects to Constance's rock cress from hand thinning are expected to be minimal because (a) very few individuals grow within the dense clusters of trees that are proposed for thinning and (b) all slash will be piled at a sufficient distance to protect individual plants and the seedbank from excessive heat. Some individual plants may be directly impacted from the prescribed fire treatments; however monitoring data collected before and after prescribed burning suggest that this species is tolerant of low to moderate intensity fire (USDA 2008c).

Indirect Effects

The proposed hand thinning and prescribed fire treatments could increase the amount of suitable habitat within Constance's rock cress occurrences by opening up the overstory canopy, reducing the duff layer, and thinning dense clusters of trees. Studies have shown that conifers can alter the physical characteristics of serpentine soils and make them less suitable for serpentine endemic plants (Chiarucci and DeDominicis 1995, Barton and Wallenstein 1997).

Although fires on serpentine tend to be smaller, less frequent, and less severe, periodic fire is believed to be an important factor for maintaining the vegetative characteristics of many serpentine habitats (i.e. Arabas 2000). Therefore, the reintroduction of prescribed fire will likely have a beneficial impact on Constance's rock cress habitat. Thinning the dense clusters of small trees prior to burning will reduce the fire intensity as well as the threat of future high-severity wildfires; both of these actions will reduce the potential for long-term negative impacts on Constance's rock cress.

The mechanical thinning proposed within Treatment Unit 71 will have a negligible indirect effect on Constance's rock cress habitat. The habitat within this unit is considered to be marginal for Constance's rock cress, due to historic rock deposition that has occurred over an older serpentine substrate. Due to the low quality of the serpentine substrate, thinning the surrounding stands will likely not create additional areas of suitable habitat for Constance's rock cress.

While serpentine habitats tend to be less invaded by non-native species than other habitat types, treatment activities still increase the risk of noxious weed introduction and spread within these occurrences (Harrison 1999). The control measures proposed under alternatives A and D will greatly reduce the risk of invasion into these habitats and the potential impact to Constance's rock cress. The indirect effect of herbicide treatments on Constance's rock cress occurrences would be negligible because the closest treatment site is over four miles away.

Cumulative Effects

This species has undoubtedly lost individuals and areas of suitable habitat over the past 100 years as a result of ground disturbing activities such as mining, timber harvest, road construction, and recreational off-highway vehicle use. Constance's rock cress has been on the Plumas National Forest Sensitive species list since at least 1979; therefore it is expected that projects implemented over the past 30 years would have avoided or mitigated negative effects to known occurrences. A review of past projects (appendix F) indicates that this has generally been the case. Five of the six occurrences in the Botany analysis area fall within the boundary of a past timber sale and all were avoided during project implementation. One exception to this was a mining operation expansion that occurred in the early 1980's. Individuals and areas of suitable habitat were likely impacted within this occurrence, which occurs in the Botany analysis area but outside of the proposed Keddie Ridge Project units.

The two occurrences within the proposed treatment units represent approximately four percent of all known occurrences in California (Figure 21). Less than one percent (0.3 percent) of estimated suitable habitat for Constance's rock cress has the potential to be impacted by the proposed project activities (i.e. falls within a treatment unit). It is expected that implementation of the action alternatives will not reduce the viability of Constance's rock cress due to (a) this relatively small proportion of occurrences and suitable habitat impacted; (b) the low intensity of the proposed treatments; and (c) the potential for positive indirect effects. Overall, the cumulative effects from the proposed activities are expected to be minor.

The effects of future projects on Constance's rock cress would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of determinations for Constance's rock cress

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

***Cypripedium fasciculatum* (clustered lady's-slipper)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Under this alternative, the five clustered lady's-slipper occurrences and their surrounding stands would not be treated. This could indirectly affect the species over the long-term by reducing the quality of occupied and unoccupied habitat and by increasing the risk of extirpation from high severity wildfires.

Fire has been excluded from most of the clustered lady's-slipper orchid sites within the Botany analysis area for over a century, which has resulted in densely forested stands with closed overstory canopies. Dense overstory canopy can negatively impact the abundance of understory species such as dogwood, which have been shown to have indirect impacts on the quality of orchid microsites (Brown 2008). In addition, dense clusters of small conifers can compete with clustered lady's-slippers for limited understory resources such as space, light, and water (Brown 2008). Under the no action alternative, stands would continue to become dense and could result in a decrease in habitat quality for clustered lady's slipper over the long-term.

The no action alternative would not implement treatments designed to reduce the risk of high-severity wildfires within clustered lady's-slipper orchid sites. An analysis of clustered lady's-slipper populations in northern California determined that over 75 percent of sites had an elevated risk of extirpation due to high intensity wildfire (Vance 2005). Research has also suggested that increased summer drought from climate change could increase both the frequency and severity of wildfires throughout the western United States (e.g. Whitlock et al. 2003, Marlon et al. 2009). These two factors (i.e. vulnerability to extinction from high-intensity fire and increased likelihood of wildfires) elevate the risk to clustered lady's slipper occurrences within the Keddie Ridge Project area. Severe wildfires could not only negatively impact individual plants, but could also reduce the availability of suitable habitat by removing the overstory canopy and adversely impacting soil conditions.

Cumulative Effects

Clustered lady's-slipper has likely lost individuals and a considerable amount of suitable habitat over the last 100 years due to human activities related to mining, logging, road building, fire suppression, and homesteading (Kaye and Cramer 2005). These activities, to one extent or another, have resulted in a reduction in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microclimate conditions.

Clustered lady's-slipper has been designated as a Plumas NF Sensitive or Special Interest species since the early 1980's. A review of past projects (appendix F) indicates that protection measures for this species were included when occurrences were known at the time of implementation. For example, of the four occurrences that fall within the boundary of a past timber harvest, only one was known (and consequently protected) at the time of project implementation; the remaining three occurrences, which were discovered only recently (after 2006), were not protected. This underscores the fact that many of the management activities that have occurred within the Botany analysis area have potentially impacted clustered lady's-slipper occurrences and areas of suitable habitat.

Overall, the cumulative effects from the no action alternative are expected to be negligible to minor, primarily because the direct and indirect effects are expected to be minor. Although existing occurrences would not be enhanced or protected from high-severity wildfire, the no action alternative would not significantly reduce the viability of clustered lady's-slipper.

The effects of future projects on clustered lady's-slipper would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects are anticipated from mechanical thinning, group selection harvest, mastication, or noxious weed treatment because these activities will be prohibited within clustered lady's-slipper orchid sites. The direct effects to clustered lady's-slipper from hand thinning are expected to be minor because individual plants will be avoided during implementation and hand piles will be placed at a sufficient distance from plants to ensure that radiant heat will not impact individuals or the surrounding duff layer. Some individual plants may be directly impacted from prescribed fire treatments; however surface fuels will be manipulated (i.e. pulled back) prior to treatment in order to reduce the fire intensity and consumption of the duff layer. Clustered lady's-slipper orchids appear to tolerate, and in some cases even benefit from, low severity fires; however their response has been shown to be highly dependent upon the characteristics of the site, as well as the intensity and duration of the burn.

Indirect Effects

The proposed hand thinning and prescribed fire treatments would increase the habitat quality within existing clustered lady's-slipper occurrences by: (a) increasing the amount of light that reaches understory species such as dogwood, which are thought to indirectly impact the quality of orchid microsites, and (b) removing small conifer trees (less than 8 inches DBH) that may compete with orchids for limited understory resources such as space, light, and water (Brown 2008). Under all of the action alternatives, hand thinning treatments within orchid sites are designed to maintain the essential components of the orchid's microsites; these include sufficient overstory canopy cover to reduce direct solar radiation to individual plants, decayed down logs and standing snags, an adequate duff layer, and undisturbed soils. Over the long-term, the proposed thinning treatments would also reduce the risk of negative impacts from high-severity wildfires, which could affect both individuals and areas of suitable habitat.

Five of the clustered lady's slipper occurrences are within units where mechanical thinning and group selection harvest is proposed. Although all of the known occurrences will be designated as control areas where these activities will be excluded, some areas of unoccupied suitable habitat may be negatively impacted by implementation of the action alternatives. In the short-term, areas where the overstory canopy is completely removed (i.e. in group selection units), would become unsuitable habitat for clustered lady's slippers.

The indirect effect of implementing the proposed herbicide treatments (under alternatives A and D) would be negligible because the closest treatment site is over three miles away (Table 76). While the proposed vegetation treatments will increase the risk of noxious weed introduction and spread into orchid sites, the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to clustered lady's-slipper orchids.

Cumulative Effects

Clustered lady's-slipper has likely lost individuals and a considerable amount of suitable habitat over the last 100 years due to human activities related to mining, logging, road building, fire suppression, and homesteading (Kaye and Cramer 2005). These activities have, to one extent or another, resulted in a reduction in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microclimate conditions.

Clustered lady's-slipper has been designated as a Plumas NF Sensitive or Special Interest species since the early 1980's. A review of past projects (appendix F) indicates that protection measures for this species were included when occurrences were known at the time of implementation. For example, of the four occurrences that fall within the boundary of a past timber harvest, only one was known (and consequently protected) at the time of project implementation; the remaining three occurrences, which were discovered only recently (after 2006), were not protected. This underscores the fact that many of the management activities that have occurred within the Botany analysis area have potentially impacted clustered lady's-slipper occurrences and areas of suitable habitat.

The five occurrences within the treatment units represent less than four percent of all known occurrences on the Plumas NF (

Figure 21). It is expected that implementation of the action alternatives will not reduce the viability of clustered lady's-slipper due to (a) this relatively small proportion of occurrences with the potential to be impacted; (b) the low intensity of the proposed treatments; and (c) the potential for positive indirect effects. Overall, the cumulative effects from the proposed activities are expected to be minor.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Clustered Lady's-slipper

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Cypripedium fasciculatum* (clustered lady's-slipper). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Cypripedium fasciculatum* (clustered lady's-slipper). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

***Lupinus dalesiae* (Quincy lupine)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

Quincy lupine may be negatively affected by the no action alternative. This species is most commonly associated with open habitats, many of which have been previously disturbed. Although Quincy lupine has been found in undisturbed sites, it has not been documented in dense forest stands with high overstory canopy cover. Under the no action alternative, the number of trees within stands would continue to increase, resulting in areas with greater canopy cover, reduced light to the understory, and increased duff and litter deposition. Over time, this would decrease the habitat quality within existing Quincy lupine sites and result in a loss of suitable habitat for this species across the landscape.

Cumulative Effects

The ability of Quincy lupine to colonize both previously disturbed and undisturbed sites, and tolerate and even thrive on disturbance, suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory. The Quincy lupine occurrences within the Keddie Ridge Project area are found along road cuts, in old skid trails, previous timber sales, and within the perimeter of large, historic fires.

The three occurrences within the Botany analysis area represent one percent of all known occurrences on the Plumas NF and in California; the one occurrence within the proposed treatment units represents less than 0.5 percent of all known occurrences (Figure 21). Areas of suitable, but unoccupied habitat, exist in just under half (42 percent) of the proposed treatment units. Because of Quincy lupine's ability to tolerate a broad range of habitat conditions, this area represents only a small fraction (less than one percent) of the total estimated area of suitable habitat across the Plumas NF.

There would be no direct effect to Quincy lupine under the no action alternative; however the potential for indirect effects could result in negative cumulative effects over time. Under this alternative, additional areas of suitable habitat would not be created and the habitat within existing occurrences would not be enhanced. The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

Quincy lupine is a perennial herb that is found in undisturbed and disturbed sites (i.e. old skid trails and road cut banks). Monitoring has demonstrated that this species tolerates and even thrives on disturbance. Individuals have often been found occupying areas that were previously disturbed by mechanical thinning activities or along road cut banks. Recent monitoring within group selection units found that the number of individuals increased following treatment, even when all of the overstory trees were removed and the plants were situated in the middle of a skid trail (USDA 2008a).

Some individual plants may be directly impacted by the hand thinning and prescribed fire treatments proposed in Units 78a, 78b, and 89. Pile burning may also impact individuals or the soil seed bank if located underneath or in close proximity to the pile (Korb et al. 2004). Overall, the likelihood of negative direct effects is considered low based on (a) the low intensity of the proposed treatments; (b) the positive response of Quincy lupine to disturbance; and (c) the small, scattered locations of Quincy lupine, which are found in openings where thinning activities are unlikely to take place.

Indirect Effects

The proposed project activities are expected to have a beneficial indirect effect on Quincy lupine. This species is most commonly associated with open habitats; it is not found under dense forest canopies. As mentioned above, Quincy lupine has been shown to readily colonize disturbed sites such harvest units, skid trails, and old roads. Past observations also demonstrate that populations respond favorably to both thinning and prescribed fire treatments. Based on these factors, the proposed treatments are expected to improve the habitat quality within existing sites and to increase the amount of suitable habitat for Quincy lupine across the landscape.

The indirect effect of implementing the proposed herbicide treatments would be negligible because the closest treatment site is over four miles away (Table 76). The proposed vegetation treatments will increase the risk of noxious weed introduction and spread into disturbed sites; however the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to Quincy lupine individuals and potential habitat.

Cumulative Effects

The ability of Quincy lupine to colonize both previously disturbed and undisturbed sites, and tolerate and even thrive on disturbance, suggests that this species may have benefited from past management activities that created open conditions and increased light reception to the understory. The Quincy lupine occurrences within the Keddie Ridge Project area are found along road cuts, in old skid trails, previous timber sales, and within the perimeter of large, historic fires.

The three occurrences within the Botany analysis area represent one percent of all known occurrences on the Plumas NF and in California; the one occurrence within the proposed treatment units represents less than 0.5 percent of all known occurrences (

Figure 21). Areas of suitable, but unoccupied habitat, exist in just under half (42 percent) of the proposed treatment units. Because of Quincy lupine’s ability to tolerate a broad range of habitat conditions, this area represents only a small fraction (less than one percent) of the total estimated area of suitable habitat across the Plumas NF.

Overall, the cumulative effects to this species are anticipated to be beneficial. Although implementation of the action alternatives may have some direct impacts on individuals, these effects will likely not be severe enough to negatively impact the long-term viability of Quincy lupine. This is based on the small percentage of sites with potential to be directly impacted, the species’ high tolerance to disturbance, and the creation of additional areas of suitable habitat through implementation of the proposed treatments.

The effects of present and future projects on this species would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Quincy Lupine

No Action Alternative (B)

The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Lupinus dalesiae* (Quincy lupine). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Lupinus dalesiae* (Quincy lupine). This determination is based on the potential for impacts to individuals and areas of suitable habitat.

***Oreostemma elatum* (Plumas alpine-aster)**

Alternative B – No Action Alternative

Direct Effects

No direct effects are anticipated because no project-related activities would occur.

Indirect Effects

The no action alternative is expected to have a negligible effect on Plumas alpine-aster. This species grows in wet meadows and small spring-fed forest openings where high soil moisture levels during the fire season and the dominance of fine fuels (i.e. grass-like species) greatly reduce the likelihood of high-severity fire (Dwire and Kauffman 2003). Based on this, the lack of treatments in adjacent stands is not expected to significantly alter the future wildfire risk or intensity within Plumas alpine-aster occurrences or areas of unoccupied suitable habitat.

Cumulative Effects

Plumas alpine-aster has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species relatively recently in 1998; therefore it is unknown whether projects implemented more than 12 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years (USDA 1988). In addition, none of the past projects (described in appendix F) occurred in or near the Plumas alpine-aster occurrences in the Botany analysis area. Based on these two factors, it is likely that the six Plumas alpine-aster occurrences have received little impact from management activities in the past few decades.

There would be no cumulative effects from the no action alternative because the direct and indirect effects are expected to be negligible. The effects of future projects on Plumas alpine-aster would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Action Alternatives (A, C, D, and E)

Direct Effects

No direct effects will occur because the two Plumas alpine-aster occurrences will be flagged for avoidance.

Indirect Effects

The indirect effects from the action alternatives are anticipated to be negligible. Plumas alpine-aster is found in wet meadows and small spring-fed openings within forested habitats. These types of habitats differ from their surrounding uplands in moisture regime, microclimate, and vegetative composition (Pettit and Naiman 2007). In general, high soil moisture levels and the dominance of grass-like species (i.e. fine fuels) greatly reduce the risk of high-severity wildfire within these habitats. Based on this, the hand thinning and underburning treatments in adjacent stands are not expected to significantly alter the future wildfire risk or intensity within Plumas alpine-aster occurrences or unoccupied suitable habitat.

Positive effects of the proposed thinning treatments may include increased water percolation and groundwater, which could slightly increase the water availability within adjacent meadow habitats where Plumas alpine-aster is found. Occurrences and suitable habitat for Plumas alpine-aster will be avoided during project implementation; therefore the proposed activities are not expected to negatively affect the timing or hydrologic regime within areas of suitable habitat.

The indirect effect of implementing the proposed herbicide treatments (under alternatives A and D) would be negligible because the closest treatment site is 0.9 miles away (Table 76). Meadows and seeps are highly susceptible to invasion from noxious weed species that thrive under wet conditions, such as Canada thistle (*Cirsium arvense*). While the proposed treatments may increase the risk of noxious weed introduction and spread into these areas; the control measures proposed under alternatives A and D will reduce the risk of invasion into these habitats and the potential impact to Plumas alpine-aster individuals and potential habitat.

Cumulative Effects

Plumas alpine-aster has likely lost individuals and a considerable amount of suitable habitat over the past 100 years due to land use activities such as water diversions, habitat type conversion (i.e. meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails. This species was added to the Plumas NF Sensitive species relatively recently in 1998; therefore it is unknown whether projects implemented more than 12 years ago avoided or mitigated negative effects to known occurrences. With the exception of some land use activities (such as off highway vehicle use, fire suppression, etc.), protection measures for meadows have generally been in place for nearly 25 years

(USDA 1988). In addition, none of the past projects (described in Appendix F) occurred in or near the Plumas alpine-aster occurrences in the Botany analysis area. Based on these two factors, it is likely that the six Plumas alpine-aster occurrences have received little impact from management activities in the past few decades.

The six occurrences in the Botany analysis area represent 35 percent of the Plumas alpine-aster occurrences in California; the two occurrences within the treatment units represent approximately 12 percent of all known occurrences (Figure 21). All of these occurrences will be avoided during implementation of the action alternatives. In addition, areas of suitable habitat will be protected through implementation of best management practices (BMPs). Based on these protection measures, as well as the negligible direct and indirect effects to Plumas alpine-aster, no adverse cumulative effects are anticipated from implementation of the action alternatives.

The effects of future projects on Plumas alpine-aster would likely be minimal or similar to those described in this analysis if existing management guidelines (such as field surveys, protection of known rare species locations, and noxious weed standard management requirements) remain in place.

Summary of Determinations for Plumas Alpine-aster

No Action Alternative (B)

The no action alternative (B) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

Action Alternatives (A, C, D, and E)

The Keddie Ridge Project action alternatives (A, C, D, and E) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.

Summary of Effects

The effects presented below are based on professional experience and judgment; the existing condition of botanical resources within the analysis area, and the potential impacts of the alternatives.

Alternative B (No Action)

- The no action alternative may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress), *Cypripedium fasciculatum* (clustered lady's-slipper), and *Lupinus dalesiae* (Quincy lupine). Under this alternative, direct effects to individuals will be avoided; therefore this determination is based on the potential for long-term impacts to areas of suitable habitat.
- Alternative B (no action) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.
- Alternative B (no action) will not affect any other Region 5 Sensitive plant species or any Threatened, Endangered, or Candidate plant species. This determination is based on the absence of suitable habitat

within the project area for these species and the lack of individuals known or expected to occur within the project area.

Action Alternatives (A, C, D, and E)

- The Keddie Ridge Project action alternatives (A, C, D, and E) may affect individuals, but are not likely to result in a trend toward Federal listing or loss of viability for *Arabis constancei* (Constance's rock cress), *Cypripedium fasciculatum* (clustered lady's-slipper), and *Lupinus dalesiae* (Quincy lupine). This determination is based on the potential for impacts to individuals and areas of suitable habitat.
- The Keddie Ridge Project action alternatives (A, C, D, and E) will not affect *Oreostemma elatum* (Plumas alpine-aster). This determination is based on the negligible direct and indirect effects to individuals and areas of suitable habitat.
- The action alternatives (A, C, D, and E) will not affect any other Region 5 Sensitive plant species or any Threatened, Endangered, or Candidate plant species. This determination is based on the absence of suitable habitat within the project area for these species and the lack of individuals known or expected to occur within the project area.

Compliance with the Forest Plan and Other Direction

All of the alternatives are consistent with the Forest Plan and other direction. Under these alternatives, sensitive plant species are protected as needed to maintain viability.

Noxious Weeds

Introduction

In 2003, the United States Forest Service identified invasive species as one of four critical threats to the nation's ecosystems (Bosworth 2003). Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure (Bossard et al. 2000). Noxious weed species have the potential to affect native plant species indirectly through allelopathy (the production and release of plant compounds that inhibit the growth of other plants) (Bais et al. 2003), as well as through direct competition for nutrients, light, and water (Bossard et al. 2000). Noxious weed infestations can also reduce the recreational or aesthetic value of native habitats.

Forest management activities, such as those associated with timber harvest, can contribute to the introduction and spread of noxious weed species by creating suitable environmental conditions for establishment and by acting as vectors for spread. The following section provides a discussion of the risk associated with noxious weed introduction and spread as a result of the proposed Keddie Ridge project. A complete assessment of noxious weed risk is appended to the Keddie Ridge Hazardous Fuels Reduction Project: Biological Evaluation of Potential Effects to Threatened, Endangered, and Sensitive Plant Species (USDA 2011f), which is located in the project record and incorporated by reference.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Federal Acts and Orders

Executive Order 13112 (1999)**-** directs federal agencies to prevent the introduction of invasive species; detect and respond rapidly to control such species; and to minimize the economic, ecological, and human health impacts from invasive species on NFS lands.

Forest Service Manual (FSM) Direction

FSM Section 2081.03 **-** directs the U.S. Forest Service to prevent the introduction and establishment of noxious weeds; contain and suppress existing weed infestations; and to educate and cooperate with agencies, land owners, land managers, and members of the public to control weeds. It also requires a weed risk assessment for any proposed ground disturbing activities and calls for the incorporation of noxious weed control measures into any project that has a moderate to high risk of introducing or spreading noxious weeds.

Forest Plan

Plumas NF Land Management Plan (USDA 1988, 1999a, 2004b): The Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Final Environmental Impact Statement (USDA 2003a) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment (SNFPA) Final Supplemental EIS (USDA 2004b) amended the management direction in the Forest Plan to address management of noxious weeds and invasive exotic (nonnative) species.

The HFQLG EIS provides direction for noxious weed and invasive exotic weed management; this direction is to “manage National Forest System lands so that management activities do not introduce or spread noxious or invasive exotic weeds.” The HFQLG EIS also provides guidelines to follow during project planning and implementation. These guidelines are included as standard management requirements in Appendix H of this document.

The Record of Decision (ROD) for the 2004 SNFPA established goals for noxious weed management using an integrated weed management approach according to the priority set forth in Forest Service Manual 2081.2. The three priorities include:

1. Prevent the introduction of new invaders.
2. Conduct early treatment of new infestations.
3. Contain and control established infestations.

Provisions for implementing these goals are embodied in the noxious weed management standards and guidelines of the SNFPA 2004 Record of Decision.

Effects Analysis Methodology

Geographic Area Evaluated

The geographic area used to analyze the effects to noxious weeds is referred to as the “Botany analysis area”; it encompasses approximately 64,000 acres and consists of all proposed treatment units, including access roads to the treatment units, and the area within one mile of the treatment unit boundaries. This area was selected to focus the analysis on weed species and infestations with the highest potential for impacts within the project area. In general, weed infestations located in close proximity to proposed treatment units and access routes increase the probability of spread into treated areas as well as other parts of the Forest.

Methodology

The analysis of effects for noxious weeds followed a process similar to that described under the Botanical Resources section of this document. Field surveys were conducted within all of the proposed units and data were collected that described the spatial extent of infestations and the potential options for treatment.

The risk of noxious weed spread or introduction was evaluated for each proposed unit using the following factors: (a) amount of soil disturbance associated with the proposed project activities; (b) species invasiveness; (c) proximity to the proposed units; (d) proportion of infestations proposed for treatment; and (e) the effectiveness of the weed treatment measures. In general, a high risk was assigned based on the presence of weed infestations within a proposed unit; a high level of invasiveness; a large amount of soil disturbance associated with the proposed activities (i.e. group selections); and a lack of effective weed treatments.

Indicator Measures

The indicator measures used to compare the effects across the alternatives were: (a) the amount of soil disturbance associated with the proposed project activities; (b) the number and acres of weed sites treated; (c) the effectiveness of the proposed control treatment methods; and (d) the overall risk of noxious weed introduction and spread.

Assumptions

Recent reconnaissance surveys of noxious weed sites within the Botany analysis area suggest that many infestations have spread beyond their originally mapped boundaries; for example, within one proposed weed treatment unit, infestations increased from 2.4 acres to an estimated 4.4 acres over a period of eight years (Coppoletta, personal observation, 2010). To obtain an estimate of the amount of spread that could occur prior to project implementation, the scientific literature was reviewed and general rates of spread were estimated for each species (e.g. Roche 1992, Nuzzo 1997). These values were used to obtain an average rate of spread, which was then applied as a buffer to existing noxious weed polygons within the Botany analysis area. Consequently, all of the noxious weed treatment acres presented in this document represent the maximum area proposed for treatment and take into account the projected amount of spread that may occur prior to project implementation (i.e. over a period of two to three years).

Affected Environment

Five invasive species of high management concern have been documented within the Botany analysis area. These weed species, which are known from roughly 118 locations, range in size from five square feet to over 25 acres. Table 78 lists the noxious weed species known to occur within the Botany analysis area. Also included in the table are the ratings from the California Department of Food and Agriculture's noxious weed list (CDFA 2009b) and the California Invasive Plant Council's invasive plant inventory (Cal-IPC 2006).

Table 78. Noxious Weed Species within the Botany Analysis Area

Species	Common Name	CDFA rating [1]	Cal-IPC rating [2]	Number of sites within:	
				Botany analysis area	Vegetation treatment units
Cardaria draba	hoary cress	B	Moderate	1	0
Centaurea solstitialis	yellow starthistle	C	High	53	40
Cirsium arvense	Canada thistle	B	Moderate	16	10
Cytisus scoparius	Scotch broom	C	High	4	0
Taeniatherum caput-medusae	Medusahead	C	High	44	30

[1] CDFA ratings - *A-listed weeds*: eradication or containment is required at the state or county level; *B-listed weeds*: eradication or containment is at the discretion of the County Agricultural Commissioner; *C-listed weeds*: eradication or containment required only when found in a nursery or at the discretion of the County Agricultural Commissioner.
[2] CalIPC ratings- *High*: attributes conducive to moderate to high rates of dispersal and establishment; usually widely distributed among and within ecosystems. *Moderate*: impacts substantial and apparent, but not severe; attributes conducive to moderate to high rates of dispersal; distribution may range from limited to widespread. *Limited* : ecological impacts are minor or information is insufficient to justify a higher rating, although they may cause significant problems in specific regions or habitats; attributes result in low to moderate rates of invasion; distribution generally limited, but may be locally persistent and problematic.

Cardaria draba (hoary cress)

In California, this deep-rooted perennial occupies disturbed habitats under 4,000 feet in elevation (Chipping and Bossard 2000). It is generally found in moderately moist, alkaline soils; however it can also tolerate a wide range of soil types and moisture regimes (CDFA 2009a).

Once introduced to a site, either through a seed or root fragment, hoary cress can rapidly expand through extension of lateral roots and shoot buds (USDA 2005b). Over the course of one year, a single plant growing in an open site can produce up to 455 shoots that cover an area of 12 feet in diameter (CDFA 2009a). Once established, seedlings quickly develop lateral roots, shoot buds, and tap roots, some of which reach a depth of 25 cm in less than one month. The mature root system of hoary cress can reach depths of three feet or more and can account for 75 percent of the plant’s total biomass (CDFA 2009a). This extensive root system enables plants to survive cold winter climates and periods of drought.

Seeds of hoary cress germinate in the fall after the first rains and are most commonly dispersed by wind, water, vehicles, and agricultural practices. Seeds can remain viable in the soil for up to three years (USDA 2005b).

There is one infestation of hoary cress, which covers approximately 0.2 acres, within the Botany analysis area. This infestation was hand-pulled and mowed on an annual basis between 2002 and 2005. Over this time period, the infestation increased from an estimated 300 plants to approximately 3,000 individuals. Due to the failure of these manual methods to control hoary cress, alternatives A and D propose a combination of mowing and herbicide treatment within this infestation. No treatments for hoary cress are proposed under alternatives B, C, and E due to the lack of feasible and effective non-herbicide alternatives.

Centaurea solstitialis (yellow starthistle)

This highly invasive, deep-rooted winter annual is considered a high priority for control and eradication in Plumas County as well as on the Plumas NF. In California alone, this invasive species is estimated to cover approximately 12 million acres of rangeland and wildland (Duncan and Clark 2005). Dense infestations of yellow starthistle have been shown to reduce the diversity and abundance of native plant species; decrease the value of wildlife habitat and forage; alter fuel characteristics and fire behavior; and deplete soil moisture reserves (Duncan and Clark 2005).

Yellow starthistle reproduces exclusively from seed, with most long-distance dispersal attributed to wildlife or human-related factors (Roche 1992). The control or eradication of this species requires elimination of seed production as well as depletion of the soil seedbank (i.e. seeds residing in the soil that have not germinated). The size of the seedbank is dependent upon the age of the infestation; experimental results suggest that seeds remain viable in the soil for three to ten years (DiTomaso et al. 2006). Yellow starthistle is the most abundant weed in the Botany analysis area (Table 79). It is very common in Indian Valley, which is in close proximity to many of the proposed treatment units. Of the 53 sites within the Botany analysis area, 10 are not proposed for treatment under any of the action alternatives because they are either on private property (1 site); within the boundary of a special use permit (4 sites); or are highly inaccessible (5 sites). Twenty of these yellow starthistle sites have been treated in the past with manual methods as part of the Mt. Hough noxious weed program. Of these, four have decreased and 16 have increased over time; fifteen are currently considered too large to treat with manual methods.

Cirsium arvense (Canada thistle)

This aggressive, perennial thistle is common throughout northern California, where it infests a variety of habitat and soil types (Bayer 2000). It is most competitive in moist, well-aerated, productive soil types, but can also tolerate dry habitats and sandy soil conditions (Bayer 2000). Canada thistle negatively affects native plant species through direct competition for nutrients, light, and water; production of allelopathic chemicals (compounds that inhibit the growth of other plants); and the accumulation of nitrates, which can cause poisoning in animals (Bayer 2000).

Canada thistle spreads either by seed or vegetatively by producing long horizontal underground roots that give rise to aerial shoots (Bossard et al. 2000). Canada thistle's extensive root system has been shown to produce over 66 feet of new roots over a two-year period, some of which have been shown to grow 15 to 20 feet deep. The rates of Canada thistle spread that are documented in the scientific literature range from less than two feet to over 40 feet per year (Donald 1990, Nuzzo 1997, Bond and Turner 2004, USGS 2005)

Canada thistle is a shade-intolerant species, and its growth has been shown to be discouraged in areas where there are low levels of disturbance and sufficient competition from native species. For example, in Rocky Mountain National Park, dry upslope conditions, thick canopies from woody species, and well-established grassy meadows inhibited Canada thistle invasion and population size over time (Beck 1994); however it was also noted that only a minor amount of disturbance (such as from elk grazing) was necessary to promote Canada thistle invasion and establishment.

There are 16 Canada thistle sites within the Botany analysis area. Of these, two are not proposed for treatment because they occur on private property. The remaining 14 sites, which cover an estimated 4.3 acres, are proposed for treatment under alternatives A and D with a combination of aminopyralid and glyphosate applications and prescribed fire. No treatments for Canada thistle are proposed under alternatives B, C, and E.

Cytisus scoparius (Scotch broom)

Since its introduction into California as a landscape ornamental in the mid to late 1800s, this yellow-flowered shrub has aggressively invaded many of the State's disturbed sites and natural areas (CDFA 2009a). Scotch broom is a strong competitor that can quickly form dense thickets, which decrease native plant diversity and have the potential to modify fire frequency and intensity (Bossard et al. 2000). The flowers and seeds of this shrub are also toxic to humans and livestock (CDFA 2009a).

Scotch broom spreads by producing large quantities of seed; one medium-sized plant can produce over 12,000 seeds (Bossard et al. 2000). Seeds are long-lived and can remain viable in the soil for up to 30 years (Bossard et al. 2000). After germination, the initial growth of seedlings can be rapid with some individuals growing over one meter in the first year. Scotch broom is also capable of stump sprouting after cutting, freezing, or fire.

There are four Scotch broom sites within the Botany analysis area. Of these, one occurs on private property and two are included under a previous project; these three sites are not proposed for treatment under the Keddie Ridge Project. The remaining site is proposed for hand-pulling under all of the action alternatives. Although no Scotch broom plants have been seen since the site was discovered and hand-pulled in 2006, follow-up monitoring and treatments are necessary due to the longevity of the soil seed bank.

Taeniatherum caput-medusae (medusahead)

Over the past 20 years, managers of public lands in the western United States have witnessed an explosive spread of this invasive grass species. Medusahead is currently documented in more than 20 counties in California, as well as in Oregon, Washington, Idaho, Nevada, and Utah (Kan and Pollak 2000).

Medusahead is a winter annual grass; its seeds germinate with the first rains of fall, over winter as seedlings, flower in late spring to early summer, and set seed and die by late summer or early fall. This species reproduces by seed, which is primarily dispersed by wind and water, although it can be dispersed to more distant sites by grazing animals, machinery, vehicles, and clothing (Bossard et al. 2000). Medusahead is able to grow in a wide range of climatic conditions and has been documented in plant communities up to 7,000 feet in elevation. On the Plumas NF, most medusahead occurrences are found in relatively disturbed areas along roadsides and railroad tracks; however this grass has also been documented in a few native plant communities.

Medusahead is the second most abundant species in the Botany analysis area (Table 79). It is also common in Indian Valley, which is in close proximity to many of the proposed treatment units. Of the 44 sites within the Botany analysis area, 28 occur within units that will be treated with prescribed fire under all action alternatives. Medusahead is a species of significant concern within the project area because it occurs in sites where there is increased potential for spread (i.e. along roadsides and within units) and available treatment methods are not practical or effective for control.

Environmental Consequences

Effects of the Proposed Weed Treatments on Individual Noxious Weed Species

The following section provides a summary of information for the five noxious weed species that occur within the Botany analysis area; it also provides a discussion of the effectiveness of the different noxious weed treatment measures. The effect to noxious weed species from the five proposed alternatives is presented in a later section. To highlight the differences among the proposed treatments, alternatives that proposed similar noxious weed control measures (i.e. alternatives A and D) were lumped together for the discussion.

Cardaria draba (hoary cress)

Effects from proposed noxious weed treatments

Alternatives A and D

The weed treatments proposed under alternatives A and D will control or eliminate the hoary cress infestation within the Botany analysis area. When used alone, mowing and glyphosate applications provide only variable levels of control; however when they are integrated, these two treatments can be highly effective at reducing hoary cress infestations. Studies of closely related species have shown that mowing followed by glyphosate application can reduce biomass by more than 80 percent after only one year of application (Renz and DiTomaso 2004, 2006). The inclusion of effective weed treatments under alternatives A and D will decrease the risk of hoary cress spread within the Botany analysis area.

Alternatives C and E

Alternatives C and E do not include treatments for hoary cress due to the fact that non-herbicide treatments, such as hand-pulling or prescribed fire, are either impractical or ineffective. Prescribed fire is not an effective control measure because the extensive root system allows hoary cress to survive even a severe fire (Zouhar 2004). Manual treatments, without follow-up herbicide applications, have been unsuccessful at this site in the past. Individuals were hand-pulled and mowed annually over a four year time period, during which the number of plants increased from 300 to 3,000. Manual treatments are also considered infeasible because they require considerable effort. Treatments must occur within 10 days of emergence throughout the growing season, be repeated for two to four years, and be thorough enough to prevent vegetative propagation from small root fragments (USDA 2005b). The lack of effective weed treatments proposed under alternatives C and E will increase the spread of hoary cress within the Botany analysis area.

Centaurea solstitialis (yellow starthistle)

Effects from proposed noxious weed treatments:

Alternatives A and D

The weed treatments proposed under alternatives A and D will significantly reduce large infestations and eradicate small occurrences of yellow starthistle within the Botany analysis area. Under these alternatives, 43 sites (covering approximately 58 acres) are proposed for treatment with a combination of aminopyralid applications, hand pulling, and prescribed fire.

Prescribed burning can be an effective tool for controlling yellow starthistle infestations if timed to occur early in the flowering period, prior to seed production (DiTomaso et al. 1999). Successful control usually requires more than one year of consecutive burning; however some studies have suggested that integrating one year of burning with a follow-up herbicide treatment can be the most effective strategy (DiTomaso and Johnson 2006). Recent studies have shown that aminopyralid provides excellent control of yellow starthistle after one year of treatment, even at low application rates (DiTomaso and Kyser 2006, DiTomaso et al. 2006). Hand pulling, which can be effective for controlling yellow starthistle in small infestations, will be a practical tool for follow-up treatments.

The inclusion of effective weed treatments under alternatives A and D will decrease the risk of yellow starthistle spread within project treatment units and the Botany analysis area.

Alternatives C and E

The weed treatments proposed under alternatives C and E will not eradicate and may not reduce yellow starthistle infestations within the project area. Under these alternatives, only 24 infestations (covering approximately 44 acres) are proposed for treatment with a combination of prescribed fire and hand pulling.

As mentioned above, long-term control of yellow starthistle with prescribed fire alone usually requires more than one year of burning; for example, DiTomaso et al. (1999) determined that three consecutive year of burning were required to reduce the yellow starthistle seedbank by 99 percent. Although a single year of burning can reduce the seedbank by as much as 75 percent, this is not usually sufficient to significantly reduce the infestation (DiTomaso and Johnson 2006).

Hand pulling can be effective for controlling yellow starthistle; however because it is very time-intensive and requires multiple follow-up visits, it is only recommended for small infestations or for those areas of steep terrain where other methods are infeasible. The limited amount of hand-pulling proposed under this alternative will not be sufficient to reduce the extent of yellow starthistle within the project area.

The lack of effective weed control measures will greatly increase the spread of yellow starthistle under alternatives C and E.

Cirsium arvense (Canada thistle)

Effects from proposed noxious weed treatments:

Alternatives A and D

The weed treatments proposed under alternatives A and D will reduce or eradicate Canada thistle infestations within the project area. Under these alternatives, 14 infestations (covering approximately 4.3 acres) are proposed for treatment with a combination of aminopyralid and glyphosate applications and prescribed fire.

Herbicide treatments are the most effective method for Canada thistle control. Aminopyralid has been shown to reduce the density of Canada thistle by over 99 percent in as little as 10 months time, with little impact on the native plant community (Samuel and Lym 2008, Almquist and Lym 2010). Glyphosate is also effective at reducing both shoot and root growth in Canada thistle (Carlson and Donald 1988 *in*

Nuzzo 1997). In their study, Krueger-Mangold et al. (2002) determined that a fall wick application of glyphosate effectively decreased Canada thistle (by an average of 82 percent) while maintaining native species richness.

The effectiveness of prescribed fire treatments at controlling Canada thistle range from positive to negative, and appear to be dependent upon season, soil moisture, and location (Nuzzo 1997). Repeat burning in late spring has shown some reduction in established Canada thistle infestations; however, the overall control is generally considered less than satisfactory and early spring burns have been shown to increase sprouting and reproduction (Zouhar 2001). While fire often kills the above-ground portion of the plant, the roots are often able to survive even high-severity fires and colonize recently burned sites (Zouhar 2001). Prescribed fire alone is not considered to be a viable option for Canada thistle control; however it can be an effective tool when combined with follow-up herbicide applications.

The inclusion of effective weed treatments under alternatives A and D will decrease the risk of Canada thistle spread within project treatment units and the Botany analysis area.

Alternatives C and E

No weed treatments are proposed for Canada thistle under alternatives C and E because non-herbicide treatment alternatives (i.e. manual treatments or prescribed fire) are considered either infeasible or ineffective. Effective long-term control of Canada thistle must focus on killing the roots and root buds, preventing seed production, and preventing re-infestation by seedlings (Zouhar 2001).

Canada thistle is considered particularly difficult to eradicate with mechanical methods due to its ability to spread vegetatively and produce an extensive root system. Repeated hand pulling, which is believed to drain the plant’s reserves because it forces underground roots to produce new shoots (Bond and Turner 2004), has shown variable levels of success for long-term Canada thistle control. On the Plumas NF, one Canada thistle site, selected because of its location within a botanically significant area, has been repeatedly hand pulled since 2003. Over a three-year time period, this site was treated an average of six times during the field season at an average interval of 21 days. To date, treatment of this 2,000-square-foot area has produced little discernable impact on the Canada thistle population.

As mentioned above, Canada thistle’s response to prescribed fire treatment is highly variable and repeated treatments are generally necessary (Nuzzo 1997). Because of the variability of control, prescribed fire treatments alone are not considered a viable option for treatment of Canada thistle infestations.

The lack of effective weed control measures will greatly increase the spread of Canada thistle under alternatives C and E.

Cytisus scoparius (Scotch broom)

Effects from proposed noxious weed treatments:

Alternatives A, C, D, and E

The manual treatments proposed under all of the action alternatives will provide long-term control of the Scotch broom infestation within the analysis area. If manual treatments are feasible, hand pulling can be a highly effective tool for broom removal (CDFA 2009a). On the Plumas NF, eleven Scotch broom sites have been hand pulled annually for an average of five years. Of these, nine have been reduced by an average of 99 percent.

Taeniatherum caput-medusae (medusahead)

Effects from proposed noxious weed treatments:

Alternatives A, C, D, and E

The effectiveness of the prescribed fire treatments at controlling medusahead within the proposed project units is highly dependent upon the timing of the burn. A number of studies have demonstrated that burning medusahead in late spring, prior to seed dispersal can significantly reduce infestations (Rice 2005). In contrast, prescribed burns initiated in the summer and fall, have not been effective due to the fact that the seeds have been dispersed and are on or above the soil where they are protected from the heat of the fire (Kan and Pollak 2000). In many cases, the increased light availability and nutrients as a result of prescribed burning, acts to encourage weed species growth and spread (Hatcher and Melander 2003). From a management perspective, prescribed fire is not always a viable option for medusahead control because the optimal time for controlling infestations is often outside the burn permit parameters (Rice 2005).

Flaming with a propane torch has been tested on medusahead at a limited number of sites on the Plumas NF. Results from these treatments suggest that if flaming is conducted in the spring, over small areas of infestation, it may provide some level of medusahead control (Coppoletta 2006). The major limitation with this method is that it is very time intensive and can only be used on very small, isolated infestations. Flaming may be used in areas that are at a high risk of spread from equipment or personnel.

Other treatments, such as mowing or herbicide application, are not considered practical for medusahead control within the Keddie Ridge Project area. Mowing is nonselective, oftentimes fails to remove the active portion of the plant where new growth originates, and is not recommended along roadsides after seed set because of increased potential for seed dispersal (CDFA 2009a). Glyphosate has shown some level of medusahead control; however its effectiveness has been variable and it is not recommended in native communities where there is a high potential for impact to non-target species.

Based on the variability of the prescribed fire treatments, as well as the low number of sites proposed for treatment (64 percent of the sites in the Botany analysis area), there is a high risk of spread from medusahead under all of the proposed action alternatives.

Effects to Noxious Weeds

The proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed spread by creating disturbed conditions that favor noxious weed establishment and spread. The implementation of standard management requirements (appendix H) and noxious weed treatment measures would reduce the risk of noxious weed spread; however, this would be highly dependent upon the effectiveness of each proposed control method. For the discussion below, alternatives that resulted in similar effects were grouped together for purpose of the analysis

Alternative B (No Action)

Direct Effects

There would be no direct effects to noxious weed species under this alternative. Of the 118 noxious weed locations that have been documented within the Botany analysis area, 22 have been treated in the past with manual methods. Due to the ineffectiveness of these treatments, only one (Scotch broom) is treated on an on-going basis. Therefore the remaining infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead would continue to spread within the analysis area at their current rates.

Indirect Effects

This alternative would not result in any new ground-disturbing activities so the amount of suitable noxious weed habitat would remain at its current level. Infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead, which are not treated on an on-going basis, would continue to spread at their present rates.

Noxious weed species are oftentimes classified as pioneer species or invaders. Disturbance, whether it is natural (i.e. lightning-caused fire) or associated with management activities, often creates ideal conditions for noxious weed introduction and establishment. Under this alternative, soil disturbance would be minimized and the existing cover of native plant species maintained. These factors could reduce the rate of noxious weed invasion within the analysis area. Some studies have shown that the spread of medusahead may be slowed by competitive perennial vegetation (Davies et al. 2010) while others suggest that Canada thistle invasion can be inhibited by dense canopy cover and well-established competitive meadow species (Beck 1994).

While the no action alternative may decrease the short-term risk of noxious weed invasion by minimizing the amount of disturbance, it will not reduce the long-term risk of disturbance from high-severity wildfire. High-severity wildfires aid in the establishment and spread of noxious weeds by increasing the availability of resources, such as light and nitrogen, and decreasing competition from native plant species. In their comparison of low-severity and high-severity burns, Turner et al. (1997) found that the density of Canada thistle after severe surface and crown fires was two to four times greater than the density after a light surface fire.

Even in the absence of proposed treatments, habitats that are in close proximity to roads, trails, or private land will remain vulnerable to noxious weed invasion and spread. At present, an estimated 37 percent of the noxious weed sites in the Botany analysis area, including three of the largest infestations, occur in close proximity (within 0.1 mile) to the National Forest System land boundary. In addition, approximately 81 noxious weed infestations or almost 70 percent of the known sites, are situated within 100 feet of a road or trail. Roads, whether they are major highways, general forest roads, or motorized vehicle trails, are often the primary conduit for weed introduction and establishment. Roads and motorized trails contribute to dispersal of noxious weed species because they (1) create suitable habitat by altering environmental conditions, (2) make invasion more likely by stressing or removing native species, and (3) allow for easier movement by wild or human vectors (Trombulak and Frissell 2000). Under this alternative, these infestations could act as entry points or seed sources for weeds moving into less-invaded parts of the analysis area.

Cumulative Effects

The effect of specific past management actions on noxious weed species is largely unknown. Targeted noxious weed surveys at the project-level began relatively recently on the forest. Aside from an occasional appearance on a plant list, the first targeted noxious weed survey on file for the Botany analysis area occurred in 2000.

Records for past projects that occurred in the Botany analysis area over the past 20 years were examined to (1) determine if noxious weed species were surveyed for and documented prior to project implementation and (2) if noxious weed species are currently present within the boundary of past projects. Approximately 41 percent of the Botany analysis area weed infestations (48 sites) fall within the boundary of a past project. Of these, only five infestations were documented prior to project implementation. One specific project incorporated standard management requirements, such as equipment cleaning and avoidance measures and conducted manual weed treatments; the infestations within this particular project increased from an estimated 2.4 acres prior to project implementation to approximately 4.4 acres eight years after project completion. While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity, combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie Ridge Project area.

The lack of ground disturbing activities under the no action alternative would reduce the amount of suitable weed habitat in the short-term; however the lack of weed treatments would allow hoary cress, yellow starthistle, Canada thistle, and medusahead to persist and expand in their current locations and would increase the risk of spread into un-invaded native habitats within the Botany analysis area.

The large number of past activities, the close proximity to private land, and the spatial extent of weed infestations all increase the vulnerability of the landscape to noxious weed invasion, even in the absence of project activities. Vectors for noxious weed spread that are unrelated to the proposed project, such as recreational activities and ongoing forest management (e.g. road maintenance), would continue to aide in the dispersal and spread of noxious weed species in the Botany analysis area.

Alternatives A and D

Direct Effects

The proposed weed treatments, which include manual removal, prescribed burning, and herbicide application, are expected to greatly reduce or eliminate infestations of hoary cress, yellow starthistle, Canada thistle, and Scotch broom within the Botany analysis area. The risk of medusahead spread, which currently lacks a feasible or effective control method, would remain high under all of the action alternatives. The specific treatments, which are proposed for 87 weed sites covering approximately 107 acres, are described in detail in chapter 2. The effectiveness of each method is also discussed in the section above. No direct effects to noxious weed species are anticipated from the proposed vegetation and fuels treatments because infestations will be treated or avoided during project implementation.

Indirect effects

The proposed vegetation, fuels, and road treatments would result in areas with reduced native plant cover and increased soil disturbance; these conditions favor noxious weed establishment and spread. During implementation, project equipment and vehicles could facilitate the spread of noxious weeds by transporting seed and propagative plant parts into un-invaded portions of the project area. In one National Park in Australia, weed seed was found to be most often transported into and around the park by vehicles that had been driven off-road (Lonsdale and Lane 1994).

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each treatment unit. For example, group selection units (i.e., those with relatively high amounts of soil disturbance and vegetation removal) may be at higher risk of invasion than hand thinning units. The amount of soil disturbance associated with the proposed project activities is considered high for alternative A and moderate for alternative D (Table 79).

The five weed species that currently exist within the Botany analysis area can rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present. Donald (1990) demonstrated that Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species. Additionally, some habitats with sparse native vegetation have been shown to be more susceptible to medusahead invasion than more diverse plant communities (Young and Evans 1971). Monitoring of one medusahead site in montane chaparral on the Plumas NF has shown a three-fold increase in infested acres over a period of six years (Coppoletta, personal observation, 2010).

The elevated risk of noxious weed introduction and spread under alternatives A and D would be greatly reduced through implementation of the standard management requirements (refer to appendix H) and the proposed noxious weed treatments. Although these control measures would not remove the risk of noxious weed invasion and spread entirely, they would greatly reduce the potential for noxious weeds to impact native plant communities within the project area. Post-implementation monitoring of past projects with similar vegetation and fuels treatments has shown that aggressive treatment of noxious weeds prior to and through project implementation and incorporation of the standard management requirements have been successful in eradicating small populations of noxious weeds as well as preventing new occurrences (USDA 2006b).

Cumulative Effects

While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity within the Botany analysis area (discussed under the no action alternative), combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie landscape.

As discussed above, the proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed establishment and spread in the Botany analysis area by increasing the amount of suitable habitat for weeds. In addition, the close proximity of the project to private land, the existence of on-going activities such as recreation and road maintenance, and the spatial extent of existing weed infestations, all increase the vulnerability of the Keddie Ridge landscape to noxious weed invasion, even in the absence of project activities.

Implementation of the proposed noxious weed treatment measures and standard management requirements, as well as post-project monitoring, would greatly reduce this risk. By directly reducing the density and extent of weeds within the Botany analysis area over time, the cumulative effect of noxious weed spread would be greatly reduced.

Overall, an estimated two percent of the treatment units proposed under alternative A are considered to have a high risk of noxious weed invasion or spread; none of the proposed units under alternative D were classified as high risk. These risk determinations take into account factors such as the amount of soil disturbance associated with the proposed activities; the invasiveness and proximity of the weed to the proposed units; the proportion of infestations proposed for treatment; and the effectiveness of the proposed weed treatment measures. Overall, the risk of noxious weed spread and introduction under alternatives A and D would be (a) slightly greater than the estimated risk under the no action alternative and (b) lower than that predicted under alternatives C and E, where vegetation, fuels, and road treatments are proposed with no effective weed treatment measures in place (Table 79).

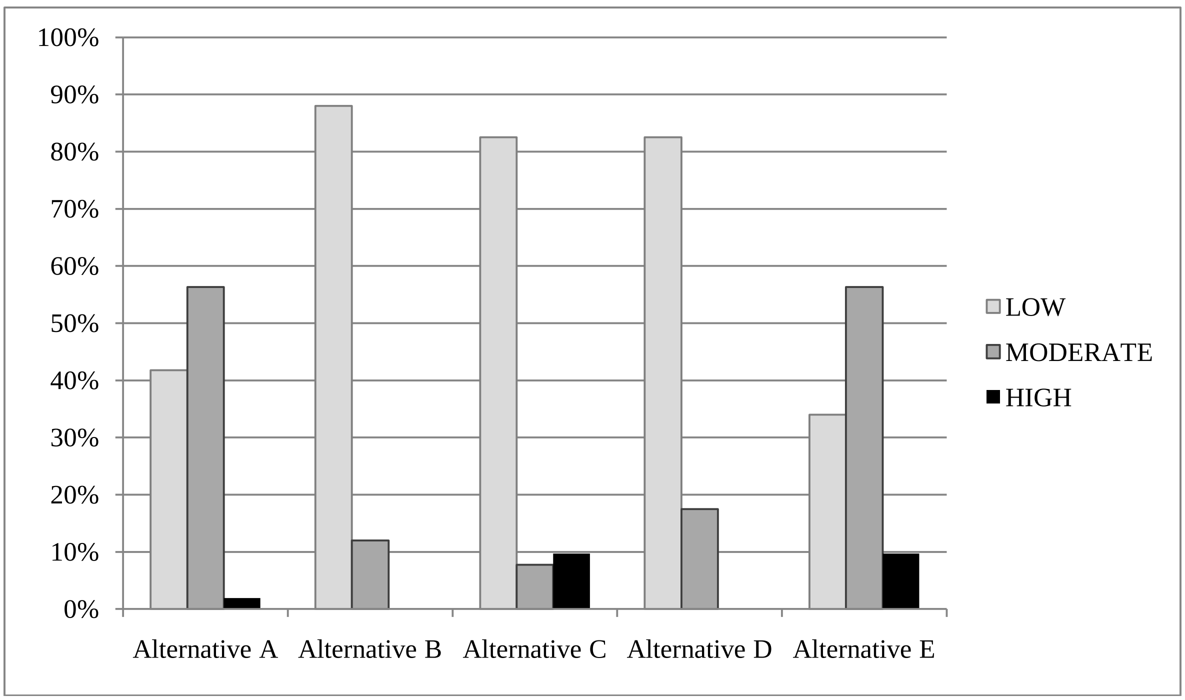


Figure 22. Percentage of Units with Low, Moderate, or High Risk of Noxious Weed Introduction or Spread, Compared Across the Five Alternatives

Alternatives C and E

Direct Effects

The proposed noxious weed treatments, which include manual removal and prescribed burning, would not significantly reduce the existing noxious weed infestations within the Botany analysis area. Less than half (45 percent) of the existing infestations will be treated under these alternatives, primarily due to feasibility constraints and the lack of effective, non-herbicide control methods. Some species that are considered particularly difficult to eradicate with non-herbicide methods, such as hoary cress and Canada thistle, are not proposed for treatment under these action alternatives.

Implementation of standard management requirements (refer to appendix H) would reduce the risk of noxious weed introduction and spread into the project area; however there may be direct effects to noxious weeds from the proposed treatments if they are unable to avoid infested areas during project implementation.

Indirect effects

The vegetation, fuels, and road treatments proposed under these alternatives would result in similar conditions as those described under alternatives A and D. The resulting soil disturbance and removal of native vegetation would increase the probability of noxious weed establishment and spread. In addition, project equipment and vehicles could facilitate weed spread by transporting seed and propagative plant parts to un-invaded portions of the project area (Lonsdale and Lane 1994).

At the site-specific level, the risk of noxious weed establishment and the potential for spread is largely dependent upon the type and frequency of disturbance associated with each treatment unit. For example group selection units (i.e., those with relatively high amounts of soil disturbance and vegetation removal) may be at higher risk of invasion than hand thinning units. The amount of soil disturbance associated with the proposed project activities is considered high for alternative E and moderate for alternative C (Table 79).

The five weed species that currently exist within the Botany analysis area can rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present. Donald (1990) demonstrated that Canada thistle can spread at a rate of 8 to 12 feet per year in areas with low competition from native plant species. Additionally, some habitats with sparse native vegetation have been shown to be more susceptible to medusahead invasion than more diverse plant communities (Young and Evans 1971). Monitoring of one medusahead site in montane chaparral on the Plumas NF has shown a three-fold increase in infested acres over a period of six years (Coppoletta, personal observation, 2010).

The elevated risk of noxious weed introduction and spread under alternatives C and E would not be greatly reduced through implementation of the standard management requirements (refer to appendix H) or the proposed noxious weed treatments. Fewer sites (45 percent) are proposed for treatment under these alternatives and the treatments that are proposed are not highly effective. . Infestations of hoary cress, yellow starthistle, Canada thistle, and medusahead, which are not treated on an on-going basis, would continue to spread at their present rates. Infestations that are situated within proposed treatment units will have the highest probability of spread due to these species' ability to rapidly invade disturbed habitats, particularly in areas where little to no competing vegetation is present (i.e. Young and Evans 1971, Donald 1990).

Under alternatives C and E, the proposed treatment activities combined with the limited non-herbicide weed treatments, would be increase the risk of noxious weed invasion and spread and the potential for negative impacts native plant communities.

Cumulative Effects

While it is often difficult to draw definitive conclusions regarding the effects of past project activities on noxious weeds, the high level of past activity within the Botany analysis area (discussed under the No action alternative), combined with the current level of weed infestation, suggest that past activities have had a significant effect on noxious weed introduction and spread across the Keddie landscape.

As discussed above, the proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed establishment and spread in the Botany analysis area by increasing the amount of suitable habitat for weeds. In addition, the close proximity of the project to private land, the existence of on-going activities such as recreation and road maintenance, and the spatial extent of existing weed infestations, all increase the vulnerability of the Keddie Ridge landscape to noxious weed invasion, even in the absence of project activities.

Implementation of the proposed noxious weed treatment measures and standard management requirements, as well as post-project monitoring, would not be sufficient to reduce this risk. The proposed weed treatments would not reduce the density or extent of weeds within the Botany analysis area over time; therefore the cumulative effect of noxious weed spread would not be reduced.

Under alternatives C and E, approximately ten percent of the proposed vegetation and fuels treatment units are considered to be at high risk of noxious weed invasion or spread (Figure 22). These risk determinations take into account factors such as the amount of soil disturbance associated with the proposed activities; the invasiveness and proximity of the weed to the proposed units; the proportion of infestations proposed for treatment; and the effectiveness of the proposed weed treatment measures. Overall, the risk of noxious weed spread and introduction under alternatives C and E would be (a) greater than the estimated risk under the no action alternative and (b) greater than that predicted under alternatives A and D, where vegetation, fuels, and road treatments are proposed in combination with effective weed treatment measures (Table 79).

Summary of Effects

The proposed vegetation, fuels, and road treatment activities would greatly increase the risk of noxious weed spread by creating disturbed conditions that favor noxious weed establishment and spread. The implementation of standard management requirements (appendix H) and noxious weed treatment measures would reduce the risk of noxious weed spread; however, this would be highly dependent upon the effectiveness of each proposed control method. Table 79 provides a summary of the effects of the proposed alternatives.

Overall, alternatives C and E carry the highest risk of noxious weed introduction and spread, primarily due to implementation of the vegetation, fuels, and road treatments with no effective weed treatment measures in place. Alternatives B (no action) and D have the lowest risk of noxious weed introduction and spread. This is mostly due to the lack of, or reduction in, soil disturbing activities. Alternative A proposes treatments that will likely result in high levels of soil disturbance; however it also proposes to implement highly effective weed treatment measures. In comparison to the other alternatives, alternative A carries a more moderate risk of noxious weed introduction and spread.

Table 79. Summary of Potential Effects on Noxious Weeds.

Indicator Measures	Rankings of Alternatives for Each Indicator[1]				
	Alternative A	Alternative B (No Action)	Alternative C	Alternative D	Alternative E
Amount of soil disturbance associated with the proposed project activities	High	Low	Moderate	Moderate	High
Number of noxious weed infestations proposed for treatment	87	None	53	87	53
Approximate (maximum) number of acres proposed for treatment	107	None	89	107	89
Overall treatment effectiveness	High	None	Variable	High	Variable
Overall Risk Ranking[1]	**3**	**1**	**4**	**2**	**5**

[1] A score of 1 indicates the alternative has the lowest overall risk of noxious weed introduction and spread; a score of 5 indicates that the alternative has the highest overall risk.

Compliance with the Forest Plan and Other Direction

The action alternatives are consistent with the Forest Plan and other direction. A noxious weed risk assessment has been completed for each alternative (FSM 2081.03 and USDA 2004b); the public has been informed of the risk and effects from the proposed project and noxious weeds (USDA 2004b); noxious weed treatment measures have been proposed under some of the alternatives; and control measures (i.e. appendix H) have been identified in areas of high risk (FSM 2081.03).

Economic and Social Environment

Introduction

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

Forest Plan

The guidance for economic and social environment is provided in the 1988 Plumas National Forest Land and Resource Management Plan, as amended by the 1999 Record of Decision on the final environmental impact statement for the Herger-Feinstein Quincy Library Group Forest Recovery Act, the 2004 Record of Decision on the final environmental impact statement EIS for the Sierra Nevada Forest Plan Amendment.

Effects Analysis Methodology

Specific Assumptions

This economic analysis focuses on those revenues and treatment costs associated with implementing fuel reduction treatments and forest health activities, in the Keddie Ridge Project area. The purpose of this economic analysis is to present the potential revenues and costs associated with each of the alternatives for comparison purposes.

This analysis does not include monetary values assigned to resource outputs such as wildlife, watersheds, soils, recreation, visual quality, or fisheries. It is intended only as a relative measure of differences between alternatives based on direct costs and values used.

Employment opportunities can have direct, indirect, or induced effects on the local economy. Direct effects are associated with the primary producer. For example, the manufacturing of lumber from the Keddie Ridge Project area would have a direct effect on employment opportunities. Indirect effects account for employment in service industries that serve the lumber manufacturer. These industries may include logging, trucking, and fuel suppliers. Induced effects are driven by wages, and are circulated through the local economy for food, housing, transportation, and other living expenses. The sum of direct, indirect, and induced effects is the total economic impact in terms of jobs and monetary outputs. It was assumed for this analysis that 10 to 15 jobs are created per million board feet of timber harvested. This number includes direct, indirect and induced jobs. It was assumed for this analysis that most products from the Keddie Ridge Project area would be processed locally due to high hauling costs of products. Likewise, it is also assumed that most employment would largely be derived from Plumas County for the timber harvesting activities.

Specific Methodology

Timber harvest values used in this economic analysis were based on the pond values (delivered log prices) of local mills from the State Board of Equalization. Harvest costs and road improvement costs were developed from the latest timber sale appraisal values. Reforestation treatments are based on the latest service contract prices and Knutson-Vandenberg sale area improvement plans. The “IMPLAN” software program was utilized in the input/output analysis for monetary outputs to the local economy.

Data Sources

The social and economic figures were obtained from State and Federal maintained databases. The most current reports were run as well as several years earlier in order to correlate with current year’s information. Statistics were obtained from the U.S. Census Bureau, America Community Survey, Censtats, Business and Industry, Bureau of Labor Statistics, Bureau of Economics, and California Department of Finance.

Affected Environment

The Plumas National Forest contributes to the regional economy in two primary ways: (1) through the generation of income and employment opportunities for residents of the immediate area, and (2) through direct and indirect contributions to local county revenues. The Plumas National Forest also contributes in secondary ways, such as through production of goods and services in local and regional markets.

Although some economic effects are dispersed over a broad area, the most substantial impacts are felt locally in Butte, Plumas, Lassen, Sierra, and Yuba Counties. Table 80 shows the percentage of Plumas National Forest land in local counties. The National Forest System lands account for approximately 72 percent of Plumas County. Consequently, management of National Forest System lands has a notable effect on the regional economy of Plumas County.

Table 80. Percentage of National Forest System Lands by County (Based on GIS Data)

County	County Acres	Beckwourth Ranger District (acres)	Feather River Ranger District (acres)	Mount Hough Ranger District (acres)	Total National Forest System Lands in Each County (acres)	National Forest System Lands within Each County (percent)
Butte	1,072,708	0	143,517	0	143,517	13.4
Lassen	3,022,136	39,686	0	1,635	41,320	1.4
Plumas	1,672,778	448,365	183,210	579,196	1,210,771	72.4
Sierra	615,514	14,794	33,522	0	48,316	7.8
Yuba	411,695	0	33,734	0	33,734	8.2
Totals	**6,794,830**	**502,844**	**393,984**	**580,831**	**1,477,659**	**21.7**

Industry/Employment

The two employment sectors most related to forest planning processes are the timber industry and tourism. Forest planning processes can positively affect the farm industry (logging operations), manufacturing (mills), transportation (trucks and railroad) and utilities (biomass power plants). They are very difficult to quantify, in terms of both total employment and their relative importance to local economies, because state and federal statistical gathering agencies generally do not break down employment data specific to logging and lumber; rather it is lumped under farm manufacturing and transportation industries. industries.

The timber industry resides within two industries, (1) Farm and (2) Manufacturing. According to the Bureau of Economic, Farm and Manufacturing earnings in Plumas County represent 11.73 percent of the major industries in Plumas County. Earnings in these two industries have decreased and are experiencing negative growth. Employment in farm and manufacturing represents 7.87 percent of the jobs in Plumas County. The per capita personal income in 2008 was $38,525. The total personal income for Plumas County was $784 million. Output for all industries in Plumas County is $1.1 billion. There are six employers in logging operations, and seven employers related to forestry services totaling 104 jobs. There are two large mills in the local area within distance of the project area combined employment is under 500 employees. The value of the mills total production is at $91 million.

Plumas County labor statistics reflect a seasonal labor force with employment up during the warmer months. In the winter unemployment rises as the timber harvesting season stops, contributing to the unemployment rate as reflected in Table 81 and Table 82. The housing downturn has had an impact on the unemployment rates in Plumas County; nearly doubling the unemployment rate during the months when normal employment rates go up. In 2009 between May and September the unemployment rates nearly doubled as reflected in the information obtained from the Bureau of Labor Statistics. This project can have a significant effect on the numerous industries' employment in the local labor force and transient labor force.

Table 81. Bureau of Labor Statistics, Plumas County Unemployment Rate

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	12.3	12.6	12.2	9.8	7.4	6.3	6.7	6.1	5.8	6.4	8.2	10.3
2008	14.2	14.2	14.0	11.6	8.3	7.9	7.8	7.7	7.3	9.1	12.0	14.0
2009	18.9	19.5	20.8	17.8	16.2	15.3	14	13.9	13.6	14.6	16.7	18.9
2010	22.3	22.8	22.9	20.1	17.5	16	16.1p					

(p) preliminary

Table 82. Bureau of Labor Statistics, Plumas County Labor Force

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2007	9363	9268	9220	9799	10188	10740	11023	11007	10475	10178	9763	9583
2008	9400	9375	9356	9705	10090	10447	10703	10559	10260	10232	9983	9843
2009	10033	10209	10125	10152	10180	10416	10561	10141	10033	9788	9549	9442
2010	9456	9579	9608	9468	9363	9473	9380p					

(p) preliminary

Energy

Plumas County has two co-generation plants and two biomass power plants operating within a reasonable haul distance. The Wendell facility is 35 megawatt plant and when operating at full capacity uses 550 bone dry tons/ day or 37 truck loads. The Wendell facility sells to PG&E approximately 30 megawatts a day when they can produce at full capacity. Presently they cannot produce full capacity due to the lack of biomass material. The Westwood facility is a 10 megawatt plant that employs 10 to 19 people. The Westwood facility when operating at full capacity uses 200bone dry tons/day.

County, State and Federal Taxes

Forest contributions to local county revenues come from three sources: (1) Payments in Lieu of Taxes, a standard rate, (2) (2) *Receipt Act* payments or payments from the *Secure Rural Schools and Community Self-Determination Act of 2008* ,a fixed rate, (3) timber yield taxes that fluctuate based on timber sold.

Payments in Lieu of Taxes

The Bureau of Land Management administers the Payments in Lieu of Taxes, which apply to many different types of federally owned land, including National Forest System lands. Payments in Lieu of Taxes compensate counties for the loss of property tax revenues due to nontaxable federal land in the county.

Secure Rural Schools and Community Self-Determination Act

The *Secure Rural Schools and Community Self-Determination Act* 2008, offers counties an alternative to the *Receipt Act*. A county may choose to continue to receive payments under the *Receipt Act* or to receive its share of the state's full payment amount under the *Secure Rural Schools and Community Self-Determination Act*. Table 83 reflects Plumas County's payments of $7,000,000 for the past several years.

The *Secure Rural Schools and Community Self-Determination Act* payments are set to expire September 2011. This Act provides payments to counties regardless of the amount of timber harvested. The payment is based on a complicated formula that takes into account in part acres of National Forest System lands, population and per capita income. When or if this Act terminate then counties will continue to receive payments under the Receipt Act at 25% of the harvested value from the National Forest System lands contained within the county. Table 83 list payments made to counties partially based on acres of National Forest System lands within the county boundary. If Plumas County reverts back to the Receipt Act collections then each project and the timber harvested become significantly important to Plumas County and its residence, as education and road safety will be impacted with each commercial project the Plumas National Forest implements.

Table 83. *Secure Rural Schools and Community Self-Determination Act* Full Payment Amounts to Counties for Fiscal Years 2001-2007

	Butte	Lassen	Plumas	Sierra	Yuba
2001	$866,419	$3,751,241	$7,024,648	$1,788,350	$231,268,
2002	$873,350	$3,781,250	$7,080,847	$1,802,657	$233,118
2003	$883,830	$3,826,626	$7,165,816	$1,824,289	$235,915
2004	$895,320	$3,876,372	$7,258,972	$1,848,005	$238,982
2005	$915,912	$3,965,528	$7,425,928	$1,890,509	$244,479
2006	$925,071	$4,005,183	$7,500,187	$1,909,414	$246,924
2007	$923,173	$3,996,963	$7,484,795	$1,905,495	$246,417
2008	$832,565	$3,604,665	$6,750,168	$1,718,472	$222,231
2009	$749,308	$3,244,198	$6,075,151	$1,546,625	$200,008
2010	$675,302	$2,923,783	$5,475,136	$1,393,872	$180,254
Total	$8,540,250	$36,975,809	$69,241,648	$17,627,688	$2,048,328

Timber Yield Taxes

The third source of revenues to local government is the timber yield tax, which is administered by the State Board of Equalization. The Forest does not pay this tax; instead, it is paid by private timber operators, based on the amount of timber harvested in a given year on both private and NFS lands. The tax is 2.9 percent of the value of the harvested timber. The taxes are collected by the state, and approximately 80 percent is returned to the counties from which the timber was harvested. The amount of revenues disbursed to the counties can be affected by decisions about the amount of timber to be offered for sale each year on the Forest. The volumes harvested from Plumas County indicate a downward trend with a notable positive shift of volume harvested from NFS lands in 2009, due to the salvage of timber from numerous fires. In Table 84 a downward trend of volume harvested on NFS lands has occurred since 1994 as reported by the Board of Equalizations tax records.

Table 84. Plumas County Percent of Volume from National Forest System Lands

Year	Percent
1994	37%
2005	15%
2006	22%

2007	11%
2008	10%
2009	29%

Source: California Board of Equalization

Plumas County in 2005 produced 107,817 mmbf of timber which is 6 percent of the volume produced in the State of California as documented in the California Department of Finance. According to the California Board of Equalization 15 percent of the volume from Plumas County came from NFS lands including the Forest Service; a total of 16 mmbf.

Timber Harvest Trends

The harvest of trees provides commercial and noncommercial wood products, such as sawlogs and biomass, to the local economy. Local sawmills that rely, at least in part, on logs from National Forest System lands include Sierra Pacific Industries in Quincy and Collins Pine Company in Chester. Figure 23 displays the volume of timber harvested on the PNF since 1978. Local sawmills have processed most of this volume although mills as far away as Weaverville and Roseburg have bid or purchased timber from the Forest.

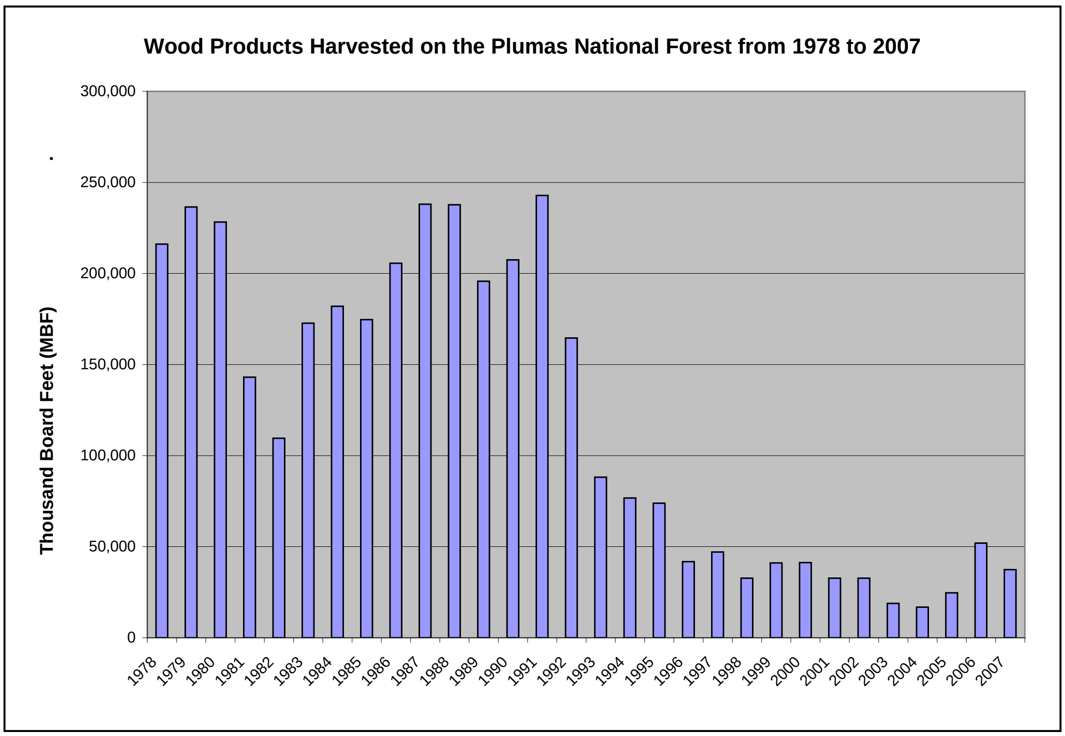


Figure 23 Annual Amount of Wood Products Sold on the Plumas National Forest from 1978 to 2007

Environmental Consequences

Alternative A – Proposed Action

Direct and Indirect Effects of DFPZ and WUI Fuels Reduction Treatments

Economic effects are determined by the value of products and services for each alternative (which includes the no action alternative) considered in this analysis. The level and mix of goods and services available to the public varies by alternative. The effects discussed in this section include estimated government expenditures for cost of services and revenues from the value of timber and biomass, as well as monetary impacts on local communities.

Direct monetary effects are discussed in terms of net cash value to the U.S. Treasury, including the costs associated with implementing the treatments; and direct, indirect, and induced job opportunities. In general, the monetary value of each alternative depends on the amount and method of timber harvest, type of treatment and the acreage planned for treatments.

The anticipated timber volume, value, costs, service treatment costs, and jobs, are displayed for all alternatives in Table 85. The revenue generated would also depend on the availability of logging equipment, haul distances to available mills, and fuel prices. This analysis assumes equipment cost and not full ownership of equipment, and hauling to the closest mill. However, haul to other mills is feasible as evidenced by past and current timber sales. Table 85, summarizes the economic effects to the local economy that would occur from implementation of alternative A, C, D, and E.

Table 85. Comparison of Economic Effects by Action Alternative

Revenue/Cost Employment	Alternatives			
	Alternative A	Alternative C	Alternative D	Alternative E
Sawlog Volume	10.37 mmbf	231 mbf	1.9 mmbf	15.48 mmbf
Biomass Volume	21,000 gt	24, 000 gt	13,000 gt	18,000 gt
Sawlog and Biomass Value (cost deducted)	$2,127,902	$556,180	$580,450	$3.001,415
Additional Operation Cost	$2,186,298	$1,442,220	$1,184,091	$2,453,130
Potential Advertised Value to the Government	$130,301	$2,772	$22,800	$202,488
Percent Above Value	-3%	-160%	-104%	18%
Fuels Reduction Project Costs	$5,496,675	$5,496,675	$5,334,351	$5,496,675
Potential Direct and Indirect Jobs	189	60	66	252
Potential Employee Income	$6,799,620	$2,161,134	$2,374,303	$9,082,986
Receipt Act Plumas County Estimate Collections	$32,575	$693	$5,700	$50,622

All action alternatives would create additional employment opportunities in service industries (such as logging supply companies, trucking companies, and fuel suppliers) that serve the timber industry. The local economy, driven by wages would improve stability for the small communities throughout the county. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses.Harvesting and forest health improvement treatments would generate 189 direct and indirect jobs with alternative A. Some of the other industries to benefit from activities associated with alternative A are retail, newspaper, data processing, banks, real estate, waste management, college, doctors, hospitals, child care services, lodging, electric power, and gas distribution.

This project would generate $1,595,051[1] in Federal Tax collections and $730,189[2] in state and local tax. The Keddie Ridge Project area would create an induced income of $2,537,185 throughout numerous business sectors and generate induced outputs of 18 percent of the total project inputs for other businesses in the community.Potential electricity produced from the biomass is 550 MWH with a potential retail value of $75,900. Table 86 displays the value generated by this alternative by industry, as well as the indirect effects and the induced effects on the local economy.

[1] “”Values generated through IMPLAN software an Economic Modeling Program

[2] “”

Table 86. Alternative A Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$3,918,422	$959,888	$784
Support activities for forestry	$5,498,075	$45,431	$499
Sawmill	$3,860,026	$285,285	$4,780
Transportation	$1,177,803	$57,855	$12,703
Other Business Sectors		$697,683	$2,522,419
Total value to Plumas County Economy	$14,454,326	$2,046,142	$2,537,185

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries used by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

This alternative would have a positive effect on the overall economic activity in Plumas County. This project would help provide stability and revenue to the manufacturing industry, farming industry (logging operators), transportation (haul trucks and equipment), and indirect industries (housing, food, education, etc.). Alternative A would help sustain employment for families and generate harvest revenues for local businesses and provide the state and county timber yield taxes. These collections would help the county provide services such as road maintenance and education. The saw-timber provided by the action alternatives contributes to the stability of local economy by providing a supply of wood products to local industries dependent on forest management activities. Refer to appendix D of this EIS for the complete economic analysis by alternative.

Alternative B – No Action

Under alternative B, no treatments would be implemented. There would be no implementation costs. Under the no action alternative, no funds would be generated for the U.S. Treasury or returned to local counties through the receipt tax. No additional employment opportunities or wages paid to primary and service industry employees would circulate through the local economy.

The no action alternative would result in a negative effect on the local industries that depend on service contracts or a steady supply of timber, as well as counties that use timber yield taxes to fund county programs. Local industries would have notably reduced opportunities related to forest management activities such as timber harvesting and forest health projects. Additionally, the local economy would not receive benefits from associated employment, such as in food, lodging, and transportation businesses. The unemployment rate could potentially stay constant throughout the year, at double the national unemployment rate. The income loss for families would trickle throughout the local economy affecting many of the local industries in a negative way.

The economic resiliency of Plumas County is low. The major industries manufacturing lumber, the logging operators, transportation, the Forest Service and the county are all inter-connected and represent nearly 40 percent of employment. If manufacturing of lumber is diminished or stopped, then all of these industries would be affected by the lack of production by the mill. There is not another industry which can carry the community through economic lows.

Throughout northern California, cumulative years of reduced timber harvesting activities (including those on federal lands) have resulted in the loss of infrastructure to complete such activities. The loss of such infrastructure, including local mill closures and corresponding loss of logging companies could significantly reduce or eliminate future economic and environmental opportunities from National Forest System lands. The Plumas National Forest is unique in that the infrastructure is still in place; however these industries in the county are experiencing numerous years of negative growth and may be faced with lay-offs, mill closures, and operators liquidating equipment. The loss of this industry will have a negative effect on managing NFS lands in a cost effective manner. The continuation of current conditions under alternative B would preclude and/or notably limit opportunities for long-term employment and rural community stability.

Alternative C – Non-Commercial Funding Alternative

The sole purpose of alternative C is to reduce hazardous fuels. The jobs generated would be from service contract providers with some harvesting jobs. This alternative would generate 60 direct and indirect jobs. Alternative C would have the least employment potential in comparison to the other action alternatives. This alternative is in strong support of forestry labor intensive opportunities in service industries (such as logging supply companies, and fuel suppliers) that serve the support forestry activities. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,259,732[3] in federal tax collections and $530,643[4] in state and local tax. The Keddie Ridge Project area would create induced income of $581,108 for other business sectors in Plumas County. This project would generate induced outputs for the business sectors of 26 percent of the total project inputs. Table 87 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Potential electricity produced from the removed biomass is 600 MWH with a retail value of $82,800. Some of the other business sectors to benefit from activities associated with alternative C are similar to alternative A, housing, food, and education.

3 “”
4 “”

Table 87. Alternative C Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$960,270	$199,996	$628
Support activities for forestry	$5,496,675	$10,988	$400
Sawmill	$745,239	$55,821	$3,825
Transportation	$499,290	$16,376	$10,165
Other Business Sectors		$228,062	$2,015,277
Total value to Plumas County Economy	$7,701,474	$511,243	$2,030,295

Values generated through IMPLAN software an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Alternative D – 2001 SNFPA ROD Consistent

Alternative D is predominantly forest health and hazardous fuels reduction treatments with timber product removal. The jobs generated would be from service contract providers with some harvesting jobs. This alternative would generate 66 direct and indirect jobs. Alternative D would have slightly larger job creation in comparison to alternative C. This alternative is in strong support of forestry labor intensive opportunities in service industries (such as logging supply companies, and fuel suppliers) that serve the support forestry activities. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,193,944[5] in federal tax collections and $498,524[6] in state and local tax. The Keddie Ridge Project area would create induced income of $554,297 for other business sectors in Plumas County. This project would generate induced outputs for other business sectors of 27 percent of the total project inputs. Table 88 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Energy that may be produced from the removed biomass is approximately 325 MWH of electricity with a retail value of $44,850. Some of the other business sectors to benefit from activities associated with alternative D are similar to alternative A include food, housing and education.

5 “”
6 “”

Table 88. Alternative D Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$783,903	$158,357	$599
Support activities for forestry	$5,334,351	$8,961	$381
Sawmill	$580,450	$43,571	$3,649
Transportation	$383,308	$12,957	$9,696
Other Business Sectors		$187,543	$1,922,299
Total value to Plumas County Economy	$7,082,012	$411,389	$1,936,624

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Alternative E – 2004 SNFPA ROD Consistent

This alternative has a mix of harvesting and forest health improvement treatments. The jobs generated would be from service contract providers, the logging sector and manufacturing sector. This alternative would generate 252 direct and indirect jobs. This alternative is similar to alternative A in support of forestry labor intensive opportunities and the manufacturing of lumber. Wages paid to workers would circulate through the local economy for food, housing, transportation, and other living expenses. This project would generate $1,561,911[7] in federal tax collections and $698,403[8] in state and local tax. The Keddie Ridge Project area would create induced income of $683,886 for other business sectors in Plumas County. This project would generate induced outputs for other business sectors of 20 percent of the total project inputs. Table 89 displays the value generated by this alternative by industry and the indirect effects and the induced effects on the local economy. Energy that may be produced from the removed biomass is approximately 450 MWH of electricity with a retail value of $62,100. Some of the other business sectors to benefit from activities associated with alternative E are similar to alternative A, are food, education, and housing.

7 “”
8 “”

Table 89. Alternative E Output Impacts on Expenditures by Industry in Plumas County

Industry	Direct Effects[4]	Indirect Effects[5]	Induced Effects[6]
Commercial Logging	$1,935,785	$712,288	$738
Support activities for forestry	$5,496,675	$24,806	$470
Sawmill	$3,260,992	$238,207	$4,502
Transportation	$1,291,108	$49,325	$11,963
Other Business Sectors		$610,372	$2,371,710
Total value to Plumas County Economy	$11,984,560	$1,634,998	$2,389,383

Values generated through IMPLAN software, an Economic Modeling Program
[4]Direct Effects represents the impacts for the expenditures and/or production values specified as direct final demand changes.
[5]Indirect Effects represents the impacts caused by the iteration of industries purchasing from industries resulting from direct final demand changes.
[6]Induced Effects represents the impacts on all local industries caused by the expenditures of new household income generated by the direct and indirect effects of direct final demand changes.

Heritage Resources

History of the Project Area

General Prehistoric Overview for the Plumas National Forest

The following is a broad historical overview of the human or heritage mechanisms that have influenced the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project). Ecosystem models based solely on biological and physical elements often disregard the complex interaction between humans and their environment. More than any other phenomenon, heritage landscapes provide a unique opportunity to interpret the history of the effects humans have had on the environment. Together, natural and heritage influences have shaped the overall character of the project vicinity. Prehistory Period is defined as generally from 8,000 years ago to the 130s. Historic Period is defined as generally between the 1930s to 50 years ago.

Prehistory Period

Archaeological studies on the Mt. Hough Ranger District have primarily been limited to heritage resource inventories for proposed Forest Service activities. Intensive archaeological research in the Keddie Ridge Project area, allowing for a refined definition of prehistoric complexes and establishment of a reliable heritage chronology,is sparse. Therefore, heritage assessments and interpretations for the Keddie Ridge Project area rely upon extrapolations from several studies that were completed for lands adjacent to the Keddie Ridge Project area.

Archeological investigations on the Plumas National Forest have revealed Native American occupation spanning at least 8,000 years. Heritage resources include flaked-stone artifact scatters, which reflect resource procurement activities and seasonal campsites, habitation sites with cultural deposits, and in some instances, house pits.

Only a few projectile points have been identified within Plumas County that date to the Paleo-Indian period between 9000–6000 B.C. (Nilsson et al. 1996). Later assemblages are summarized under two comprehensive archaeological periods, the Archaic Period and Emergent Period. These two periods date between 6000 B.C.–A.D. 500 and A.D. 500–Historic Contact, respectively. The Archaic is also generally divided into Lower (6000–3000 B.C.), Middle (3000–1000 B.C.), and Upper (1000 B.C.–A.D. 500).

Prehistoric material culture in the northern Sierra region of California has been further categorized according to local chronologies that define technological, economic, social and ideological elements. This northern Sierra region includes the drainages of the upper Feather, Yuba, Bear, and American Rivers and Lake Tahoe. The Martis-Kings Beach chronological sequence was first developed by Heizer and Elsasser (1953) after an extensive survey of the area around Lake Tahoe. The sequence was revised later by Elsasser (1960), Elston (1971), Elston et al. (1977), Humpreys (1969), Ritter (1970), and Elsasser and Gortner (1991).

The Tahoe Reach chronological sequence by Elston et al. (1977) has been adopted and used by the majority of archaeologists working in the north-central Sierra mountains and foothills, though questions have been raised about its validity (for example refer to Jackson et al. 1994). Some of these issues were examined recently by Basgall (2003). A second chronological scheme (Mesilla-Bidwell-Sweetwater-

Oroville-Historic) was developed for the west slope of the Sierra foothills, summarized by Ritter (1970) based on work at Lake Oroville, and later by Kowta (1988) based on his work at Lake Almanor. Prehistoric influences from both the high Sierra and Great Basin to the east (Martis Complex) and from the Sacramento Valley to the west have been recognized within this western foothill sequence. Recently, for example, as a result of shoreline surveys at Lake Almanor, Compas (2003) identified Martis, Mesilla, Sweetwater, and Kings Beach assemblages, among others.

Although assemblages earlier than the Martis Complex (Spooner and Tahoe Reach phases) have been tentatively identified as part of the Tahoe Reach sequence (Elston et al. 1977), the Martis Complex is the earliest well-documented phase. The sequence attempted to show continuity in development of culture, using projectile point typologies, from the Martis and Kings Beach complexes through ethnographic times. Using this argument, the Kings Beach is taken to represent the Washoe, with ancestral Washoe represented by the Martis Complex (Elston et al. 1977; Kowta 1984). This assessment, however, is not universal (Moratto 1984). Elston and others also suggest that prehistoric occupation of the Sierras may have occurred as a result of the movement westward of peoples from the Great Basin. Kowta (1988) suggested Penutian-speaking peoples from the east displaced indigenous Sierran Hokan speakers about A.D. 1000.

The seven phases of the Tahoe Reach sequence (Elston et al. 1977), which spans most of the Holocene, are summarized in Table 90. The Martis and Kings Beach complexes account for five of the seven phases; these two complexes are detailed below.

Martis Complex (2000 B.C. – A.D. 500)

This well-documented complex has been identified from the Lake Tahoe area, extending northward into Plumas and Lassen Counties, as well as southward into Alpine County (Elsasser 1960). Radiocarbon dates and obsidian hydration measurements indicate the complex was present from 2000 B.C. to A.D. 500 (Elsasser and Gortner 1991). Excavation of Martis Complex sites included the Chilcoot Rockshelter in Plumas County (CA-PLU-44; Payen and Boyolan 1961). Characteristics of the Martis Complex include an emphasis on hunting and seed collecting. Projectile points were large, heavy, and roughly flaked; they also varied in form (although they resemble Great Basin forms, including the Elko series). An abundance of distinctive tool forms included finger-held drills or punches, large biface blades and cores, spokeshave-notched tools with a concave edge, and basalt pressure-retouched flake “scrapers.” For the manufacture of flaked tools, there was an apparent preference for using local basalt other than chert or obsidian. The milling equipment used to process seeds was predominantly grinding slabs and handstones.

Table 90. Cultural Phases of the Tahoe Reach Chronology

Age	Phase	Characteristics	Climate
A.D. 1200–Historic Contact	Washo-Late Kings Beach	Desert Side-notched and Cottonwood Series points, chert cores, utilized flakes, and other small chert tools.	Neoglacial; wet and cool but with little summer precipitation
A.D. 1200–500	Early Kings Beach	Eastgate and Rose Spring series points, chert cores, utilized flakes, and other small chert tools.	Nonglacial; dry, trees growing in former bogs; Tahoe does not overflow often
A.D. 500–500 B.C.	Late Martis	Corner-notched and eared points of the Martis and Elko series Large side-notched points Large basalt bifaces and other basalt tools.	Neoglacial; wet but not necessarily cooler, increased summer precipitation
500 B.C?–1500 B.C.	Middle Martis	Steamboat points, other types in Elko-Martis series Large basalt bifaces and other basalt tools.	Possible warm, dry interval centered on 1500 B.C.
1500–2000 B.C.	Early Martis	Contracting stem points of the Elko-Martis series Large basalt bifaces and other tools. Light-colored basalt artifacts	Beginning of Meditherimal; Neoglacial, wet but not necessarily cooler, increased summer precipitation; Tahoe begins to overflow
2000–5000 B.C.	Spooner	Point in the Pinto and Humboldt series, light-colored basalt artifacts.	Altithermal; generally hot and dry; Tahoe does not overflow for long periods of time
6000 B.C.	Tahoe Reach	Parman points.	Anathermal; warming trend, climate similar to later Neoglacial intervals

The most important mountain valleys inhabited by the Maidu included American, Big Meadows (now under Lake Almanor), Butt, Genesee, Indian, Mountain Meadows, and Red Clover (Riddell 1978). One or more permanent villages were established in these valleys, winter weather permitting. Occupation was restricted to seasonal use in other valleys, including Sierra and Mohawk. The nearest recorded Maidu villages to the Keddie Ridge Project area would have been Tse'lim-nah and Yow'-koo, located in the North Arm of Indian Valley.

Political organization of the Maidu was limited to a settlement pattern of village communities (Kroeber 1925; Riddell 1978). A central village housed a circular, semi-subterranean ceremonial assembly structure and the home of the community spokesman. A community was composed of 3–5 villages, and the villages were apparently self-sufficient. Kroeber (1925) estimated village size as less than 200. Houses were either semi-subterranean or conical bark structures. Because of water discharge during the spring and summer snowmelt, villages were situated on the edges rather than the center of the valleys. Each village community owned and defended their common hunting and fishing grounds near these mountain valley settlements. Some fishing holes and deer fences were owned by individual families and inherited by male descendants.

The fundamental economy of the Maidu was one of subsistence hunting, fishing, and collecting plant foods in an area where abundant natural resources varied seasonally (Riddell 1978). Acorns were a dietary staple, and were collected from oak groves at lower elevations. Oak varieties in the area included the black oak (*Quercus kelloggii*), canyon or golden oak (*Q. chrysolepis*), and interior live oak (*Q. wislizenii*). The Maidu gathered nuts from the sugar pine and yellow pine and ate them raw or cooked into a soup or patties. In the northeastern part of their territory near Susanville, nuts from the huckleberry oak (*Q. vaccinifolia*) and bush chinquapin (*Chrysolepis sempervirens*) were also collected. Other vegetal resources included (*Corylus cornuta var. californica),* hazelnuts, buckeye nuts, wild nutmeg, grass seeds, berries, and underground roots and bulbs. Roots included camas, Indian root, cattail root, and tule root. Camas roots were harvested early in the summer and roasted in rock-lined cooking basins (Waechter 2005). Salmon, eel, birds, waterfowl, grasshoppers and other insects, as well as large and small mammals, were also consumed. Large animals included deer, elk, and grizzly bears.

A wide variety of tools, implements, and enclosures were employed by the Maidu to gather and collect food resources. These included the bow and arrow, traps, nets, slings, snares, clubs, and blinds for hunting land mammals and birds; salmon gigs, traps, and nets for fish. During communal drives, deer were driven over cliffs or shot by concealed hunters. Woven tools, including seed beaters, burden baskets, and carrying nets, as well as sharpened digging sticks, were used to collect plant resources. Snowshoes were used for winter travel, and dugout canoes or log rafts for navigating or crossing the mountain waterways (Riddell 1978).

The Maidu processed food resources with a variety of tools, including portable stone mortars, bedrock mortars and pestles, anvils, woven strainers and winnowers, leaching baskets and bowls, storage baskets, woven parching trays, wooden mortars, and knives. Baskets were either coiled or twined. They also traded between neighboring Konkow for various resources and implements, and with the Achumawi for beads, obsidian, money beads, and green pigment dye.

Log drums, rattles, flutes and whistles accompanied Maidu ceremonial dances. Mortuary practices among the Maidu included extended burials, generally facing east, that were accompanied by grave offerings (Riddell 1978).

Maidu lifestyles were little affected by exploration into mainly Konkow territory by Spanish explorers and missionaries of the early 1800s. Fur trappers and explorers introduced malaria and other diseases including the great 1833 Sacramento Valley epidemic. After the discovery of gold in 1848 at Sutter's Mill, tens of thousands of gold seekers brought diseases previously unknown in the area. In addition, the concentration and increase in population resulted in the concentration of diseases, decimating the Maidu population. The results were devastating and included the loss of land and territory, including the traditional hunting and gathering locales, violence, malnutrition, and starvation. The Maidu then worked for miners for low wages. The Maidu were forcibly marched to the Round Valley Reservation in 1863, with few provisions or water over a long, hot dry trail. By 1910, estimates indicate the Maidu population had been reduced to only 200 individuals from perhaps 2,300 prior to contact (Kroeber 1925; Riddell 1978).

Today, a small percentage of Maiduan people live on seven Rancherias (Auburn, Berry Creek, Chico, Enterprise, Greenville, Mooretown, and Susanville) and the Round Valley reservation, located in Plumas and Butte counties. The Greenville Rancheria was restored to federal recognition in 1983, and three or four of the original land allotments were also restored to its members. Nearly 200 members are serviced today by this federally recognized group in Greenville, Plumas County.

Historic Period

Early Period, General California History and Specific to the Keddie Ridge Project area

Following the settlement of San Diego in 1769, the Spanish made steady progress in the exploration and settlement of the coastal regions of California. The Central Valley, however, remained largely uncharted. Spaniards made occasional forays into the San Joaquin Valley in pursuit of natives who had fled the forced labor imposed on them at coastal missions. Between 1804 and 1823 the Spanish made numerous trips into the Valley prospecting for new mission sites, attempting to recover stolen horses and cattle, or making punitive raids on the local natives believed responsible for the theft of livestock. In 1820 the Feather River was named by a Spanish exploration party heading up the Sacramento Valley, led by Captain Louis A. Arguello. After spying many waterfowl feathers floating up the water of the river, the party dubbed the watercourse Rio de las Plumas. Subsequent to 1820, Spain's control over California grew ever more tenuous.

A law was passed on September 13, 1813 for secularization of the missions of California. However, at that time there was no expectation that this law would be acted on or enforced (Caughey 1953). That same year Mexican forces prevailed in their struggle for independence and declared California part of the Mexican state. This event marked the beginning of the short-lived Mexican period in California history. Governor Figueroa, by proclamation on August 9, 1834 ordered ten missions secularized. Half the property was to be distributed to the Indians; however, they were not given power to dispose of it and were required to work on "essential community enterprises" (Caughey 1953). The final blow for the missions came in 1844 when Governor Micheltorena ordered the disposal of the remaining mission properties (Caughey 1953). With the decline of the mission came the rise of the ranchos. These Spanish land grants, which were really Mexican, were known as ranchos and encompassed hundreds of acres. Little attention was paid to boundaries (Caughey 1953). The ranchos enriched those fortunate enough to receive one, while effectively subjugating the native labor forces.

Exploration and Settlement

The opportunity to establish an American presence in the interior of California was seized in the decades after Jedediah Smith blazed an overland trail in 1826. Subsequent American settlement of the region was enabled, in large part, by the introduction of exotic diseases that decimated the native populations of California. Early Euro-American pioneers to brave the difficult overland routes to California are exemplified by the Bartleson-Bidwell Party of 1841, the John Work party of 1833 (Englich fir trappers) and the Stevens-Murphey Party of 1844.

In 1839, Swiss emigrant John A. Sutter established a permanent settlement in the Sacramento Valley. In 1841 Sutter applied for and was granted eleven leagues of land near the confluence of the American and Sacramento Rivers where he established the settlement of New Helvetia. In short order he built a small colony which served as the nucleus for economic and political activity in the Sacramento Valley (Hoover et al. 2002). In 1848 Sutter relinquished control of his property to his son, John A. Sutter, Jr.

With the aid of Captain William A. Warner, the younger Sutter laid out the town of Sacramento on the eastern bank of the Sacramento River. That same year gold was discovered in the millrace of Sutter's Mill at Coloma, sparking a massive migration into California as thousands rushed to the goldfields. The California Gold Rush, which fed the economic vitality of northern California, further fueled the decline of the native populations. As thousands rushed to California in search of gold and established businesses, the local indigenous population was overwhelmed and displaced.

In 1848, Peter Lassen and his associate, Isadore Meyerwitz, passed through what is today Plumas County (Fariss and Smith 1882). Later that year Lassen began promoting his route over the Sierra to the goldfields beyond, which traversed Plumas County. The route was variously referred to as Lassen's Cut-off, the Lassen Road, and Lassen's Horn (Fariss and Smith 1882). While many emigrants opted for Lassen's Cut-off in the first year following the discovery of gold at Coloma, prospecting within the streams and rivers of the county would not be successfully conducted until June 1850 (Fariss and Smith 1882). Further down the Feather River, John Bidwell directed a number of Native Americans in his employ to begin working the gravels on his rancho near Chico in 1848, after visiting Coloma (Caughey 1953).

In 1850, Peter Lassen and an associate were the first to establish a settlement in Indian Valley. At the north margin of the valley, immediately south of the Keddie Ridge Project area, they build a small cabin that would serve as a trading post. The men named the broad expanse that lay before them "Caché Valley," although the name did not stick. The Noble party, passing through the area in 1851, referred to the area as "Indian Valley" for the significant population of Maidu people living there. Lassen and his associate took to cultivating the valley and raised a number of vegetables to be sold at their trading post.

In March of 1852 a settlement at Taylorsville was established. During the next few years Indian Valley grew appreciably, and large portions of it were claimed for agriculture. Taylorsville was the site of much of the activity, and it was there that the first sawmill and grist mill were established in the valley in 1855 and 1856, respectively. A private school was opened in 1859, and by 1863 a public school had been built (Fariss and Smith 1882.

Greenville was established to support the thriving quartz mines being operated in its vicinity. The most important mines at the time of Greenville's founding included the Bullion, the Lone Star, and Ellis mines. A four stamp mill was built at Greenville in 1862 by Alfred McCargar, and the town eventually grew up around this location. By 1882 Greenville was home to roughly 500 people and a newspaper, a post office, a church, water-works, a physician, dentist, soda factory, boarding house, barbers, a market, wagon maker, shoemaker, blacksmiths, a sawmill, flour mill, saloons, restaurants, threes stores, and one large hotel (Fariss and Smith 1882). A third town in Indian Valley, Crescent Mills, was established early in the county's history as a quartz mining and processing center. Mining and milling of quartz ore were conducted up until 1926 (Hoover et al. 2002).

Plumas County was organized in 1854, by partitioning Butte County. An official survey and mapping of the recently formed county was authorized in 1871, to be carried out by the County Surveyor, Arthur W. Keddie. Keddie surveyed portions of Plumas County beginning in 1864, including the road between Indian and American Valleys. In addition, he surveyed a projected rail line connecting Oroville to Reno, Nevada. Finally settling in Quincy he served in his official capacity for a number of years (Fariss and Smith 1882).

The population of Plumas County (then still a part of Butte County) grew rapidly following the discovery of gold and the subsequent diversification of the economy. The population of the county in 1860 was 4,554 persons; by 1880 the population had grown by 35 percent to 6,180 individuals (Fariss and Smith 1882). During the 1860 census the population of Indian Valley was reported as 479; this included 362 White, 12 Chinese, and 105 Indian (Fariss and Smith 1882).

Mining in Plumas County

Plumas County has been blessed with an abundance of mineral wealth, which was the impetus for its settlement and early economic development. Mining provided the economic base that allowed other industries, such as agriculture and timber, to evolve in the county. The earliest placers worked in what is now Plumas County include diggings at Nelson's, Poorman's, and Hopkin's Creeks, as well as the vicinity of Rich Bar. Within a few years the easily accessible placer gold deposits were exhausted. New operations sprang up using hydraulic and drift mining techniques, which required much more capital expenditure and expertise. As a result, many of the small mining operations were unable to compete. Many immigrants left the goldfields to seek more steady work in the county's diversifying economy, or to chase new strikes elsewhere, such as the Comstock in Nevada.

Particular to the Keddie Ridge Project area, major gold-bearing quartz ledges were discovered in the Indian Valley area beginning in the early 1860s, which came to be known as the Cherokee Mining District. In 1862 the Green Mountain ledge was discovered near Crescent Mills, which led to greater mineral exploration in the area. The mine was owned by the Green Mountain Gold Mining Company, which also operated the Cherokee Mine near Round Valley and the Gold Stripe mine near Crescent Mills (Fariss and Smith 1882). Mining required a great deal of water, and it was generally supplied by ditches in Plumas County. Fariss and Smith (1882) report that by 1857 there were 45 miles of ditch in the county; by 1880 that figure had reached 1,000 miles county-wide.

Gold mining continued to be the dominant industry in Plumas County until the turn of the twentieth century, when it began to lose ground to other industries such as timber production. Copper deposits discovered in Plumas County in 1865 had not yet begun to turn the economic tide back towards mining due to the relatively low value. Around the turn of the century, the value of copper had increased and one entrepreneurial family was poised to take advantage. The Engels family, led by Henry Engels, had worked for many years to establish a copper mining operation in Lights Canyon, and in 1906 incorporated the Engels Mine. The region experienced a boom in copper production roughly between 1915 and 1930, and Plumas County was the state's largest producer. The Engels Mine proved to be very successful, and led to the construction of the first rail line in Indian Valley. The town of Englemine developed around the operation and was home to roughly 1,200 people in the 1920s. The Engels Mine closed in 1930 (Foote 1991; Smith 1970; Young 2003).

Other significant copper mines operated in the region, notably the Walker Mine. Located about halfway between Grizzly Valley and Genesee, the Walker Mine produced more than $23 million in copper ore in more than three decades of operation. Discovered in 1904, the Walker Mine began producing sizable quantities of copper in 1911. A nine-mile tramway was completed in 1919 to transport ore to a Western Pacific siding in Spring Garden near Quincy. A company town sprang up around the mine, known as Walkermine, owned by the Anaconda Copper Mining Company. The mine and adjacent town went into rapid decline with the sharp drop in copper prices in 1939. By 1941 the mine had shut its doors for good (Bullard-Watson 2006).

Like many places in the Sierra Nevada, Plumas County experienced a resurgence of small-scale gold mining during the Depression. Known as "Snipers", disenfranchised people looking to make enough money to eat, returned to the hills of Plumas County to unearth small amounts of gold. Despite the small resurgence, gold mining never regained the prominent position it once held in the county's economy.

Transportation

In the formative years of the county, there were two primary transportation routes from theCentral Valley to the gold mines and population centers. The two routes are described by Fariss and Smith (1882): "one from Marysville, through Strawberry Valley to Onion Valley, and the Middle Fork of the Feather River, and thence on to American Valley; and one from Bidwell's Bar to Buck's Ranch, Spanish Ranch, American and Indian Valleys, and the mines on the North Fork and East Branch. The former was the first one opened, but the latter has been the most important." The early routes were little more than trails and travel proved difficult. In subsequent years wagon roads were established that made travel easier, thus contributing to the economic health of the area by providing for the transportation of goods. Early wagon roads were private ventures that relied upon tolls to recoup the costs of construction and maintenance. Early notable wagon roads in the region included the Quincy and Spanish Ranch Wagon Road, the Pioneer Wagon Road, the Plumas Turnpike, the Chico and Humboldt Wagon Road, Quincy and Indian Valley Wagon Road, the La Porte and Quincy Wagon Road, and the Red Clover Wagon Road.

In 1849, James Pierson Beckwith (Beckwourth) an African American explorer, was operating a trading post in Sonora, but the next spring he joined the search for a "Gold Lake" said to be somewhere in the northern part of the state. This prospecting trip lead directly to the development of the Beckwourth Trail. In 1850, he discovered a new pass over the Sierra Nevada. In 1854 Beckwith related his life story to Thomas D. Bonner and at the same time changed the spelling of his name to Beckwourth. Crossing the Sierra Nevada was an arduous and dangerous task, so the discovery of the lowest pass across the range, at a mere 5,221 feet in elevation, was an important accomplishment. The Beckwourth Trail branched off from the main California Trail at Truckee Meadows (site of Sparks in Reno, NV) and ended in Bidwell's Bar (mining camp now under waters of Lake Oroville) (Plumas County Visitors Bureau, Oregon-California Trails Association, Plumas National Forest, n.d.).

As mentioned above, the success of the Engels Mine led to the creation of the Indian Valley Railroad, which was built to haul ore from the mine to a siding at Paxton. The standard gauge railroad operated from 1917 – 1938 (Fickewirth 1992). Following the closing of the Engels Mine in 1930, the line continued carrying passengers until 1938. On December 1, 1909, Western Pacific Railroad inaugurated through freight service. Prior to this there had been local freight service between Salt Lake City and Shafter for the Nevada Northern Railroad connecting to the mines in Ely, Nevada. Passenger service did not operate until late summer of that year. There was much fanfare in the towns along the line. DeNevi states that "In Quincy, where the original concept came into fruition, Authur Keddie, now 68 years old almost wept as he spoke in enthusiastic welcome from the courthouse steps" (DeNevi 1978). The Northern California Extension of the Western Pacific Railroad, which was known as the "Inside Gateway," consisted of a 112 mile section through some of the most rugged and isolated sections of California. This section of line between Keddie and Bieber was completed on November 10, 1931 in order to provide the Western Pacific Railroad (in connection with the Great Northern Railroad), a north/south route, competitive with the Southern Pacific Railroad (DeNevi 1978).

Agriculture and Timber Production

After the founding of Taylorsville, agriculture came to play a major role in the economy of Indian Valley. The fertile soil on the valley floor, which was fed by the many tributaries to Indian Creek, had to be reclaimed before farming and ranching could take place on a large scale. By 1853, Indian Valley was on its way to becoming a significant producer of cereal crops as people realized that the mountain valleys of Plumas County were well suited to growing wheat, oats, and barley. By 1855 a variety of agricultural products were being produced by the county including corn, potatoes, hay, butter, cattle, swine, sheep, beer, apples, pears, peaches, and honey (Fariss and Smith 1882). Cattle were raised to provide beef and dairy products. The first flourmill was built in Indian Valley at Taylorsville in 1856, and was followed by a second mill in Greenville.

Timber production in Plumas County dates back to the Gold Rush when wood for flumes, wing dams, and structures was in high demand. The first lumber mill was established by J.B Batchelder at Rich Bar to serve the booming mining community. The development of quartz mines in places like Greenville contributed to the steady demand for the commodity. Early timber operations were small, with a fairly local market (Young 2003).

One of the first companies to acquire significant amounts of timberland in the county was the Reno Mill and Lumber Company, who amassed more than 7,000 acres of forest by 1889 (Young 2003). The industry grew gradually until 1909 when the Western Pacific Railroad was completed in Plumas County and the timber industry expanded rapidly. A number of small, narrow gauge railroad lines were built into the heavily timbered hills of the county to extract the valuable resource. The steam donkey arrived in Plumas County in the early twentieth century, thus making even more timber available for the busy mills. From that point on, timber was the dominant industry in the county and continues to be an economic force to this day (Young 2003).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Section 110 of the National Historic Preservation Act (NHPA) requires the federal government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies use the Section 106 process associated with the National Historic Preservation Act (NHPA). Passed by Congress three years before the National Environmental Policy Act (NEPA), the NHPA sets forth a framework for identifying and evaluating historic properties and assessing effects on these properties. This process has been codified in 36 Code of Federal Regulations (CFR) 800 Subpart B. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8.

NEPA includes reference to ". . . important historic, cultural, and natural aspects of our national heritage." This terminology includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l)(1)). Therefore, agencies use the NHPA Section 106 process to consider, manage, and protect historic properties during the planning and implementation stages of federal projects. The Plumas National Forest uses the Regional Programmatic Agreement (RPA) to implement the Section 106 process.

Additional direction is provided by *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement (June 2004).*

Effects Analysis Methodology

Specific Methodology

The heritage resources geographic analysis area is the Keddie Ridge Project area (6,160 acres)., also the Area of Potential Effect (APE). Area of potential effects as defined by 36CFRPart 800.16(d) means the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking. An Undertaking as defined by 36CFR800.16(y) means a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approvalThis boundary was chosen because sites within the Keddie Ridge Project area would be protected during the implementation of the action activities. The temporal boundary is determined by the life of the project. This boundary was chosen because sites within the Keddie Ridge Project area would be protected during the implementation of any of the action activities.

Three levels of analyses were completed to understand the significant themes and extent of heritage resources associated with the Keddie Ridge Project. First, research into the greater history of the Keddie Ridge Project area was conducted to understand historic themes or events that have transpired in time and space (refer to the "History of the Project Area" section above). Second, a heritage resource survey was conducted for the Keddie Ridge Project area to identify heritage properties associated with these themes. Lastly, heritage properties were assessed to determine potential effects associated with implementation of the project. The results and relevant rationale for each of these analyses are presented below. Inventory survey methodology consisted of pedestrian transect spacing of 0-20 meters (Complete), 20-40 meter transects (General), and 40-60 meter transects (Cursory).

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past

actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

Affected Environment

The majority of the Keddie Ridge Project area was previously surveyed during thirty three earlier projects (3,742 acres). The remaining 2,418 acres of the Keddie Ridge Project area were inventoried in 2006, 2007, and 2010 by Pacific Legacy Inc., the Plumas National Forest, and TEAMS Enterprise. Based on previous studies and the inventories conducted for this undertaking, the entire area has been adequately assessed for heritage resources. All identified heritage resources have been fully recorded and are on file at the Mt. Hough Ranger District office.

There are a total of forty-seven known heritage resource sites (historic properties) located within the Keddie Ridge Project area. Thirty-six of these sites are located within proposed treatment units. Ten sites are not located within treatment units but are located within the Keddie Ridge Project area. One site is located both within and outside of a Treatment Unit and is also located within the Project area. Of the 47 known heritage resource sites, three are classified as prehistoric; one is classified as multi-component (both prehistoric and historic attributes); and 43 sites are classified as historic. The prehistoric sites consist of bedrock mortars, a traditional bear grass gathering site, and a village site. The multi-component site consists of house depressions and a historic artifact concentration. The historic sites consist mainly of artifacts and features associated with mining activities that took place within and adjacent to the project area. All known heritage resources within the Keddie Ridge Project area of potential effect (APE) were field visited and the site boundaries flagged with the exception of three sites within three of the treatment units.

Treatment units 68, 72 and 79 are slated for hand thinning, piling and burning. Two of the units contain large mining complexes and one of the Units contains a town site. Within these large historic sites, there are areas devoid of heritage features where hand piles can be carefully placed without affecting the integrity of the heritage resources. Each of the features has been flagged for avoidance within the heritage resource site boundaries. In addition, an Archaeologist from the Mt. Hough Ranger District Heritage Resources Staff will be on site monitoring placement of hand piles within Units 68, 72 and 79. Vegetation treatment within site boundaries is allowed under certain conditions stated in the *Standard Resource Protection Measures V.B.8, Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects* (June, 2004). A total of 53 isolated finds were recorded in 2006 and in 2010. Isolated finds are not heritage resource sites (historic properties) and therefore require no protection. Isolated finds are defined as single artifacts, a small group of a few artifacts no associated with a larger heritage resource site or single archaeological features.

Native American Consultation

Consultation was initiated on March 31, 2010 with the following tribes: Honorable Gary Archuleta (Chairman, Concow Maidu tribe of Mooretown Rancheria), Honorable Glenda Nelson (Chairwoman, Estom Yumeka Tribe of Enterprise Rancheria), Honorable Kyle Self (Chairman, Greenville Indian Rancheria), Honorable Stacy Dixon (Chairman, Susanville Indian Rancheria), Honorable Jim Edwards (Chairman, Tyme Maidu Tribe of Berry Creek Rancheria), and the Honorable Waldo Walker (Chairman, Washoe Tribe of Nevada and California). In addition, consultation was initiated with Lorena Gorbet (Chairwoman, Maidu Cultural and Development Group).

Responses to Native American Consultation

Responses were received from Mike DeSpain, (Director of the Office of Environmental Plannning and Protection, Mechoopda Indian Tribe of Chico Rancheria, California), Melany Johnson (Tribal Historic Preservation Officer, Susanville Indian Rancheria) and Ren Reynolds (Environmental Coordinator Estom Yumeka Tribe of Enterprise Rancheria).

Herbicide Use on Basketry Material Collectors

On June 10, 2010, a field trip to the Keddie Ridge Project area was undertaken. Two heritage resource sites were visited and the boundaries re-flagged at this time.

There is one known bear grass location south of Canyon Dam. No herbicides will be applied in or around the Canyon Dam bear grass areas. No other plant collection areas are known in the Keddie Ridge Project area. No weed infestations have been documented within Bear Grass collecting sites.

The hazards associated with the proposed herbicides and fungicide (aminopyralid, glyphosate, and borax) have been compiled in a group of risk assessments completed by Syracuse Environmental Research Associates (SERA 2003, 2006, 2007) and are incorporated by reference into this section. This risk assessment was completed for the entire USDA Forest Service. In addition, Appendix I presents project-specific results from an analysis conducted for the Keddie Ridge Project to further characterize the risk of herbicide exposure to members of the general public. One of the scenarios that produced a hazard quotient above one (i.e. had an elevated level of risk) was one that involved the consumption of glyphosate-contaminated vegetation. Under normal circumstances, particularly in the case of noxious weed treatment applications, it is extremely unlikely that humans will consume, or otherwise place in their mouths, vegetation contaminated with the proposed herbicides. One exception to this could be plants collected by Native Americans for basket weaving or medicinal use. However, in most instances, particularly for longer-term scenarios, treated vegetation would probably show signs of damage from herbicide exposure, thereby reducing the likelihood of consumption that would lead to significant levels of human exposure. In addition, there are no individuals with permits to collect in these areas, which further reduces the risk of exposure. Signs may also be posted prior and post herbicide application. All relevant federal, state, and local laws will be followed with respect to herbicide application. For a complete discussion of the risks associated with the proposed chemicals, refer to Appendix I.

Environmental Consequences

Direct and Indirect Effects (All Action Alternatives)

Heritage Resource site boundaries are flagged and the Standard Resource Protection Measures as outlined in the RPA (March, 2001) would be followed during implementation of any of the Action alternatives (Alternatives A, C, D and E). All artifacts and features would be avoided during project implementation therefore there would be no effect to heritage resources.

Cumulative Effects (All Action Alternatives)

Heritage resource sites will be protected using Standard Resource Protection Measures as outlined in the RPA. However, by protecting heritage resource sites from fuel treatments under all action alternatives, there may be a cumulative effect of creating islands of un-thinned, unburned fuels. These islands may burn hotter and longer that treated areas in the event of a fire.

In general, past, present and foreseeable future events have had cumulative effects of varying degrees on heritage resources. There is no substantive difference in cumulative effects predicted for heritage resources between the alternatives.

Alternative B – No Action Alternative

Direct and Indirect Effects

No project treatment activities would occur under the no action alternative; hence, there would be no effects on heritage resources.

Cumulative Effects

No project treatment activities would occur under the no action alternative; hence, there would be no effects on heritage resources.

Compliance with the Forest Plan and Other Direction

The effects of the project on heritage resource sites were assessed in compliance with Section 106 of the National Historic Preservation Act as mended (1966).

No effects are anticipated, since the following Standard Resource Protection Measures (SRPMs), *First Amended Regional Programmatic Agreement* (March, 2001) and *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement* (June, 2004) would be implemented, as appropriate, for all heritage resources within the Keddie Ridge Project area that could potentially be affected by project implementation. Application of the following SRPMs would result in the project having "no effect" on heritage resources (*First Amended Regional Programmatic Agreement* (March, 2001):

- All proposed activities, facilities, improvements, and disturbances shall avoid heritage resource sites. Avoidance means that no activities associated with the project that may affect heritage resource sites shall occur within a site's boundaries, including any defined buffer zones. Portions of the project may require modification, redesign, or elimination to properly avoid heritage resource sites.
- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
- When any changes in proposed activities are necessary to avoid heritage resource sites (e.g., project modifications), these changes shall be completed prior to initiating any activities.
- Monitoring during project implementation, in conjunction with other measures, may be used to enhance the effectiveness of protection measures.

From *Interim Protocol for Non-Intensive Inventory Strategies for Hazardous Fuels and Vegetation Reduction Projects Annex to Stipulation IX in the First Amended Regional Programmatic Agreement* (June, 2004):

- All heritage resource sites within the area of potential effect shall be clearly delineated prior to implementing any associated activities that have the potential to affect heritage resource sites.
- Buffer zones may be established to ensure added protection where the Forest or District Archaeologist determines that they are necessary. The use of buffer zones in conjunction with other avoidance measures are particularly applicable where setting contributes to the property's eligibility under 36 CFR 60.4, or where it may be an important attribute of some types of heritage resource sites (e.g., historic buildings or structures; historic or heritage properties important to Native Americans). The size of buffer zones needs to be determined by the Forest or District Archaeologist on a case-by-case basis.
- Fire crews may monitor sites to provide protection as needed.
- Fire lines or breaks may be constructed off sites to protect at risk historic properties.

- Vegetation may be removed and fire lines or breaks may be constructed within sites using hand tools, so long as ground disturbance is minimized, and features are avoided, as specified by the Heritage Resource Manager.
- Fire shelter fabric or other protective materials or equipment (e.g., sprinkler systems) may be utilized to protect at risk historic properties.
- Fire retardant foam and other wetting agents may be utilized to protect at risk historic properties and in the construction and use of fire lines.
- Surface fuels (e.g., stumps or partially buried logs) on at risk historic properties may be covered with dirt, fire shelter fabric, foam or other wetting agents, or other protective materials to prevent fire from burning into subsurface components and to reduce the duration of heating underneath or near heavy fuels.
- Trees which may impact at risk historic properties should they fall on site features and smolder can be directionally felled away from properties prior to ignition, or prevented from burning by wrapping in fire shelter fabric or treating with fire retardant or wetting agents.
- Vegetation to be burned shall not be piled within the boundaries of historic properties unless the location (e.g., a previously disturbed area) has been specifically approved by the Forest's HRM.
- Mechanically treated (crushed/cut) brush or downed woody material may be removed from historic properties by hand, through the use of off-site equipment, or by rubber-tired equipment approved by the HRM. Ground disturbance shall be minimized to the extent practicable during such removals.
- Woody material may be chipped within the boundaries of historic properties so long as the staging of chipping equipment on-site does not affect historic properties.
- The Forest's HRM shall approve the use of tracked equipment to remove brush or woody material from within specifically identified areas of site boundaries under prescribed measures designed to prevent or minimize effects. Vegetative or other protective padding may be used in conjunction with the HRM's authorization of certain equipment types within site boundaries.

Recreation

Introduction

The purpose of this section is to present a summary of the effects of the proposed project on developed and dispersed recreation. Less than one percent of the proposed Keddie Ridge Hazardous Fuels Reduction Project area falls within recreation areas. The Recreation Opportunity Spectrum (ROS) is used as an indicator to measure beneficial or adverse effects on recreation. The ROS class for areas within the recreation analysis area is identified in the Plumas National Forest Land and Resource Management plan (PNF LRMP) (USDA 1988).

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Federal Laws

Travel Management Rule

The 2005 Travel Management Rule requires that in designating National Forest System (NFS) roads, trails, and areas, responsible officials consider the provision of recreational opportunities; public access needs; conflicts among uses of NFS lands, including other recreational uses; and the compatibility of motor vehicle use with existing conditions in populated areas (36 CFR Part 212, Subpart B).

Forest Plan

The 1988 PNF LRMP provides goals, objectives, and management direction for recreation activities on the Plumas National Forest. The PNF LRMP was amended by the 1999 Record of Decision on the Herger-Feinstein Quincy Library Group Forest Recovery Act Final Environmental Impact Statement (EIS) and the 2004 Record of Decision on the Sierra Nevada Forest Plan Amendment Final Supplemental EIS. The PNF LRMP identifies standards and guidelines for the Indian Valley area, Round Valley Lake, and Keddie Ridge Restricted Vehicle Access Area. The actions proposed for the Keddie Ridge Project would need to meet PNF LRMP standards and guidelines in order to maintain recreational opportunities. The 1988 PNF LRMP classifies recreational opportunities for the Forest under the Recreation Opportunity Spectrum (ROS). ROS classes in the project area include “Semi-Primitive Non-Motorized,” “Roaded Natural,” “Rural,” and the majority of the project area falls under “Roaded Modified.” The existing condition of the landscape for the recreation analysis area is described in the “Forest Vegetation, Fire, Fuels, and Air Quality” section of this DEIS. Past management activities are common where recreation occurs, but a naturally appearing landscape still dominates the project area.

Sierra Nevada Forest Plan Amendment: Final Supplemental Environmental Impact Statement Record of Decision: Forestwide Standards and Guidelines (2004)

There are no Forest-wide standards and guidelines from SNFPA 2004 that are applicable to recreation.

Specific Methodology

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.(Refer to appendix F for past, present and future projects).

The geographic area analyzed for effects on recreation is the area in the immediate vicinity of the treatment units, haul routes, and roads proposed for reconstruction. The recreation analysis area boundary incorporates campgrounds, dispersed recreation areas, roads, trails, lakes, creeks, and vegetative landscape that could be affected by the activities listed under each alternative.

Data Sources

All the data displayed in the recreation analysis was obtained from the special use permit files, National Forest System records (trails, roads, etc.), and corporate and project GIS data (treatment areas, prescriptions, etc.) which is stored at the Mount Hough Ranger District.

Affected Environment

The Greenville Campground, and Indian Falls Interpretive Trail are developed recreation sites within the project area, but they are not in the vicinity of any treatment units and therefore will not be analyzed in this document. The Round Valley Recreation Area and the Peters Creek Trail are developed recreation sites within the recreation analysis area. The Round Valley Recreation Area has a “Roaded Natural” ROS class. The Roaded Natural ROS class is: “a predominately natural environment where resource modification and utilization practices are evident. Evidence of the sights and sounds of man is moderate and in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from sights and sounds of man” (USDA 1988). The Peters Creek Trail area has a “Roaded Modified” ROS class. The LRMP defines the Roaded Modified ROS class as: “those Roaded Natural areas that are also coded as Middleground, Background or Unseen, and Sensitivity Level II or III. This is the general resource management area of the Forest, typified by pick-up trucks and many miles of dirt and gravel roads. Other than trails and trailheads, virtually no improvements are present. Users experience low interaction” (USDA 1988).

The Round Valley Run, Indian Valley Century Bike Ride, and the Patriots Day Ride are three permitted, annual recreation events that occur partially or entirely within the project area. The Round Valley Fishing Derby is a Forest sponsored event.

- Round Valley Run/Walk-foot Race – The event route is around Round Valley Lake (5.3 miles) and also includes a walk along County Road 204 for two miles. This one day event date is scheduled for August and involves approximately 100 participants and hosts approximately 30 spectators.
- Indian Valley Century Bike Ride – This 100 mile bike ride begins in Greenville, continues to Genessee Valley, then to Boulder Creek Work Station and returns to Greenville. This one day event is scheduled for May, and involves approximately 100 participants and hosts approximately 40 spectators.
- Patriots Day Ride - This is a 100 mile horse endurance ride. This event is scheduled for September. and involves approximately 60 participants and 50 spectators. This event operates on existing Forest System roads and trails and is spread over two days. The event course will take place on both the Mount Hough and Almanor Ranger Districts, the latter of which is on the Lassen National Forest.

Currently there are 39 special use permits within the project area that include: road easements, power lines, railroad right-of-ways, waterlines, telephone lines, barn/shed, private residences, irrigation ditches, transfer stations, livestock areas, natural resource monitoring, weather stations, weather modification devices, storage yards, industrial microwaves, a campground concession permit, and recreation events. Most special use permits require maintenance of the permitted area by permittees and include activities such as hazard tree removal, brush removal, road and improvement maintenance.

Dispersed recreation activities within the recreation analysis area include camping, hiking, swimming, boating, fishing, wildlife watching, horseback riding, mountain biking, off-highway vehicle (OHV) use, snowmobile riding, ice skating, hunting, rock hounding, driving for pleasure, Christmas tree cutting, and firewood cutting.

There are two non-motorized system trails within the recreation analysis area, the Peters Creek Trail and the Round Valley Interpretive Trail. Annual trail maintenance work consists of logging out, maintaining water bars or other erosion control devices, and maintaining and replacing signs. Work is typically accomplished by Forest Service crews and volunteers.

Woodcutting for personal and commercial use is permitted throughout the recreation analysis area. In the past nine years it is estimated that approximately 20 percent of the Mt. Hough Ranger District’s fuel wood permit sales are within the project area. Approximately 25 percent of the Christmas tree cutting is within the project area.

Environmental Consequences

Alternative B – No Action

Direct Effects

There would be no direct effects on recreation under this alternative because there would be no change in current recreation opportunities or ROS classifications.

Indirect Effects

Alternative B would not cause any short-term indirect effects on recreation opportunities. However, taking no action could result in long-term effects on recreation opportunities due to the increased risk of large-scale wildfires and reduced forest health, which could degrade scenic landscapes within recreation areas.

In the absence of the proposed treatments, forested stands would continue to grow and become dense, resulting in increased fuels accumulation and elevated risk of severe wildfire. Depending on the scope and severity of a wildfire, this type of event could cause temporary or long-term closures to recreation areas and inconvenience the recreation user. In the worst case, fire damage could be so extreme that recreation areas could take several decades to recover; these situations could result in displacement of forest visitors due to destruction of recreation facilities or loss of access to trailheads and dispersed or developed campgrounds.

Past observations on the Plumas NF suggest that large-scale fires could have adverse effects on recreation opportunities for 20 to 30 years. For example, areas that burned in the recent Moonlight Fire near Antelope Lake can still be seen from Forest System roads and campgrounds. Vegetation in these areas has been slow to return and has created a barren-looking landscape. Corrals at the Antelope Trailhead were burned by the fire and fallen snags along the trail prevented equestrians and mountain bikers from using the trails for a several years until crews finished restoration work

Reduced forest health in over stocked stands can result in insect infestations which create hazard trees as well as diminish aesthetic values.

Alternatives A, C, D, and E

Direct Effects

The four action alternatives are very similar in their effects on recreation resources. Although alternatives A and D propose the use of two herbicides and a fungicide, the risk to Forest visitors is expected to be negligible. The Human Health Risk Assessment, completed for the Keddie Ridge Project (appendix I), provides a detailed summary of the low risk that these chemicals present to human health and safety. The ROS Roaded Natural and Roaded Modified both allow for resource modification and utilization practices being evident, therefore the ROS classification would not be directly effected.

Developed Recreation

All of the action alternatives would result in minor direct effects on developed recreation areas at Round Valley Reservoir. There is a total of 134 acres of mechanical and hand thinning treatments proposed around the Round Valley Reservoir (units 72, 73, 74, and 107). These treatment activities would require an increased presence of heavy equipment and logging trucks on National Forest System roads; however signs would be posted to alert visitors of potential safety hazards. The Interpretive Trail at Round Valley Reservoir would be closed temporarily during the treatment activities. Signs will be posted in advance to notify the public. Heavy equipment and logging trucks may be noisy at times, which could have a minor temporary effect on a visitor’s opportunity for a peaceful recreation experience.

Dispersed Recreation

The action alternatives would result in minor short-term direct effects on dispersed recreation activities. A total of 136 acres of treatment are proposed around the Peters Creek Trail (unit 84); treatments include hand thin, underburn, and herbicide application. The trail system would be closed for the duration of the treatment activities. Advanced placement of warning signs as a safety precaution would help reduce any potential impacts on recreation users. Treatment activities would have long-term beneficial effects on the Peters Creek trail by helping to reduce fuels buildup, reduce debris along the trail and improve forest health

Project implementation activities could displace visitors seeking to use dispersed camping areas or day use areas. This is considered a minor short-term effect since visitors could use other areas of the Forest. Advanced placement of signs as safety precaution would help reduce any potential impacts on recreation users.

Existing NFS maintenance level 2 roads within the recreation analysis area would be used during operations as haul routes. Currently these routes are open to all vehicles. Prior to operations these routes may be improved to facilitate logging trucks. These improvements are not expected to diminish the recreation experience, and would have a beneficial effect on the NFS roads within the recreation analysis area. The impacts to recreational users during operation on these roads would be temporary road closures, increased traffic, dust, and noise. Signs would be posted in advance to notify the public and help avoid any potential impacts on recreation users. This is considered a minor short-term effect since visitors can use other areas of the Forest.

Portions of NFS road 28N38A (0.6 miles) and non-system road (continuation of 28N38A) (0.4 miles) are proposed for decommissioning. The routes decommissioned with the Keddie Ridge Project would remain closed to all motorized traffic. These routes are not OHV routes and decommissioning them would not have any effect on recreation and minimal impacts on public access due to the fact that it is a small dead end spur.

Indirect Effects

The proposed treatments would reduce hazardous fuels and create a more diverse and fire-resilient forest, which would have an overall beneficial effect on recreation opportunities by helping to maintain and preserve the landscape of existing recreation sites and areas. Reducing hazardous fuels adjacent to Round Valley Picnic Area and Peters Creek Trail would likely reduce the risk of a wildfire that could threaten existing improvements. Reducing the risk of wildfire would help ensure that recreation opportunities for developed and dispersed recreation would be maintained at existing conditions.

Underburning in treatment units could cause short-term negative effects on visual quality in developed and dispersed recreation areas. Smoke caused by underburning could also affect recreation events such as the Round Valley Run, Indian Valley Century Bike Ride and Patriots Day ride; however these three events happen in May, August and September, when burning is generally prohibited or considered infeasible. Herbicide applications would not cause any indirect effects on recreation users and are expected to present a low risk to human health and safety as demonstrated in the Human Health Risk Assessment (Appendix I).

Cumulative Effects

Alternatives A, C, D, and E would have no long-term cumulative effects on recreation resources in the recreation analysis area. Although effects of past vegetation management activities are common in the recreation analysis area, the proposed DFPZ, area thinning, group selection, and fuels treatments would have minor long-term beneficial effects on meeting the desired conditions for recreation opportunities. The desired conditions are to provide forest-related recreation for the public with facilities: preserve, protect or improve the surrounding forest around all recreation sites. There may be minor short-term effects on view sheds from campgrounds, trails, or roads, but long-term effects would meet forest standards and guidelines for identified ROS classes. Future vegetation management projects in the recreation analysis area would likely reduce hazardous fuel conditions that could threaten recreation areas, facilities, and view sheds.

The thinning activities would have a beneficial effect of reducing the risk of wildfire and aesthetically improving the stands of trees. Improving forest health would insure that this area remains well stocked and pristine. These values promote and benefit recreation.

Range

Introduction

The range resource encompasses permitted livestock that are authorized to graze within an allotment boundary through a ten year Term Grazing Permit issued by the Forest Service. Included in the range resource are:

- permitted livestock;
- range improvements needed to manage the allotment including fences, gates, exclosures, cattle guards and water developments;
- the permittee, that is, the rancher who owns and manages the cattle;
- creeks and springs from which livestock drink;
- and forage (grass, forbs, and shrubs) eaten by permitted livestock.

Analysis Framework: Statute, Regulatory Environment, Forest Plan, and Other Direction

Regulatory Environment

The guidance for range management is provided in the Plumas National Forest Land and Resource Management Plan (PNF LRMP) (USDA 1988) as amended by Herger-Feinstein Quincy Library Group (HFQLG) Final Supplemental Environmental Impact Statement (FSEIS) and Record of Decision (ROD) (USDA 1999a, 1999b, 2003a, 2003b), and the Sierra Nevada Forest Plan Amendment (SNFPA) FSEIS and ROD (USDA 2004a, 2004b).

Effects Analysis Methodology

The analysis area for direct, indirect, and cumulative effects on range resources includes the Lights Creek Allotment. Effects were not considered for the Taylor Lake Allotment, which is currently vacant.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past

actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Affected Environment

The Plumas National Forest is divided into 67 allotments. An allotment is an area of land that has been designated for the permittee to graze their cows. The area of land contains both primary and secondary range. Primary range is land that is less than 40 degrees slope and produces more than 200 pounds of forage per acre. Secondary range is the timbered areas within an allotment. Transitory range can be created when timbered areas are treated. Keddie Ridge Project treatment areas are located in secondary range. There are no range improvements in the Keddie Ridge Project area.

The Lights Creek Allotment is 9,612 acres. The overlap with the Keddie Ridge Project is 678 acres (Figure 24). The Lights Creek Allotment is considered small for the Plumas National Forest. An average allotment on the east side of the forest characterized by more open timbered East Side Pine type vegetation and flatter ground grazes about 200 cattle pair during a four month season. The Lights Creek Allotment grazes only 24 pair (On) and 16 pair (Off) with a three month season. An On/Off permit grazes Natioanl Forest System lands as ‘On’ and leased private lands as ‘Off’. Only limited use has occurred in the treatment area. Use has not been monitored or reported within the treatment area because it is not primary range.

The current permittee has been grazing the same herd, with replacement heifers on this allotment for decades. With the current permittee, the cows tend to use the northern portion of the allotment because it is flatter, has meadows, and ties in with his adjacent allotment on the adjacent Lassen National Forest to the north of the project area. The portion of the allotment the cows use is approximately 4 miles from the treatment area. Figure 24 shows the spatial relationship between the project area, the allotment boundary, and the monitoring area. The cows tend to prefer meadows over timbered areas and therefore tend to use the project area very little because it is timbered. The monitoring area for the Lights Creek Allotment is Indicator Meadow, which is approximately 4 miles north of the project area (Figure 24).

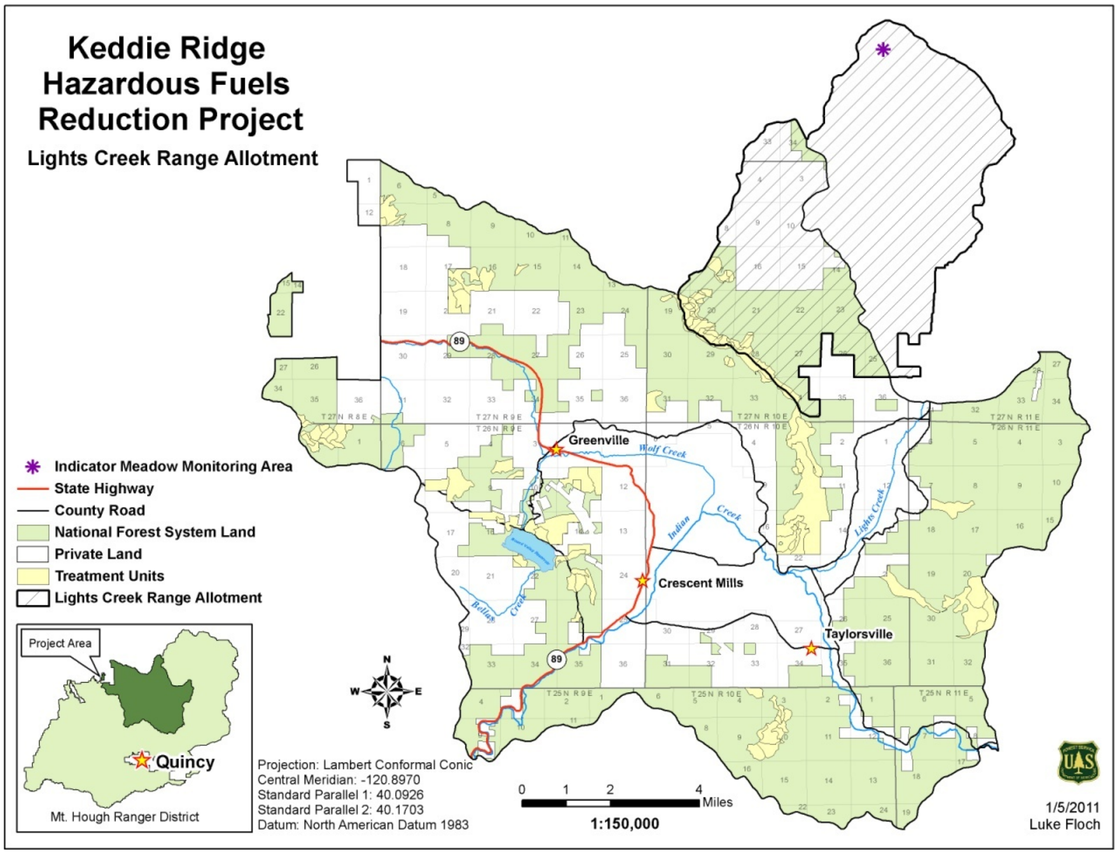


Figure 24. Map of Lights Creek Allottment, Keddie Ridge Project Area, and Indicator Meadow Monitoring Area

Environmental Consequences

Alternatives A, C, D, and E

Direct and Indirect Effects

Alternatives A, C, D, and E would have minor short-term direct effects on range resources. The Lights Creek Allotment would continue to be managed at current levels. Direct and indirect effects of hand thin, mechanical thin, group selection, mastication, and prescribed fire treatments to permitted cattle are displacement from the noise and activity. Since cattle use in the treatment areas is minimal, there will be little short-term displacement. Area thinning, group selections, and DFPZ units that involve timber falling and prescribed burning would require coordination between the Forest Service range specialist and the range permittee to ensure that livestock are kept away from active operations.

There could be an increased risk of vehicle collisions with livestock on haul routes and access roads to the treatment areas. Vehicle collisions could be avoided by ensuring that contracts contain safety specifications for traffic and by alerting contractors where cattle may be present.

The herbicide treatments proposed in alternatives A and D would have negligible adverse indirect effects on livestock. Although the potential is low (since livestock do not typically graze on noxious weeds, such as starthistle or Canada thistle), it is possible that livestock could consume vegetation contaminated by glyphosate or aminopyralid. In order to quantify the potential effect on livestock, a scenario was analyzed to examine chronic or longer-term exposure to contaminated vegetation with both proposed applications of pesticides for glyphosate and aminopyralid (SERA 2003, 2007). The level of risk was determined by using a "Hazard Quotient," which is calculated based on proposed application rates. A Hazard Quotient of less than one is considered to be a low risk. The results of this analysis are presented in Table 91. These results indicate that the Hazard Quotients for applications of glyphosate and aminopyralid would be less than one; therefore, the risk to livestock exposed over the long-term to glyphosate or aminopyralid would be low.

Table 91. Scenario Involving Long-Term Exposure of a Large Mammal to 100 Percent Contaminated Vegetation

Herbicide Scenario (long-term exposure to contaminated vegetation)	Hazard Quotient		
	Central	Lower	Upper
Aminopyralid	0.002	0.0002	0.03
Glyphosate	0.05	0.006	0.5

Sources: SERA 2003, 2007

Herbicide labels and Human Health and Ecological Risk Assessments Final Reports for aminopyralid, glyphosate, and borax were reviewed for the Keddie Ridge Project. There are no label restrictions for range cattle. Since there are no label restrictions for range cattle, Hazard Quotients are low, and livestock use within the treatment area is limited, there will be negligible direct or indirect effects to permitted livestock. The District will coordinate treatments with Forest Range Staff who will let the permittee know when treatments are planned.

Cumulative Effects

Alternatives A, C, D, and E would not contribute to adverse cumulative effects on range resources. Past, present and future vegetation management activities (listed in appendix F) have and would continue to help maintain or improve transitory range. The proposed area thinning treatments combined with future vegetation management projects would help maintain transitory grazing opportunities for livestock. Future DFPZ maintenance would continue to allow short-term opportunities for openings and transitory rangelands.

Alternative B No Action

Direct and Indirect Effects

There would be no adverse effects on range resources under the no action alternative. The Lights Creek Allotment in the Keddie Ridge Project area would continue to be managed under current direction and guidelines in the Forest Plan.

The short-term benefits of taking no action would be that the permittee or their livestock would not be affected by project activities.

There could be minor short-term indirect effects on suitable habitat without the underburning treatments, since burning helps encourage growth of available forage (grasses). Without implementing area thinning treatments, there could be long-term minor effects on range resources through decreased suitable habitat.

In the absence of noxious weed treatments, it is possible that noxious weed populations could spread and have long-term effects on available native forage species. However, without herbicide use, there would be no risk of exposing cattle to herbicide spills or vegetation that has been treated with herbicides.

Cumulative Effects

Alternative B could increase the potential short-term cumulative effects on range resources. The risk of future fires causing damage to forage would be a short-term effect on grazing because forage would return after a fire. Cows may need to be temporarily removed for one to three years until new vegetation and soils are better stabilized.

Minerals

Introduction

There are approximately 168 active mining claims in the Keddie Ridge Project area[9]. The Mt. Hough Ranger District currently administers three active plans of operation and four notices of intent for active mining claims in the project area. In addition, there are 5 claims for which plans have been submitted and completed, but are on hold by the owner operator. These could be activated at any time. This area has a long history of mining. There are several claims which are not currently being worked but which may be worked in the future. There are two abandoned mines in the project area that may be identified for closure next year. Many more exist but are not yet identified.

This mining analysis includes the effects of the Keddie Ridge Project on mining claimants and mine operators. The short-term and long-term effects, including beneficial effects, are included in this analysis.

[9] http://www.blm.gov/lr2000/

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Environment

Federal Laws

Management of mining operations on the Plumas National Forest falls under several regulatory authorities. The Mining Law of 1872 established the category of locatable minerals. It authorized placer and lode mining claims, mill site claims and tunnel site claims and modified the ability for patenting upon proven discovery. It also required at least $100 worth of work on each claim annually in order to maintain a possessory title.

The Forest Service Organic Administration Act of 1897 gave the Forest Reserves the basic authority to regulate surface uses, including mining.

Other regulatory Acts which affect minerals administration on the Forest include the 1947 Materials Act, the 1955 Multiple Use Mining Act (Surface Use Act), and the Clean Water Act, Section 401.

Daily operations are regulated under 36 CFR 228 regulations, Subpart A and Subpart C.

State Laws

The California Surface Mining and Reclamation Act of 1975 (SMARA) requires that anyone, including government agencies, engaged in surface mining operations in California (including those on federally managed lands) which disturb more than one acre or remove more than 1,000 cubic yards of material must submit and be subject to a Reclamation Plan. This includes, but is not limited to: prospecting and exploratory activities, dredging and quarrying, streambed skimming, borrow pitting, and the stockpiling of mined materials.

Mining operators are responsible for the preparation and submission of reclamation plans and financial assurances for reclamation to the lead agency. Annual reporting to both the State and the lead agency on the status of mining and reclamation activities, annual updates of financial assurances, and annual inspections (to be conducted under the auspices of the lead agency), are required. Following completion of mining activities, and in accordance with the approved reclamation plan and relevant permit conditions, mining operators return mined lands to a second, productive use. Examples of post-mining uses may include, but are not limited to, open space, wildlife habitat, agricultural lands, grazing, park lands, and preparing the land for industrial or commercial uses[10].

Forest Plan

Herger-Feinstein Quincy Library Group Forest Recovery Act

No specific references to mineral and geology resources are made within the HFQLG Forest Recovery Act.

Herger-Feinstein Quincy Library Group Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts

No specific references to mineral and geology resources are made within the HFQLG Forest Recovery Act EIS, Supplemental EIS, Records of Decision (1999 and 2003) and Appropriations Acts.

[10] http://www.consrv.ca.gov/omr/smara

Sierra Nevada Forest Plan Amendment Final Supplemental EIS (2004)

The Sierra Nevada Forest Plan Amendment (2004) expands upon direction outlined in the Forest Plan and further delineates standards and guidelines for mining with requirements for reclamation, inspections and monitoring. These guidelines ensure that plans of operation, reclamation plans and reclamation bonds fully address all costs of reclamation and that reclamation is accomplished in a timely manner; ensure that mine operators and owners limit new road construction, decommission unnecessary roads and maintain needed roads consistent with Forest Service policy; require inspections and monitoring on a regular basis consistent with potential severity of mining related impacts; and limit clearing of trees and other vegetation to the minimum necessary for operations (pages 58-59).

Forest Plan Direction

The 1988 Plumas National Forest Land and Resource Management Plan (commonly referred to as the "Forest Plan"), as amended by the 1999 HFQLG final EIS Record of Decision, and as amended by the 2004 SNFPA Final Supplemental EIS Record of Decision, guides the proposed action and alternatives. Forest wide Standards and guidelines for minerals and geology are outlined in the Forest Plan and help move the project area towards desired conditions described in that plan. General direction is to "Encourage mineral and materials development that reasonably protects surface resources, and provides for land reclamation; maintain and update a materials source inventory for Forest uses; recommend withdrawal from mineral entry areas valued for other purposes; protect public safety and Forest resources from slope failure; and prevent loss of groundwater quality and quantity", Chapter 4, Forest Wide Standards and Guidelines (page 4-46 to 4-49).

Effects Analysis Methodology

Specific Assumptions

The project boundary encompasses several areas where Plan of Operations have been submitted and approved but are currently on hold by the owner or operator for a variety of reasons. These plans may be activated at any time. These plans include Golden Wolf #2, Golden Wolf #7, Forman's Jackpot #1, Forman's Gold #2, and Three Golden Stars #4. Analysis of the project area will assume that these plans will be activated during the course of Keddie Ridge Project implementation.

Specific Methodology

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, "agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.

Scope of the Analysis

Geographic Analysis Area: The geographic boundary for the Minerals Effects Analysis is the Keddie Ridge Project area. This project area encompasses 103,309 acres on the Mt. Hough Ranger District. The rationale for this boundary is that mining claims do not stop at treatment boundaries and the effects of traffic, heavy equipment and smoke would occur across the project area.

Timeframe of Analysis: In the analysis of the project, current ongoing mining projects and reasonably foreseeable actions were considered. The existing condition encompasses the past history of the area including a long and intensive use of the land for mining purposes. The timeframe that these cumulative effects would impact mining is during the project and for 10 years beyond its completion. During the project there will be disturbance from logging, hand piling and burning.

Analysis Methodology

Mining claim data and claim locations were acquired through the Bureau of Land Management (BLM) LR2000 database [11] and the BLM GeoCommunicator database [12]. Information from these sources was cross referenced with the Keddie Ridge Project map to determine areas of impact. Acreages were taken from project specific GIS data.

Affected Environment

The Keddie Ridge Project area has experienced extensive copper and gold mining over the last century, and some gold mining and copper exploration continues today. There are approximately 168 active mining claims in the project area: most of these are placer claims with a few lode claims. Most claims are worked by small time operators who mine for gold utilizing gold pans and sluice boxes. Historically, many claims have been worked with suction dredges; however, there is currently a moratorium on suction dredging in the state of California. Several operators have larger operations involving trenching and

[11] http://www.blm.gov/lr2000/
[12] http://www.geocommunicator.gov/GeoComm/index.shtm

processing through trommels and power sluices. Some underground mining takes place as well. Exploratory copper mining (core drilling) has occurred in the Moonlight area over the past 10 years. These claims are still active, but are not currently under a Plan of Operations.

The Mt. Hough Ranger District currently administers three active Plans of Operation and four Notices of Intent for active mining operations in the project area. In addition, there are multiple claims for which plans have been submitted and completed, but are on hold by the owner operator. These could be activated at any time.

Historic and current day mining creates deep horizontal adits and vertical mine shafts that dot many locations in the project area. Terrain, ground cover, and a lack of surrounding structures make many of these mine shafts difficult to see, and because the open shafts are not readily visible, they pose a direct hazard to Forest visitors. There are two known abandoned mines in the Keddie Ridge Project area; with many more likely but not yet identified.

Environmental Consequences

Alternatives A (Proposed Action), C, D and E

Direct and Indirect Effects (Alternatives A, C, D and E)

With all action alternatives, the main impacts will be on mining activities at 3 separate claims. These claims include El Rico Mina, Forman’s Jackpot #1 and Forman’s Gold #2. At El Rico Mina, haul routes along National Forest System (NFS) road 26N81 road could directly affect mining operations. This mining operation is directly adjacent to treatment unit #66. Mining is authorized under a Plan of Operations along the shoulders of the road and may be interrupted during periods of haul travel. Smoke may be an additional concern for the mine operators during peak burning periods.

At the Forman’s Jackpot #1 and Forman’s Gold #2 claims, mining operations are planned for areas along the southwest side of NFS road 26N02, between the road and the South Fork of Lights Creek. Exploratory trench work has been authorized under a Plan of Operations. These claims fall within treatment unit #85. Impacts to this mining operation would include shared use of the NFS road and shared use of the surface in areas proposed for mining. Logging trucks, heavy equipment and water trucks will increase the potential hazards encountered by miners and other users of the road systems within the project area. Impacts to mining operations could also occur at Forman’s Ravine claims during periods of underburning. Potential conflicts could be resolved through notification of the operator regarding project timeframes and coordination of project efforts. The placing of signs in treatment areas would also help to reduce conflicts.

Part of the Keddie Ridge Project is to underburn certain areas and pile burn in others. The smoke from burning would have a temporary impact on air quality in the area. Most mining operations take place during the summer months, typically Memorial Day weekend through mid-October. Burning that occurred outside this typical mining season would have less of an impact on claimants.

There are several mining claims in the vicinity of the proposed road construction and road decommissioning.[13] These six claims are located in T27N, R8E, east 1/2 of Section 35. [14] However, these claims may be accessed via NFS road 27N92 and therefore there should be no direct effect on mining due to road decommissioning. Road maintenance and improvements undertaken during the project will benefit mining claimants and improve claim access.

Forest visitors are not at substantial risk from direct contact with herbicides under normal conditions. The Human Health Risk Assessment demonstrates that application of the herbicides Glyphosate and Aminopyralid and the fungicide borax, as proposed by the Keddie Ridge Project, is expected to present a low risk to human health and safety of forest visitors and therefore would not have a direct affect upon mine operators (appendix I).

The indirect effects of all action alternatives within the area boundary would be to reduce fuel loading and improve access to the surface. This would have a beneficial effect for mining claimants as it would thereby improve access to subsurface resources. There would be a beneficial effect of reducing the risk of wildfire and aesthetically cleaning up the stands of trees. Road maintenance would also improve mining access. There may be some indirect effect on mining operators as there would be with any forest visitor due to heavy equipment and haul traffic in the area during the life of the project. There may be some indirect effects on access to future mining claims from road decommissioning but it would be minor and limited.

Herbicide applications would not cause any indirect effects on mine operators. Herbicide applications are expected to present a low risk to human health and safety as demonstrated in the Human Health Risk Assessment (appendix I).

Cumulative Effects (Alternatives A, C, D and E)

In the analysis, cumulative effects of past actions, the action alternatives, current ongoing actions and reasonably foreseeable actions were considered. The existing condition encompasses the past history of the area including mining throughout the project area. Future fuels reduction projects would serve to reduce hazardous fuel conditions that could threaten mining areas, historic structures and equipment. Reasonably foreseeable future projects (identified in appendix F) that would close or fence off abandoned mine shafts would help reduce safety risks to Forest visitors. Overall, there will be no significant cumulative effects from implementation of the action alternatives.

Alternative B – No Action Alternative

Direct and Indirect Effects (Alternative B)

Forest ground cover and fuel loading not addressed by fuels reduction may impact the accessibility of areas for exploratory mining utilizing trenching methods. Many mine operators tend to target areas with minimal understory vegetation when selecting areas for exploratory trenching. Dense stands are more problematic for heavy equipment and an open canopy allows for better access to surface resources. The no action alternative would be less beneficial to miners seeking improved accessibility.

[13] http://www.blm.gov/lr2000/
[14] http://www.geocommunicator.gov/GeoComm/index.shtm

Road access would remain the same under the no action alternative. Roads will deteriorate further without maintenance.

Although there are currently no active mining claims accessed by roads selected for decommissioning under the action alternatives, the no action alternative would allow access to potential new claims in these areas.

Cumulative Effects (Alternative B)

There would be no reduction in available mineral resources or mining opportunities under this alternative because there would be no change in current conditions. However, a large-scale fire could have adverse effects on the miner's environment. Hazardous fuel conditions contributed to the severity of the Moonlight Fire near Antelope Lake. Vegetation in these areas has been slow to return and has created a barren looking landscape. Snags from the fire still pose a safety hazard to miners in the Lights Creek and Indian Creek areas.

Scenic Resources

Introduction

Viewing scenery consistently rates as a popular recreation activity on the Plumas National Forest. Scenic resources contribute indirectly to local quality of life, tourism, and economic vitality. Scenic quality within the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) is important to people who enjoy views from the communities in Indian Valley, including Greenville, Crescent Mills, and Taylorsville.

This evaluation applies current National Forest Landscape Management methodology in conjunction with existing *Plumas National Forest Land and Resource Management Plan* (Forest Plan) direction. The Keddie Ridge Project will help achieve Forest Plan direction for scenic resources by perpetuating the area's landscape character (attributes, qualities, and traits that make a landscape identifiable or unique), and conserving its scenic integrity (natural appearance).

Analysis Framework: Forest Plan Direction

Regulatory Framework

The 1988 *Plumas National Forest Land and Resource Management Plan* established goals, policies, and objectives for the management of the forest (USDA 1988, pages 4-3 to 4-11 and 4-13 to 4-20). The following specific Forest Plan goal applies to scenic resources:

- "Allow management activities to dominate the visual landscape of lands committed to intensive timber or other commodity production. Maintain high visual quality on lands committed to other uses or readily apparent from recreation developments, major travel routines, and other high use areas" (USDA 1988, page 4-4).

Visual Quality Objectives

The Visual Quality Objectives (VQOs) contained in the Forest Plan are used to identify and classify scenic resources in the Keddie Ridge Project area.

VQOs were mapped as part of the forest planning process using Agriculture Handbook 462 – Visual Management System, volume 2, chapter 1 (USDA 1974). The VQOs describe different degrees of acceptable alteration of the natural and characteristic landscape. The objectives are considered the measurable standards for the management of the "seen" aspects of the land. Standards and Guidelines outlined in the Forest Plan provide direction for managing land classified under different VQO definitions (USDA 1988). Standards and Guidelines for managing land classified under the four VQOs present within the Keddie Ridge Project area are as follows:

- **Retention** – Provide a natural-appearing landscape where management activities are not visually evident.
- **Partial Retention** – Provide a natural-appearing landscape where management activities remain visually subordinate.
- **Modification** – Allow management activities to dominate the landscape; however, keep visual elements comparable to those of natural occurrences.
- **Maximum Modification (MM)** – Allow management activities to dominate the landscape; however, keep background visual elements comparable to those of natural occurrences.

Methodology for Assessing Impacts on Scenic Resources

Geographic Area Evaluated for Impacts

The geographic area analyzed for effects on scenic resources (the analysis area) is the Keddie Ridge Project area. The analysis area is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye. The analysis area encompasses two developed recreation sites: Greenville Campground and Round Valley Picnic Area. There are approximately 7 miles of non-motorized system trails within the analysis area. These trails include Peters Creek Trail, Round Valley Interpretive Trail, and Indian Falls Interpretive Trail.

Indicator Measures

Visual Quality Objectives (VQOs) are the indicators analyzed in detail for scenic resources. Aesthetic identity (landscape character) and natural appearance (scenic integrity) are two indicators used to measure scenic quality changes and effects. Landscape character is defined as the attributes, qualities, and traits that make a landscape identifiable or unique, and scenic integrity is considered the natural appearance of a site.

Analysis Methods

The Visual Management System (which includes VQOs) presents a vocabulary for managing scenery and a systematic approach for determining the relative value and importance of scenery and associated recreation in a National Forest. High-quality scenery, especially scenery with naturally appearing landscapes, enhances the lives of local community members and forest visitors. Ecosystems provide the environmental context for this Visual Management System. The system is used in the context of ecosystem management to inventory and analyze scenery in a National Forest, assist in the establishment of overall resource goals and objectives, monitor the scenic resource, and ensure high-quality scenery for future generations.

Duration

The timeframe considered for cumulative effects is based on past and present vegetation management activities dating back to 1980 and past wildfires dating back to 1979 (appendix F). As discussed in the "Forest Vegetation and Fire, Fuels, and Air Quality section of chapter 3, past management activities have contributed to the existing scenic landscape. Future activities were considered (appendix F) in this analysis, but only until the time that Keddie Ridge Project implementation has been completed. Unanticipated future wildfires and other treatments could occur prior to completion of the Keddie Ridge Project, potentially affecting the area's scenic character.

Affected Environment

The landscape in the Keddie Ridge Project area ranges from the flat areas in and around Indian Valley, to moderately and extremely steep slopes. The forests are primarily mixed conifer types, with some pine dominated stands. Red and white fir-dominated forests exist at higher elevations. Valued scenery attributes include the diverse and largely continuous tree canopy of mixed conifer and understory vegetation. Past activities such as mining, grazing, and timber harvesting, fire exclusion, and high-severity wildfires have heavily influenced the existing landscape character of the project area. These past activities have created many areas where dense even-aged stands of trees dominate the landscape. Vegetation is often dense, largely due to historic fire suppression, making for a moderate risk that valued scenery attributes may be lost for decades or centuries through wildfire events.

Scenic resources include views of naturally appearing landscapes such as landforms, vegetation, rock formations, and water features. Scenic resources in the Keddie Ridge Project area are important to forest visitors who may enjoy views anywhere from the floor of Indian Valley to ridges such as Keddie Ridge. Scenic attractiveness is common in many locations in the project area and is used as a measure of the scenic importance of the landscape.

Visual Quality Objectives

Four Visual Quality Objective (VQO) definitions apply to the landscape in the project area: Retention (14,675 acres), Partial Retention (28,225 acres), Modification (38,201acres), and Maximum Modification (1,009 acres).

The Forest Plan describes the types of activities that may occur within Keddie Ridge treatment units:

- **Retention (189 acres in treatment units)** – activities are not to be evident to the casual forest visitor.
- **Partial Retention (2,970 acres in treatment units)** – activities may be evident but must remain subordinate to the characteristic landscape.
- **Modification (2,599 acres in treatment units)** – activities may dominate the characteristic landscape but must, at the same time, use naturally established form, line, color, and texture. Activities should appear as a natural occurrence when viewed in the foreground or middleground.
- **Maximum Modification (35 acres in treatment units)** – activities may dominate the characteristic landscape but should appear as a natural occurrence when viewed as a background.

Sensitive Places, Viewsheds/Viewpoints

Several areas within the analysis area are defined by a VQO of Retention. These areas include a portion of Highway 89 near Indian Falls, a portion of Highway 89 outside of Greenville, an area along Highway 89 at the turnoff from Highway 70, a portion of land in the Arlington Heights area, and land surrounding Round Valley Reservoir within the Round Valley Picnic Area.

The only treatment units proposed on land with a VQO of Retention surround Round Valley Reservoir. The purpose and need for these units (71, 72, 73, 74, 75, 75a, 106 and 107) includes fuel reduction, forest health, and protection/enhancement of habitat for sensitive plant and wildlife species.

Existing Scenic Integrity

Overall, the scenic integrity in the Keddie Ridge Project area meets the VQOs for Maximum Modification, Modification, Retention, and Partial Retention. However, the Moonlight Wheeler Fire of 2007 greatly compromised scenic integrity within the northeastern portion of the analysis area. Many scenic values were lost as approximately 64,960 acres of National Forest System land burned. Many of these acres burned with stand-replacing high severity fire. The charred landscape is visible from many places within the analysis area.

Desired Landscape Character

The desired landscape character for the Keddie Ridge Project area is a slightly more open forest cover, displaying and sustaining an uneven-aged, multistoried, fire-resilient, largely continuous mature tree canopy of mixed conifer and understory vegetation (USDA 1988 pp. 4-95 and 4-105). Dense vegetation in stands classified under Retention and Partial Retention VQOs would be managed to meet the Visual Retention and Visual Partial Retention prescriptions (USDA 1988 pp. 4-95 and 4-105), while reducing the risk that valued scenery attributes may be lost for decades or centuries through wildfire events.

Environmental Consequences

All Action Alternatives (A, C, D, and E)

Direct Effects

Area thinning and group selection would all have a minor beneficial effect on the landscape character. Scenic quality would be improved, and the desired landscape character of a more open and diverse forest would be achieved.

Underburning, group selection, and area thinning activities may have a short-term negligible effect on the scenic integrity of the landscape where burned areas, skid trails, and tree stumps would be visible from forest roads in the analysis area. The desired Visual Quality Objectives (VQOs) for areas in the treatment units may not be met initially after treatments due to project activities, and burning may cause color contrasts between green and brown needles. These effects would diminish over time as VQOs are achieved, and scenic quality would eventually be improved.

Indirect Effects

Fuels treatments in the analysis area would likely have long-term beneficial effects on scenic resources by reducing the risk of a wildfire destroying the existing landscape. Reducing hazardous fuels in the analysis area would likely help ensure that existing scenic landscapes are preserved.

Cumulative Effects

Past activities (grazing, mining, and vegetation management) in the analysis area have all had minor cumulative effects on the landscape character. These past activities have played a large part in creating the landscape that forest visitors identify with. Implementation of area thinning, group selection, and underburning treatments in any of the action alternatives would not drastically change this landscape but would help improve and maintain the desired landscape character that has been shaped by past activities. Future risks of catastrophic fire would be reduced by implementing area thinning and underburning treatments proposed in the action alternatives. Any future vegetation management projects and DFPZ maintenance (appendix F) would slightly benefit the scenic quality of the landscape over the long-term.

Alternative B – No action Alternative

Direct Effects

There would be no direct effects on scenic resources in the analysis area under this alternative because no actions are proposed that would change the landscape character. Scenic quality, however, could be directly affected without area thinning and group selection treatments because lack of treatments would perpetuate existing dense forest canopy and even-aged stand conditions throughout the analysis area.

Indirect Effects

The no action alternative would likely not cause any short-term indirect effects and possibly no indirect effects for years to come. However, without hazardous fuels reduction treatments in the analysis area, the continued risk of a catastrophic fire would increase the potential for long-term adverse effects on the scenic quality of the landscape.

Cumulative Effects

Past activities (vegetation management, grazing, and mining) in the analysis area have cumulatively helped shape the scenic landscape character of the analysis area. The no action alternative would perpetuate adverse cumulative effects on the scenic quality of the analysis area over time because the existing conditions (dense, even-aged stands) would continue, thus increasing the risk of wildfire.

A large-scale fire could have adverse effects on scenic quality for several years. Past hazardous fuel conditions contributed to the severity of the Moonlight and Antelope Complexes of 2007, and the Stream Fire of 2001. The effects from these fires can still be seen from forest roads and campgrounds in and near the analysis area.

Transportation

Analysis Framework: Statute, Regulatory Environment, Forest Plan and Other Direction

Regulatory Framework

The two roads (0.6 miles of National Forest System (NFS) road 28N38A and the 0.4 miles of a non-system road continuation of NFS road 28N38A) in the Keddie Ridge Hazardous Fuels Reduction Project area (Keddie Ridge Project area or project area) that are proposed for decommissioning are causing significant resource impacts. These roads are not needed because other roads are available to provide the necessary access to implement group selection harvests and construct Defensible Fuel Profile Zones (DFPZ) as directed in the *Herger-Feinstein Quincy Library Group Forest Recovery Act* (HFQLG Act) (section 401(b)(1), (d)(1), and (d)(2)) and the Sierra Nevada Forest Plan Amendment (USDA 2003a, 2003b 2004a, 2004b). The Forest Service is directed to reduce impacts on resources caused by transportation by implementing road relocation or improvements as part of the Riparian Management Plan (Appendix R of the HFQLG Final Environmental Impact Statement) as required by the HFQLG Act (sections 401(b)(1), (c)(2)(B), and (d)(4)).

Methodology for Assessing Impacts

Geographic Area Evaluated for Impacts on the Transportation System

The geographic area analyzed for effects on the transportation system (analysis area) is the Keddie Ridge Project area (project area). The analysis area is located west of Canyon Dam, east of Eisenheimer Peak, south of Keddie Peak, and north of the Greenville Wye.

Analysis Methods

The transportation system for the Keddie Ridge Project area was evaluated through a roads analysis. The interdisciplinary process for identifying road system needs and roads with resource damage includes a roads analysis consistent with legal requirements (36 CFR 212 Subpart A—Administration of the Forest Transportation System, 16 U.S.C. 551, 23 U.S.C. 205). The following needs were identified based on that analysis and known access needs for proposed treatments:

- Road reconstruction and maintenance (i.e. brushing) are needed to bring existing classified roads into compliance with current maintenance standards and to provide access to treatment areas. Reconstruction and road maintenance are necessary to reduce erosion and sedimentation and to provide for public safety.
- Road decommissioning is needed to reduce erosion, sedimentation, and soil compaction and to reduce road density and wildlife impacts.
- Out sloping road segments, installing armored rolling dips, and replacing culverts is needed to reduce road induced erosion and improve aquatic organism habitat.
- Temporary road construction is needed to access project units where existing road access is absent.
- Harvest landing construction and reconstruction are needed to facilitate removal of wood products.

Design Criteria

Roads are the largest single human-caused source of sedimentation and habitat degradation within the project area. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat.

To protect watershed resources, the desired conditions for roads that would be retained and improved (through road reconstruction and maintenance) include the following:

- Roads that are needed are maintained and improved to accommodate vehicle traffic. The proposed treatments would provide roads that will ensure safe travel for forest users, and provide a transportation system adequate for all resource management needs.
- Unneeded roads would be eliminated, closed, or obliterated in accordance with the 1988 Forest Plan, as amended, and the Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD)(September 2010) (USDA 1988a, b; USDA 2010 a, b).
- Roads that are causing a high level of resource damage would be decommissioned or improved.
- Poorly located roads would be relocated to stable areas.
- Increase habitat connectivity for aquatic species by eliminating roads which degrade habitat.

Affected Environment

Transportation System

One major arterial route accesses the project area, California State Highway 89. Seven collector roads access the project area. The project area is considered to have a fully developed arterial and collector road system.

There are a total of approximately 172 miles of existing National Forest System (NFS) roads in the project area. The system roads are inventoried, mapped, constructed to a specific design level, and categorized into a maintenance schedule. Maintenance levels are identified by road construction use and type. The following miles of roads by road system level categories exist in the Keddie Ridge Project area:

- 27.5 miles of Level 1 roads assigned to intermittent service.
- 118.1 miles of Level 2 roads managed for limited passage of traffic.
- 8.6 miles of Level 3 roads managed for safe travel by a prudent driver in a passenger car.
- 17.6 miles of Level 5 roads where management direction requires the road to provide a high degree of user comfort and convenience at moderate travel speeds.

In addition to the existing classified roads, there are numerous unclassified roads, abandoned roads, and skid trails in the project area. These nonsystem roads, abandoned roads, and skid trails are not part of the annual road maintenance schedule and budget.

The purpose of the NFS road system is to provide suitable conditions for passage of all Forest Service and cooperator emergency vehicles and to meet resource management and public access needs. In addition, needs for the road system include minimized adverse effects on watershed and wildlife resource values. Roads near streams have the greatest probability of intercepting, concentrating, and diverting flows from natural flow paths and should therefore be minimized, where feasible. Road/stream crossings with the potential to fail and divert water should be minimized, where feasible.

Off-Highway Vehicle (OHV) Routes in the Project Area

The Plumas National Forest Motorized Travel Management Project Final Environmental Impact Statement and Record of Decision was completed and signed in fall of 2010. This decision added 234 miles of trails to the existing National Forest Transportation System, creating a total of 4,482 total miles of road and trail access on the Forest. Of that total, 4,118 are available for passenger car use; 4,383 are available for 4-Wheel Drive use; 3,802 are available for unlicensed All Terrain Vehicles (ATV) use; 3,855 are available for unlicensed motorcycle use; and, 4,482 are available for licensed motorcycle use. A subset (165 miles) of the 234 miles will be available immediately while the remainder will need maintenance before they can be used. Implementation of the Plumas National Forest Motorized Travel Management Project will occur when appeals have been resolved and a Motor Vehicle Use Map (MVUM) is published. The MVUM will show which routes are available for use by what types of vehicles and any seasonal restrictions that may apply. Pending any appeal resolution, the MVUM is expected in the spring of 2011. Until then, the current Forest Order regulating use remains in place.

Within the project area, there are 22.2 miles of existing roads and trails open to all vehicles, 12.6 miles of proposed roads and trails open to all vehicles, and 2.6 miles of proposed roads and trails open to vehicles less than 50 inches wide for a total of 37.4 miles of OHV roads and trails in the project area (Table 92). Within project treatment units, there are 5 miles of existing roads and trails open to all vehicles, 2.2 miles of proposed roads and trails open to all vehicles, and 1.3 miles of proposed roads and trails open to vehicles less than 50 inches, for a total of 8.5 miles of OHV roads and trails within treatment units. Haul routes (routes used to transport forest products generated from project implementation) overlap with 13.8 miles of existing OHV roads and trails open to all vehicles. Temporary roads overlap with .8 miles of existing roads and trails open to all vehicles, .6 miles of proposed roads and trails open to all vehicles, and .4 miles of proposed roads and trails open to vehicles less than 50 inches, for a total of 1.8 miles.

Table 92. Miles of OHV Routes Affected within the Project Area and Project Units

Miles of OHV Routes Affected							
		Project Area	Units	TES	Weed Treatment	OHV/Haul Route Overlap	OHV/Temp Roads Overlap
Existing Roads and Trails							
	Open to all vehicles	22.2	5.0	0.03	0.9	13.8	0.8
	Open to vehicles 50" width or less	0.0	0.0	0.0	0.0	0.0	0.0
	Motorcycles only	0.0	0.0	0.0	0.0	0.0	0.0
Proposed Roads and Trails							
	Open to all vehicles	12.6	2.2	0.0	0.7	0.0	0.6
	Open to vehicles less than 50"	2.6	1.3	0.0	0.5	0.0	0.4
	Motorcycles only	0.0	0.0	0.0	0.0	0.0	0
Total		37.4	8.5	0.03	2.1	13.8	1.8

Environmental Consequences

Action Alternatives – A, D and E

Direct Effects

The Keddie Ridge Project proposes road decommissioning of two roads: 0.6 miles of NFS road 28N38A and 0.4 miles of of a non-system road continuation of NFS road 28N38A. These roads are not needed for the long-term transportation system. Decommissioning could include recontouring, removing drainage structures, subsoiling, restoring vegetative cover, restoring hydrological connectivity and/or blocking access. Decommissioning of roads would reduce Equivalent Roaded Acre (ERA) values, thereby lowering cumulative watershed effects and soil compaction. The roads slated for decommissioning are not needed for fire access or resource management and are causing watershed and wildlife impacts.

Roads that are to remain open but are improperly constructed or unmaintained will be improved. Improvements to the road drainage system and road surface prism will be considered for 100 miles of road within the watershed analysis area. Reconstruction would consist of brushing and/or drainage improvements including: out sloping road segments, installing armored rolling dips, or replacing culverts. Rolling dips, which will likely be one of the most commonly prescribed road improvements for the Keddie Ridge Project, are generally installed at a frequency of 1-4 dips per mile of road, depending on the grade/slope of the road. This estimate may vary depending on the existing condition of the road drainage system and the number of stream crossings present. Each dip would be approximately 15 feet long and as wide as the existing road surface. Placement of dips will be determined by District watershed staff in order to sufficiently disconnect the road drainage system from entering nearby stream channels. Please refer to appendix C for a list of roads where reconstruction will occur.

The road improvements proposed in Alternatives A, D, and E would provide access needed for project units. The proposed improvements would also provide access needed for fire suppression and fuels management to reduce the chance of catastrophic fire through intensive vegetation manipulation at a lower cost because of the improved access. The aforementioned action alternatives would generate traffic from log trucks, chip vans, and support vehicles. Traffic-related safety problems would be mitigated with standard contract requirements. Refer to the Recreation section for information about project effects on recreation, including OHV use.

Indirect Effects

Three temporary license agreements are required for access to treatment units.

Cumulative Effects

A net reduction of approximately 1 mile of system and nonsystem roads in the action alternatives would occur after proposed road decommissioning. Once decommissioned, roads would be available for reforestation and conversion back to a natural landscape.

No Action Alternative – Alternative B and Action Alternative C

Direct Effects

Reconstruction of classified roads would not occur, and impacts on watershed and user safety would continue on roads needing reconstruction. There would be no new direct impact on road surfaces from log haul activity, and there would be no increase in hazards to driver safety from logging traffic. No roads would be decommissioned and these roads would continue to cause resource damage. Normal routine maintenance would occur based on current maintenance levels.

Roads would continue to negatively impact watersheds and public safety because no roads would be reconstructed, decommissioned, or closed.

Indirect Effects

No temporary license agreements would be needed for the normal road maintenance completed in this area.

Cumulative Effects

No reduction in system or nonsystem roads would occur during normal road maintenance completed in this area.

Short-term Uses and Long-term Productivity

NEPA requires consideration of “the relationship between short-term uses of man’s environment and the maintenance and enhancement of long-term productivity” (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Action alternatives would implement mechanical thinning, mastication, hand thinning, and prescribed burning treatments which would remove trees through harvesting or result in tree mortality in the short-term. However, these treatments are designed to retain the largest, most desirable trees in sufficient amounts to meet desired stocking levels and maintain appropriate forest cover as specified by NFMA.

Long-term productivity would far exceed short-term harvest levels and treatments would enhance long-term productivity in terms of forest health, by promoting forest resilience to disturbances such as fire, drought, and insect and disease occurrences.

Action alternatives, primarily through the removal of vegetation and treatment of fire fuels, would directly impact terrestrial habitat for Region 5 Forest Service sensitive wildlife species. Potential short-term effects of entry, use, and alteration of suitable wildlife habitat to achieve project objectives is disclosed in Chapter 3 of this DEIS. Treatments would enhance long-term productivity in terms of forest health, by promoting forest resilience to disturbances such as fire, drought, and insect and disease occurrence. As a result, these treatments over the long-term are expected to increase both the quality and quantity of existing and potential suitable habitat for wildlife species.

Short-term negative impacts to fine organic matter, soil permeability, large woody debris, and channel shading are expected as a result of the proposed activities. Long-term productivity would far exceed these short-term impacts through promoting forest resilience to disturbances such as catastrophic wildfire capable of much greater impacts to the previously mentioned soil and hydrology resources.

In the short-term individual rare plants may be directly impacted from the proposed activities; however over the long-term, these treatments are expected to increase both the quality and quantity of existing and potential habitat for these species.

Over the short-term, the proposed treatments would create disturbed conditions that favor noxious weed establishment and spread. Implementation of the standard management requirements (appendix H) and the weed treatment measures proposed under action alternatives A and D would greatly reduce the risk of noxious weed spread and establishment over the long-term. This risk would not be reduced under action alternatives C and E, primarily due to implementation of ground-disturbing treatment activities with no effective weed treatment measures in place.

The Keddie Ridge Project may affect mining operations in the area in the short-term due to access issues, increased heavy equipment traffic and/or smoke production. No long-term effects to productivity are expected.

Unavoidable Adverse Effects

Action alternatives would implement prescribed burning treatments which would create smoke. Smoke may affect air quality while prescribed fire activities occur; however, prescribed fire activities would be accomplished with an approved smoke management plan to minimize effects to air quality.

Some unavoidable adverse effects may result, including immediate changes in habitat conditions and disturbance/harassment of individual wildlife species, including direct mortality, during project activities. It is assumed in this analysis that all action alternatives would be implemented as proposed, in compliance with all rules and regulations governing land management activities, including the use of Limited Operating Periods. Direct disturbance, including mortality to individual threatened and endangered species addressed in this document, would be highly unlikely due to results of survey efforts for selected species, incorporation of Limited Operating Periods, where appropriate, and implementation of Forest Plan standards and guidelines.

Direct effects on wildlife species could occur as a result of tree removal, mastication, and prescribed burning. These activities have the potential to kill young of the year birds in the nest that cannot fly and species confined to den sites, such as gray squirrels. Increased road use resulting from of project implementation could result in increased road kills of various animals. It is recognized that the proposed project, when implemented during the breeding season (April-September) could directly impact nesting birds. This would affect individual birds. Conservation measures for landbirds, such as snag/down woody retention, use of LOP's for TES species, avoidance of riparian vegetation, retention of trees greater than thirty inches diameter, which are incorporated into project design, as well as large tracts of forested land not treated with proposed management actions, would alleviate the overall effect on Neotropical migratory bird populations within the analysis area. The Forest Service and the U.S. Fish and Wildlife Service entered into a memorandum of understanding (MOU) in 2008 to strengthen migratory bird conservation. The MOU recognized that direct and indirect actions taken by the Forest Service in the execution of duties and activities, as authorized by Congress, may result in the take of migratory birds, and that short-term negative impacts are balanced by long-term benefits.

The extent of detrimental soil compaction would increase due to mechanical harvest operations. Implementation of standard management requirements would help reduce the amount of detrimental compaction. Treatment activities may lead to increased surface runoff and sedimentation. Implementation of best management practices and standard management requirements would help reduce the amount of detrimental compaction.

There are no foreseeable unavoidable adverse impacts to mining under any of the alternatives for the Keddie Ridge project.

There are no unavoidable Adverse Effects for Heritage Resources.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road

Action alternatives would implement mechanical thinning, mastication, hand thinning, and prescribed burning treatments which would 1) remove and/or kill trees, 2) reduce surface fuels and snags and 3) include the removal of forest vegetation for the construction of landings and temporary roads – these effects would be irretrievable commitments of a resource in terms of lost timber productivity and structural attributes. However, these treatments would maintain stocking and appropriate forest cover per NFMA, and tree regeneration, snag and surface fuel recruitment, and rehabilitation of landings and temporary roads would occur over time.

Surface organic matter would be reduced by prescribed fire and underburning, which is an irretrievable effect. Soil porosity would be reduced, also an irretrievable effect, resulting in detrimental compaction. Detrimental compaction is described in the "Hydrology and Soils" section of this chapter under the "Affected Environment—Soils" heading.

Surface fuels, including coarse woody debris, may be removed directly by prescribed underburning and pile burning, an irretrievable effect. Coarse woody debris would be recruited over time via recruitment from existing snags and future tree mortality.

Snags, particularly “soft” or rotten snags, may be removed due to underburning; snags that pose a hazard to firefighters may be felled prior to conducting underburning or pile burning, an irretrievable effect. Snags would be recruited over time from future tree mortality.

Adverse impacts to rare plants will be minimized under all action alternatives through implementation of the design criteria described in appendix H.

If allowed to spread, noxious weed species can have significant adverse impacts to native plants, wildlife species, soil structure, nutrient and fire cycles, and the recreational or aesthetic value of native habitats. While the weed control measures proposed under alternatives A and D would minimize the likelihood of adverse impacts, the lack of effective weed control measures in alternatives C and E would increase the probability of adverse impacts.

There are no irreversible or irretrievable commitments of mineral resources expected under any of the alternatives for the Keddie Ridge project.

There are no irreversible and Irretrievable Commitments of Resources for Heritage Resources.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders.” The proposed action and alternatives must comply with following:

Principle Environmental Laws

The following laws contain requirements for protection of the environment that apply to the proposed action and alternatives:

Endangered Species Act

Section 7(a)(2) of the Endangered Species Act requires that Federal agencies consult with the United States Fish and Wildlife Service and National Marine Fisheries Service, as appropriate, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under ESA, or destroy or adversely modify their critical habitat.

A biological assessment was prepared for Federally Proposed, Threatened, or Endangered wildlife and botany species and their critical habitat. Implementation of the project would have no effect on valley elderberry longhorn beetle and California red-legged frog. No Federally Proposed, Threatened, or Endangered wildlife or botany species were located within the Keddie Ridge Project area during past or current surveys.

Clean Water Act

The Forest Service is complying with the provisions of the Clean Water Act as it pertains to the Keddie Ridge Project. Section 208 of the Clean Water Act requires States to prepare nonpoint source pollution plans that are to be certified by the State and approved by the United States Environmental Protection

Agency (EPA). In response to this law, and in coordination with the State of California Water Quality Resources Control Board and EPA, the Forest Service, Region 5, began developing best management practices (BMPs) in 1975 for water quality management planning on National Forest System lands in California. This process identified the need to develop a BMP for addressing the cumulative off-site watershed effects of forest management activities on the benecial use of water.

The Keddie Ridge Project meets this through the incorporation of project design features (DEIS, chapter 2), Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (RHCAs)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; appendix E of this DEIS), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in appendix H of the DEIS. Refer to the Hydrology and Soils Environmental Consequences section of this chapter for a discussion of environmental consequences.

Clean Air Act

The Forest Service is complying with provisions of the Clean Air Act as it pertains to the Keddie Ridge Project. All burning implemented under the Keddie Ridge Project would be completed under approved burn and smoke management plans. Burning permits would be acquired from the Northern Sierra Air Quality Management District. The Air Quality Management District would determine dats when burning is allowed. The California Air Resources Board provides daily information on burning conditions. Burning would be implemented in a way to minimize particulate emissions.

National Historic Preservation Act of 1966 as Amended

The Forest Service is complying with the provisions of the National Historic Preservations Act of 1966 as amended as it pertains to the Keddie Ridge Project. Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. The Advisory Council on Historic Preservation has defined a Federal undertaking in 36 CFR 800.16(y) as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency.

Coastal Zone Management Act

There are no coastal management zones within the Keddie Ridge Project area or on the Plumas National Forest. The Coastal Zone Management Act does not apply to the Keddie Ridge Project.

National Forest Management Act

The Forest Service is in compliance with the National Forest Management Act as it pertains to the Keddie Ridge Project. Projects occurring on National Forest System lands must meet minimum specific management requirements under 16 U.S.C. 1604 (g)(3). The Keddie Ridge Project meets all applicable guidelines for land management plans according to 16 U.S.C. 1604 (g)(3).

Executive Orders

The following executive orders provide direction to federal agencies that apply to the proposed action and alternatives:

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

Section 1. *Accomodation of Sacred Sites*. (a) In managing Federal lands, each executive branch agency with statutory or administrative responsibility for the management of Federal lands shall, to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, (1) accomodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites.

Invasive Species, Executive Order 13112 of February 3, 1999

This document provides an analysis of the effects of the proposed project on noxious weed introduction and spread. The standard management requirements and proposed weed treatment measures were developed to prevent the introduction of invasive species, control the spread of existing infestations, and minimize adverse impacts to National Forest Sysytem lands.

Recreational Fisheries, Executive Order 12962 of June 6, 1995

The effects to fish habitat from the project are expected to be so small that direct effects on fish productivity and the quality of the recreational fishery would be negligible.

Migratory Birds, Executive Order 13186 of January 10, 2001

The environmental analyses of deferral actions are to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. There is no interagency determination to be made for migratory birds with Federally listed species. Proposed activities and alternatives are not expected to effect migratory birds.

Floodplain Management, Executive Order 11988 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project riparian management objectives; adhering to the Scientific Analysis Team guidelines, as set forth in the HFQLG FEIS and Record of Decision; and implementing best management practices, standard management requirements, and project design criteria.

Protection of Wetlands, Executive Order 11990 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating the project riparian management objectives; adhering to the SAT guidelines, as set forth in the HFQLG FEIS and ROD; and implementation BMPs, standard management requirements, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994

Although low-income and minority populations live in the vicinity, activities proposed for the Keddie Ridge Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects to human health and safety or environmental effects to minorities, low income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Use of Off-Road Vehicles, Executive Order 11644, February 8, 1972

The Keddie Ridge Project is in compliance with the Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD) (September 2010).

Special Area Designations

The selected alternative will need to comply with laws, regulations and policies that pertain to the following special areas:

Research Natural Areas

There are no Research Natural Areas within the Keddie Ridge Project area.

Inventoried Roadless Areas

There is a very small portion of PNF LRMP Semi-Primitive land allocation within the Keddie Ridge Project area; however no treatment units overlap with this land allocation. Therefore there will be no impacts to the Semi-Primitive land allocation. There are no Inventoried Roadless Areas within the Keddie Ridge Project area.

Wilderness Areas

There are no Wilderness Areas within the Keddie Ridge Project area.

Wild and Scenic Rivers

A portion of Indian Creek was identified as “eligible” in the PNF LRMP. This portion of Indian Creek is within the Keddie Ridge Project area; however no treatment units overlap with this segment of creek. Therefore, there will be no impacts to the eligible portion of Indian Creek.

Municipal Watersheds (FSM 2540)

Round Valley Reservoir is a municple water supply for Greenville. The activities proposed in the Keddie Ridge Project are expected to be beneficial to Round valey Reservoir. The Keddie Ridge Project meets this through the incorporation of project design features (DEIS, chapter 2), Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (RHCAs)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; appendix E of this DEIS), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in appendix H of the DEIS. Refer to the Hydrology and Soils Environmental Consequences section of this chapter for a discussion of environmental consequences.

Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this environmental assessment:

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Federal, State, and Local Agencies:

U.S. Environmental Protection Agency
Northern Sierra Air Quality Management District
U.S. Fish and Wildlife Service
California Department of Fish and Game
USDA Natural Resource Conservation Service
California Department of Forestry and Fire Protection
Plumas County Road Department
Plumas County Environmental Health Department
Plumas County Board of Supervisors
Plumas-Sierra Counties Department of Agriculture

Central Valley Regional Water Quality Control Board
U.S. Department of Interior

Tribes:

Estom Yumeka Tribe of Enterprise Rancheria
Mechoopda Indian Tribe of Chico Rancheria
Greenville Rancheria
Susanville Indian Rancheria
Concow Maidu Tribe of Mooretown
Tyme Maidu Tribe of Berry Creek Rancheria
Washoe Tribe of California and Nevada

Others:

Plumas County Fire Safe Council
Plumas County Horseman's Association
Sierra Access Coalition
Sierra Forest Legacy
Quincy Library Group
Sierra Pacific Industries
American Forest Resource Council
California Forestry Association
Californians for Alternatives to Toxics
The John Muir Project of Earth Island Institute
Maidu Cultural Development Group
Hank Alrich
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Sierra Pacific Industries
Plumas County Economic Recovery Committee
Plumas Corporation

Distribution of the Environmental Impact Statement

This environmental impact statement has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to federally recognized tribes, State and local governments, and organizations listed above and the following Federal agencies:

- Advisory Council of Historic Preservation, Planning and Review
- USDA Animal and Plant Health Inspection Service PPD/EAD
- Natural Resources Conservation Service

- USDA, National Agricultural Library, Acquisitions and Serials Branch
- National Marine Fisheries Service Habitat Conservationists Division, Southwest Region
- US Army Engineer Division, South Pacific CESPD-CMP
- US Environmental Protection Agency, Office of Federal Activities
- Environmental Protection Agency, Region 9
- US Department of Interior, Office of Environmental Policy and Compliance
- Federal Aviation Administration, Western-Pacific Region
- Federal Highway Administration, California HAD-CA
- US Department of Energy, Office of NEPA Policy and Compliance
- US Coast Guard Environmental Management
- All individuals listed in the public involvement section of chapter 1 of this EIS.

In addition to this list, numerous interested parties will receive notification of the EIS's availability and location on the World Wide Web through written correspondence.

Acronyms

AOC	Area of Concern
APE	Area of Potential Effect
ARCO	*Arabis constancei* (Constance's rock cress)
AT	Area Thinning
ATV	All Terrain Vehicle
BA	Biological Assessment
BAER	Burned Area Emergency Response
BE	Biological Evaluation
BEMA	Bald Eagle Management Area
BMP	Best Management Practice
CASPO	California Spotted Owl Interim Guidelines
CC	Canopy Cover/ Canopy Closure
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWHR	California Wildlife Habitat Relationships
CYFA	*Cypripedium fasciculatum* (clustered lady's slipper)
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DFPZ	Defensible Fuel Profile Zone
EHR	Erosion Hazard Rating
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency

ERA	Equivalent Roaded Area
FEIS	Final Environmental Impact Statement
FFE	Fire and Fuels Extension of the Forest Vegetation Simulator
FSEIS	Final Supplemental Environmental Impact Statement
FSSC	Forest Survey Site Class
FMA	Fire Management Analyst
FOFEM	First Order Fire Effects Model
FSH	Forest Service Handbook
FSSC	Forest Survey Site Class
FVS	Forest Vegetation Simulator
GIS	Geographic Information Systems
GS	Group Selection
GTR	General Technical Review
HFQLG	Herger-Feinstein Quincy Library Group
HFRA	Healthy Forest Restoration Act
HRM	Heritage Resource Manager
IDT	Interdisciplinary Team
MIS	Management Indicator Species
mbf	Thousand Board Feet
mmbf	Million Board Feet
MVUM	Motor Vehicle Use Map
MYLF	Mountain Yellow-legged Frog
NEPA	National Environmental Policy Act
NFDRS	National Fire Danger Rating Systems
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NOA	Notice of Availability
NSAQMD	Northern Sierra Air Quality Management District
OHV	Off Highway Vehicle
PAC	Protected Activity Center
PLAS	Plumas Lassen Administrative Study
PM	Particulate Matter
PNF	Plumas National Forest
PNF LRMP	Plumas National Forest Land and Resources Management Plan
RHCA	Riparian Habitat Conservation Area
RMO	Riparian Management Objective
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum

RPA	First Amended Regional Programmatic Agreement
SAT	Scientific Analysis Team
SMC	Sierra Mixed Conifer
SMZ	Streamside Management Zone
SNFPA	Sierra Nevada Forest Plan Amendment
SOHA	Spotted Owl Habitat Area
SRPM	Standard Resource Protection Measure
TOC	Threshold of Concern
TU	Treatment Unit
USC	United States Code
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VQO	Visual Quality Objective
WUI	Wildland Urban Interface

Glossary

90th percentile weather conditions — high air temperature, low relative humidity, strong wind conditions and low fuel moisture content levels that historically that are met or exceeded on 10 percent of days during the fire season. It defines potential fire behavior as a result of these conditions: a 90th percentile weather day has the potential for severe wildfire behavior.

Adjuvant — a vegetable oil and silicone-based surfactant used to facilitate and enhance the spreading and penetrating properties of herbicides.

Age class — a distinct aggregation of trees originating from a single natural event or regeneration activity.

Annosum root rot — a conifer disease caused by the fungus *Heterobasidion annosum.* The fungus usually enters through freshly cut stump surfaces. Annosum can cause mortality and butt rot of conifers.

Basal area — the total cross-sectional area of all stems, including the bark, in a given area, measured at breast height (4.5 feet above the ground). Usually given in units of square feet per acre.

Biomass —trees less than 10 inches DBH not used as sawlogs. This material is usually chipped and/or removed from the project area and hauled to the mill to be used for cogeneration of energy or as fiber for wood products.

Board feet — a unit of measure of sawlog volume, equivalent to 12 inches by 12 inches by 1 inch. One thousand board feet is denoted as mbf.

California Wildlife Habitat Relationships (CWHR) — a system developed jointly by Region 5 of the Forest Service and the California Department of Fish and Game that classifies forest stands by dominant species types, tree sizes, and tree densities, and which rates the resulting classes in regard to habitat value for various wildlife species or guilds. The CWHR system has three elements: (1) major tree dominated vegetation associations, (2) tree size, and (3) canopy cover. The major tree dominated CWHR habitats in the Empire Project include red fir, Sierra mixed conifer, ponderosa pine, white fir, montane hardwood, and montane riparian.

Tree size and canopy cover classes are as follows:

Tree Size Classes in CWHR:

1 = Seedling (less than 1 inch DBH)
2 = Sapling (1-6 inches DBH)
3 = Pole (6-11 inches DBH)
4 = Small (11-24 inches DBH)
5 = Medium/Large (greater than 24 inches DBH)
6 = Multilayered (size class 5 over a distinct layer of size class 3 or 4, total canopy greater than 60- percent closure). In this EIS, class 6 is included in class 5.

Canopy Cover Classes in CWHR:

S = Sparse Cover (10-24 percent canopy closure)
P = Poor Cover (25-39 percent canopy closure)
M = Moderate Cover (40-59 percent canopy closure)
D = Dense Cover (greater than 60 percent canopy cover)

Canopy cover — Also referred to as canopy closure. The ground area covered by tree crowns. Canopy cover is expressed as a percent of the area. Values for percent canopy cover can be derived in many ways (From the glossary in the 2004 SNFPA ROD, USFS PSW 2004b).

Cumulative effects — According the Council on Environmental Quality (CEQ) NEPA regulations, “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7).

Decommission (roads) — closing a road to mechanical use and returning the road to a natural or semi-natural condition. This could include removing stream crossing fills and structures (e.g., culverts or bridges), recontouring to natural topography obliteration (e.g., replacing fill slope material against cut slopes), surface shaping (e.g., constructing in-road water bars), and/or surface scarification.

Defensible Fuel Profile Zones (DFPZ) — a zone approximately 0.25 mile wide accessible to firefighters (usually along roads) in which fuel loads are light enough to cause approaching crown fires to drop to the ground where it may successfully be attacked by ground forces during 90th percentile weather conditions.

Desired conditions — desirable resource conditions for various land allocations or resources, as prescribed in forest plans.

Diameter at breast height (DBH) — the diameter of a tree trunk measured at 4.5 feet above the ground.

Disturbance — a natural event such as fire, flood, or earthquake.

Dripline — the perimeter of the vertical projection of a tree canopy upon the ground.

Duff/duff layer — decaying leaves and branches on the forest floor.

Endemic — in the context of this environmental impact statement, refers to localized pockets within a small area, such as a pocket within a stand or a small stand.

Ephemeral — a watercourse that contains sporadic running water only sporadically, such as during or following storm events. Ephemeral streams have a definable channel and evidence that scour and deposition occur with less-than-annual frequency. Activity buffers are measured from edges of stream channels.

Equivalent Roaded Area — a conceptual unit of measure used to assess ground-disturbing activities. All landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent 100 percent hydrologic disturbance, with maximum rainfall-runoff potential. Other ground-disturbing activities are assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same roaded area. Disturbance coefficients are assigned based on local coniditons. In a given watershed, disturbances are added together to determine a cumulative equivalent roaded area and compared to the Threshold of Concern.

Erosion Hazard Rating — predicts the potential for sheet, rill, and gully erosion under existing conditions if vegetation and litter are moved.

Fire frequency — the average number of years between fires.

Fireline — a corridor, which has been cleared of organic material to expose mineral soil. Firelines may be constructed by hand or by mechanical equipment (e.g., dozers).

Fire Regime Condition Class — a classification of the amount of departure from the natural fire regime. Assessing Fire Regime and Condition Class can help guide management objectives and set priorities for treatments.

> **Condition Class 1** — fire regimes are within historical range. Risk of losing key ecosystem components to wildfire is low. Species composition and structure are functioning within historical range. Potential wildfire intensities and severity are low to moderate.
>
> **Condition Class 2** — fire regimes are slightly altered from historical range. Risk of losing key ecosystem components to wildfire is moderate. This results in moderate changes in one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is moderate encroachment of shade tolerant tree species. Potential wildfire intensities and severity are moderate to high.
>
> **Condition Class 3** — fire regimes are significantly altered from historical range. Risk of losing key ecosystem components to wildfire is high. This redults in dramatic changes to one or more of the following: fire size, fire intensity, and fire severity. In forestland, there is high encroachment and establishment of shade tolerant tree species. Potential wildfire intensities and severity are moderate to extreme.

Fire type — a description of how a fire burns, such as on the forest floor (surface) or in the tree crowns.

Flame length — the length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.

Forest Survey Site Class (FSSC) — an index of the productive potential of well-stocked stands. FSSC reflects the mean annual increment of a stand at the point of culmination, and is based on normal yield tables as follows: FSSC 5: 50-84 cubic feet per acre per year; FSSC 6: 20-49 cubic feet per acre per year; FSSC 7: less than 20 cubic feet per acre per year.

Fragmentation/ stand fragmentation — occurs when a large patch of habitat is broken down into many smaller patches of open habitat, resulting in a loss in the amount of quality forested habitat.

Fuel arrangement — how fuels are distributed in the fuel bed.

Fuel bed — the fuels both living and dead that are available to burn.

Fuel loading — the weight of fuel (vegetative matter both living and dead) present at a given site; usually expressed in tons per acre. This value generally refers to the fuel that would be available for consumption by fire.

Group selection — a silvicultural system that involves harvest of small areas of trees (generally less than 2 acres). Implementation results in unven-aged (all-aged) forests consisting of small even-aged (same-aged) groups. Harvest openings must be large enough to allow for sufficient sunlight for regeneration tree seedlings to establish and grow.

Grubbing — removal of vegetation at or below the ground level with hand tools.

Hand line — fire lines created by forest workers using shovels and hand tools to remove organic materials and expose mineral soil. The line width generally ranges between 2 and 3 feet.

Hand piling — piling by hand branches and limbs from tree harvests or thinnings by hand, for burning at a later time.

Hazard Quotient — the ratio of the estimated level of exposure to the reference does or some other index of acceptable exposure.

***Heterobasidion* root disease** — see Annosum root rot.

Home Range Core Areas — these areas are designed to encompass the best available spotted owl habitat, where the most concentrated owl foraging activity is likely to occur, and is in the closest proximity to owl protected activity centers where the most concentrated owl foraging activity is likely to occur. On the Plumas National Forest, each protected activity center is 300 acres and the home range core area is an additional 700 acres, totaling 1,000 acres.

Interdisciplinary Team (ID Team) — the team of Forest Service resource specialists involved in project planning and analysis. The ID Team members for the Keddie Ridge Project are listed in the beginning of chapter 4.

Intermittent — a watercourse with non-permanent flow but having a definable channel and evidence of annual scour and deposition. Activity buffers are measured from edge of stream channel.

Jackpot burn — A burning technique that targets isolated concentrations of heavy fuels.

Ladder (fuel) — shrubs or trees that connect fuels at the forest floor to the tree crowns.

Landings — forested openings, cleared of vegetation, leveled and graded, and used to stockpile sawlogs for eventual loading of load log trucks for haul to a sawmill.

Leave trees — the trees that are purposefully left in a stand that is thinned or harvested.

Mainline — the line used in cable yarding to bring logs to the landing.

Mastication — mechanical grinding of harvest residue or thinning; masticated material is usually left scattered on the harvest site.

Mechanical thinning — the use of tractors, cable systems, or helicopters to remove trees that have been cut by chainsaws; also refers to the use of feller-bunchers (wheeled vehicles with lopping shears or saws that cut and collect trees and carry them to a landing site).

Multilayer — stand with three or more distinct foliage layers (canopies). Trees in the different layers may or may not be in the same age class.

Mycorrhiza/mycorrhizae (pl.) — the mutually beneficial association of a fungus and the roots of a plant, such as a conifer or an orchid, in which the plant's mineral absorption is enhanced and the fungus obtains nutrients.

Natural fire regime — a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but it also includes the influence of aboriginal burning (Agee 1993; Brown 1995).

Operability — the ability to conduct vegetation management operations, which include construction of access roads and log landings, use of cable logging systems, clearing of central skid trails for tractor logging, and removal of trees that pose hazards to forest workers. Trees to be removed for operability would be designated by a Forest Service representative.

Passive crown fire — the movement of fire though groups of trees; it usually does not continue for long periods of time.

Perennial streams — streams that flows continuously. The groundwater table lies above the bed of the stream at all times. Activity buffers are measured from edge of stream channel.

Piling and burning — piling harvest or thinning residues (branches and limbs) and burning them when moisture content has been reduced through evaporation, wildfire hazard is low, and atmospheric conditions are favorable for dispersal of smoke.

Prescribed burning — fire purposefully ignited to achieve a beneficial purpose, such as reducing fuels on the forest floor or fuels generated by logging or thinning forest trees.

Protected Activity Centers (PAC) — areas delineated around nesting sites of nesting pairs of particular wildlife species. Habitat disturbance is minimized or excluded within the delineated area.

Quadratic mean diameter — the upper story diameter of a tree of mean basal area within dominant or codominant positions in the stand. In other words, instead of being an arithmetic average of tree diameters, it is a weighted average based on the basal area of each tree in the upper story within the stand.

Rate of spread — the relative activity of a fire in extending its horizontal dimensions. Expressed as rate of increase of the total perimeter of the fire.

Reconstructed (roads) — reconstruction of an existing road in or adjacent to its current location to improve capacity and/or correct drainage problems. Reconstruction consists of brushing, blading the road surface, improving drainage, and replacing/upgrading culverts where needed.

Regeneration — tree seedlings and saplings that have the potential to develop into mature forest trees.

Release — in the context of this environmental impact statement, giving preferred trees (i.e. old, large pines) more space to grow – to "release" them from crowded conditions.

Residual trees — trees that are left to grow in a stand following treatment or fire.

Riparian Habitat Conservation Area (RHCA) — activity buffers of specified widths along streams and watercourses and around lakes and wetlands that vary according to stream or feature type, as described by the Scientific Analysis Team (SAT) guidelines.

Sanitation — tree removal or modification operations designed to reduce damage caused by forest pests and to prevent their spread.

Seral — relating to a series of ecological communities formed in ecological succession.

Shade intolerant — species (such as ponderosa pine) that require full, open sunlight on the forest floor to establish and grow.

Silviculture — a branch of forestry dealing with the development and care of forests.

Size class — a classification of forest stands based on the average diameter of trees in the stand.

Skidding — dragging a log with a tractor to a landing for loading onto a logging truck.

Skyline — a harvesting system in which a cableway is stretched taut between two points, such as a yarding tower and stump anchor, and used as a track for a block or skyline carriage.

Slash — tree tops and branches left on the ground after logging or accumulating as a result of natural processes.

Snags — a dead standing tree; for wildlife purposes, one that is at least 15 inches in diameter at breast height (DBH) and 20 feet high.

Spotted Owl Habitat Area (SOHA) — areas delineated in land and resource management plans for the purpose of providing nesting and foraging habitat for spotted owls.

Stocking levels — the number of trees per acre in a regeneration site.

Subsoiling — performed after vegetation treatments, wherein mechanized equipment is used to till compacted soil to reduce soil compaction and consequent soil erosion.

Surface fire — a fire that burns surface litter, debris, and small vegetation.

Surfactant — an agent, such as a detergent, that reduces the surface tension of liquids to that the liquid spreads out, rather than collecting in droplets.

Thinning from below — the process of thinning a conifer stand by removing the smallest diameter trees and successively removing larger diameter trees until a canopy cover or basal area retention standard is met for the stand.

Threshold of Concern — the level of watershed disturbance which, if exceeded, could create adverse watershed or water quality effects, in spite of application of best management practices and project design criteria.

Torching — (1) the envelopment in flame of live or dead branches on a standing tree or group of trees; (2) fire burning a single or very small group of trees.

Underburning — a prescribed fire in fuels on the forest floor that is intended to generally remain on the forest floor without consuming significant portions of the forest canopy.

Uneven-aged — a stand of trees of three or more distinct age classes, either inter-mixed or in small groups. Uneven-aged silvicultural systems are a planned sequence of treatments designed to maintain and regenerate a stand with three or more age classes.

White pine blister rust — a disease caused by a fungus that commonly infects sugar pines and causes branch dieback and bole cankers leading to tree mortality if infection is severe enough.

Whole-tree removal — a harvest method where trees are felled at the stump and skidded to the landing for de-limbing, bucking, and processing. Large trees may be bucked in the treatment unit to facilitate removal to the landing and reduce skidding damage to residual trees. Most activity slash would be removed to the landing.

Wildland Urban Interface — the area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends out for 1.5 miles from the edge of developed private land into the wildland.

Yarding — bringing sawlogs or biomass to a central location for removal from a treatment area.

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Appendices

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United States
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Forest Service

Pacific Southwest
Region

Plumas
National Forest

Plumas County
California

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Keddie Ridge Hazardous Fuels Reduction Project

Final Environmental Impact Statement

Record of Decision

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Introduction

This Record of Decision (ROD) documents the decision to implement Alternative A of the Keddie Ridge Hazardous Fuels Reduction Project (Keddie Ridge Project) Final Environmental Impact Statement (FEIS) with modifications. The purpose of this project is to modify fire behavior, improve forest and watershed health, protect and enhance habitat for Region 5 Forest Service sensitive plants and wildlife, and reduce the spread and introduction of noxious weeds in the Indian Valley area. The FEIS discloses the environmental impacts associated with the agency's Proposed Action, a No-action Alternative, and three additional action alternatives developed to meet the purpose and need and respond to issues raised by the public.

Background

The Keddie Ridge Project surrounds the communities of Crescent Mills, Greenville, Taylorsville, and all of Indian Valley. The landscape conditions coupled with the proximity of adjacent communities makes the Keddie Ridge Project a priority for treatment. Much of the existing landscape in the Keddie Ridge Project area resembles the conditions leading up to the fire season of 2007. These recent high-intensity wildfires fueled by overcrowded stand conditions have caused concern in local communities due to the potential for loss of life and property, timber values, water quality, and wildlife habitat.

In the Moonlight and Antelope Complex fires of 2007, over 54,000 acres burned with stand-replacing high severity fire. Approximately 20 California spotted owl protected activity centers (PACs) and their associated home range cores areas (HRCAs) were lost due to high severity wildfire effects and were removed from the Plumas National Forest PAC network. The resource values lost were tremendous and are fresh in the minds of the local population.

This tenuous situation within the Wildland Urban Interface (WUI) is exactly what the Keddie Project is designed to address. The communities of Indian Valley will be more fire-safe as a result of the project. Safety of the fire fighters will be an added benefit as the resulting reduction in forest fuels will make suppression more effective. If we do not take action communities will become more vulnerable as fuels accumulations increase. Biological resources will be threatened with fire and additional fires would further limit an already suppressed economy in these rural communities that struggle to diversify while still reliant on traditional forest products production as a foundation.

To address these concerns, the 2004 Sierra Nevada Forest Plan Amendment Record of Decision (SNFPA ROD) allows for full implementation of the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act Pilot Project. The HFQLG Act established certain vegetation management activities to be implemented in order to test their effectiveness in: reducing the potential size of wildfires, reducing risk to firefighters, and supplying timber for the economic stability of rural communities, while promoting ecological health of a forest through uneven-aged timber management.

Purpose and Need

This section provides a brief overview of the project purpose and need for action (FEIS, Chapter 1, Purpose and Need for Action, pp. 2-5).

Purpose 1: Reduce Hazardous Fuel Accumulation

The objective is to modify fire behavior by reducing hazardous fuels to protect communities, fire fighters, and biological resources. This is needed because the project area has high densities of small and intermediate-sized trees and heavy fuel loads within forested stands that contribute to hazardous accumulations of surface, ladder, and canopy fuels. These conditions are highly susceptible to crown fire initiation and spread under fire weather conditions, and increase the potential for high-severity stand-replacing fire events. This potential fire behavior leads to increased risk to communities and forest and riparian ecosystems within and adjacent to the Keddie Ridge Project area.

Purpose 2: Improve Forest Health

The objective is to modify forest structure, density, and species composition to improve forest health and promote the growth and development of a heterogeneous, uneven-aged, multistoried, fire-resilient forest. This is needed because the project area is dominated by homogeneous, closed canopy mid-seral forests. These forests are characterized by high densities of small and intermediate-sized trees which contribute to stressed stand conditions due to competition for water, light, and nutrients. These dense forests are susceptible to mortality caused by drought, insects, disease, and fire.

Purpose 3: Protect and Enhance Habitat for Region 5 Forest Service Sensitive Plant and Wildlife Species

Objective 1 is to reduce the threat of high-severity, stand-replacing wildfire within clustered lady's-slipper orchid (*Cypripedium fasciculatum*) and bald eagle nesting habitats.

Objective 2 is to modify forest conditions to enhance habitat and support the long-term viability of clustered lady's-slipper and Constance's rock cress (*Arabis constancei*).

These changes are needed because dense stands and high fuel loads increase the risk of high-severity, stand-replacing wildfire in both (a) the primary nesting zone of the Round Valley bald eagle territory and (b) the fourteen clustered lady's-slipper orchid sites located within project treatment units. High-severity wildfires decrease the quality of bald eagle nesting habitat by removing overstory nest structures. In addition, clustered lady's-slipper orchids are intolerant of high-severity fires that eliminate the duff layer or damage the orchid’s underground stems. Closed canopy conditions created by high densities of small trees also contribute to a decline in habitat quality for clustered lady's-slipper and Constance's rock cress through decreased light to the forest floor and an increase in leaf litter and duff.

Purpose 4: Improve Watershed Health

The objective is to reduce the number of improperly constructed or unmaintained roads. This is needed because roads are the largest single human-caused source of sedimentation and habitat degradation within the project area. Improperly constructed or unmaintained roads may restrict aquatic organism passage and transport sediment to streams and riparian areas, thus degrading water quality and aquatic habitat.

Purpose 5: Reduce Noxious Weed Infestations

The objective is to control the spread and introduction of noxious weeds. This is needed because five invasive plant species of high management concern have been documented within the Keddie Ridge Project area. These include approximately 0.2 acre of hoary cress (*Cardaria draba*), 4 acres of Canada thistle (*Cirsium arvense*), 58 acres of yellow starthistle (*Centaurea solstitialis*), 0.1 acre of Scotch broom (*Cytisus scoparius*), and 45 acres of medusahead (*Taeniatherum caput-medusae*). Past efforts to control these weeds using manual treatment methods have not been effective. Noxious weed species pose a significant threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, decrease the availability of forage for wildlife, and degrade soil structure. The large existing area occupied by weed species, coupled with the proposed ground-disturbing activities, greatly increase the potential for introduction and spread of noxious weeds.

Decision and Rationale for Decision

Decision

Based on the analysis in the Keddie Ridge Hazardous Fuels Reduction Project FEIS and the associated planning record, I have decided to implement Alternative A (FEIS, Chapter 2, Alternatives Considered in Detail, Alternative A, pp. 11-15) with modifications based on resolution of objections as discussed below.

Four objections were received for the Keddie Ridge Project and focused on decision framework and social and economic environment analysis. The objector’s brought forward concerns regarding the rationale for preferring Alternative A, intensity of fuels treatments, cost effectiveness, comparison of social and economic effects among alternatives, and incorporation of a general technical report (PSW-GTR-220) “An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests”(North et al. 2009). Based on the resolution of these objections, the following modifications will apply to Alternative A:

1. Approximately 42 acres of additional group selections analyzed in Alternative E have been distributed in Alternative A modified ground-based mechanical thinning units.

2. Defer treatment on approximately 270 acres of skyline yarding and 2.11 miles of temporary roads associated with implementing these units.
3. Change Rx 2 and Rx 4 (1,694 acres) from 40 - 50 percent canopy closure in California Wildlife Habitat Relationship System (CWHR) size and density classes 5M/5D stands to 40 percent canopy closure (467acres).
4. Remove two nonessential temporary roads, totaling 5.86 miles (one dissecting units 68 and 69 and the other within unit 84).

This decision includes the following activities (modified Alternative A): 5,122 acres of Defensible Fuel Profile Zones (DFPZs); 505 acres of area thinning (AT) outside of DFPZs, (including 34 acres of area thinning treatments within a bald eagle territory); 326 acres of group selection (GS) within DFPZ (309 acres) and AT (17 acres) units; hand thin, pile, and burn within 9 acres of clustered lady's slipper habitat, 76 acres of Constance's rock cress habitat, and 12 acres within a bald eagle territory; and 107 acres of noxious weed treatment using a combination of herbicide applications of aminopyralid or glyphosate, hand pulling, spring underburning, direct flaming with a backpack propane torch, and revegetation in select areas using native seed. More detailed descriptions of project activities are in the FEIS (Chapter 2, Alternative Considered in Detail, Design Criteria Common to All Action Alternatives, pp. 22-32).

Approximately 42 acres of group selections within ground-based mechanical thinning units from Alternative E and approximately 30 acres of group selections within skyline yarding thinning units have been distributed in Alternative A modified ground-based mechanical thinning units, therefore increasing group selection densities. A total of 72 acres of group selections (combination of modification items 1 and 2 above) have been distributed into Alternative A modified. Group selection placement for Alternative A modified will comply with the guidelines for group selection as described in Alternative A - generally avoid 5M/5D CWHR types within California spotted owl HRCAs and group selections will generally be placed within CWHR size class 4.

After deferring temporary roads associated with skyline yarding and nonessential roads, approximately 6.15 miles of temporary roads will be needed to access treatment units in Alternative A modified.

Mitigation

There are no mitigation measures or activities proposed for Alternative A; however, design criteria, best management practices (BMPs), and standard management requirements (SMRs) are incorporated into Alternative A (FEIS, Chapter 2, Alternative Considered in Detail, Design Criteria Common to All Action Alternatives, pp. 22-32; Appendix H, Standard Management Requirements and Monitoring. In Chapter 2 of the FEIS, Tables 5 – 13 display design criteria common to all action alternatives and include criteria for actions such as DFPZs, area thinning, group selections, riparian habitat conservation areas (RHCAs), noxious weeds, access and transportation, and watershed improvements. The criteria identified in the tables range from logging system, retention levels, treatment of stumps, and species. Appendix E includes Riparian Management Objectives (RMOs) and provides justification for treating RHCAs. Appendix H includes SMRs for several resources including wildlife and fisheries, hydrology and soils, botanical resources and noxious weeds, heritage resources, and treatment implementation as it relates to access. The SMRs include items such as limited operating periods, BMPs, and a water drafting plan. All practicable means to avoid or minimize environmental harm from this decision have been adopted.

Monitoring

Monitoring is discussed in Appendix H (Standard Management Requirements and Monitoring) of the FEIS and includes resource areas for soils, heritage, aquatic wildlife, noxious weeds, and range. Most monitoring efforts are made on a yearly basis and will be conducted either during or after project implementation.

Rationale for Decision

In reaching my decision, I have considered the purpose and need for action, the issues and range of alternatives and environmental consequences. I have also considered public comments on the Draft Environmental Impact Statement (DEIS) and proposed action, the Forest Plan and amendments, the FEIS, and the documents incorporated by reference, including resource specialist reports.

My decision to implement Alternative A, as modified, will meet the purpose and need for action, substantially improving resource conditions in the project area.

My decision will reduce hazardous fuel accumulation by creating conditions that provide for a surface fire, less than 25 percent basal area predicted level of mortality for residual trees, and a flame length less than four feet. Stands will retain 73-100 percent of trees greater than 20 inches DBH, 68 percent of stands will have a basal area per acre less than or equal to 150 square feet and a relative stand density of 25-40 percent post treatment, 61 percent of stands will provide a relative abundance of shade-intolerant tree species, 25 percent of the stands will grow into CWHR 5 in 30 years, post-treatment canopy cover will be 50 percent open and closed, and the distribution of CWHR size and density classes will be more diverse.

My decision will treat seven Region 5 Forest Service sensitive plant occurrences, protect and enhance 85 acres of sensitive plant habitat, improve 4 stream crossings, decommission 1 mile of road, and disconnect 5 miles of road drainages from streams. The risk of invasion of noxious weeds is moderate under this decision. It will treat 87 infestations and up to 107 acres of noxious weed infested areas.

This decision will reduce 25 percent of stands suitable to old-forest dependent species (CWHR size and density classes 4D/4M/5M/5D) to an unsuitable condition (open forest canopy or early seral), and high risk of potential habitat loss due to wildfire will be reduced.

Treatment activities will not cause any subwatershed to exceed the threshold of concern (TOC) and only one subwatershed will approach the TOC. Equivalent Roaded Acres (ERA) values have been calculated to reflect the redistribution of group selection units; all other modifications to Alternative A are not expected to alter ERA values reported in the original Alternative A analysis. Cumulative ERA values are now predicted to range from 12.8 percent (Mt. Jura subwatershed) to 98.0 percent (Upper Cooks Creek subwatershed) of the TOC. Modifications to Alternative A would result in minor increases in ERA; with no subwatersheds exceeding the TOC, the Upper Cooks Creek subwatershed would experience an additional 0.4 percent of TOC increase compared to the effects forecasted in the Proposed action estimate. Based on the assumption that group selection units will not occur within RHCAs, riparian area ERA values are expected to remain consistent with the estimates reported in the Proposed action.

Based on the modified Alternative A analysis with regard to wildlife (terrestrial and aquatic), forest vegetation, fire, fuels, and air quality, botanical resources (including noxious weeds), heritage resources, recreation, range, minerals, and scenic resources, the inclusion of additional groups proposed under modifications one and two above fall within the analyses of Alternatives A and E and would have negligible or no changes to the conclusions presented in the Keddie Ridge Project FEIS.

My decision provides a balance between resource impacts by proposing a variety of treatment intensities. Many variables were considered in developing the proposed action and associated treatment unit specific prescriptions, such as purpose and need, proposed treatment, CWHR type, size, and density classes, land allocation, visual quality objectives, and guidance from the General Technical Report PSW-GTR-220*, An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests* (USDA 2009). Unit specific prescriptions and maps are location in Appendix B of the FEIS, and address RHCAs, CWHR system specific canopy closure (CC), general retention size for trees, and post-treatment underburning. Each prescription is unique and the variables that change are: canopy closure (CC), general retention size for trees, and the land allocation for which these variables apply. Overall, this decision applies more restrictive prescriptions to RHCAs, CWHR 5M/5D, and California spotted owl HRCA land allocations, as they relate to CC's and general retention size for trees.

Alternative A was designed to account for suggestions received from the public. There were suggestions to carefully consider prescriptions for units with regard to land allocation. For example, when treating a California spotted owl HRCA, the Mt. Hough interdisciplinary team (IDT) considered treating this land allocation differently than wildland urban interface land allocations.

The Forest Service has a role to play in providing a wood supply for local manufacturers and sustaining a part of the employment base in rural communities (USDA 2004b). Considering the national economic crisis and the decrease in budgets, the economics of the Keddie Ridge Project are an essential component to weigh and balance in making this decision. While maintaining a balance between resource impacts, I have decided to modify Alternative A to incorporate and remove specific activities to both increase sawlog net value and reduce implementation costs, respectively. Approximately 270 acres of the skyline yarding units that have been deferred included biomass removal; by deferring the biomass and temporary roads needed for access associated with these skyline units costs were reduced. The combined sawlog and biomass total costs were reduced by $122,747 and combined sawlog and biomass total value increased by $779,164. Overall, the total net value of sawlogs and biomass for Alternative A modified increased by $656,417 for a total net value of $598,021. The modifications to Alternative A resulted in an additional 77 full time jobs and increase employee-related income by $4,622,755 for a total employee-related income of $11,422,375. These modifications will increase project financial viability and therefore increase overall implementation likelihood.

Legal and Regulatory Compliance

My decision complies with the laws, policies, and executive orders listed below and described in Chapter 3 of the FEIS (FEIS, Chapter 3, Legal and Regulatory Compliance, pp. 310-313).

Findings Required by Other Laws and Regulations

The National Environmental Policy Act at 40 CFR 1502.25(a) directs “to the fullest extent possible, agencies shall prepare draft EIS concurrently with and integrated with other environmental review laws and executive orders.” Each resource section in the FEIS includes a list of applicable laws, regulations, policies and Executive Orders that are relevant to that resource. Surveys, analyses, and findings required by those laws are specifically addressed in Chapter 3 of the FEIS. These laws include:

Endangered Species Act – The Forest Service is complying with the provisions of the Endangered Species Act as it pertains to the Keddie Ridge Project. Section 7(a)(2) of the Endangered Species Act requires that Federal agencies consult with the United States Fish and Wildlife Service and National Marine Fisheries Service, as appropriate, to ensure that their actions do not jeopardize the continued existence of species listed as threatened or endangered under ESA, or destroy or adversely modify their critical habitat.

A biological assessment was prepared for Federally Proposed, Threatened, or Endangered wildlife and botany species and their critical habitat. Implementation of the project would have no effect on valley elderberry longhorn beetle and California red-legged frog. No Federally Proposed, Threatened, or Endangered wildlife or botany species were located within the Keddie Ridge Project area during past or current surveys.

Clean Water Act – The Forest Service is complying with the provisions of the Clean Water Act as it pertains to the Keddie Ridge Project (FEIS, Chapter 3, Legal and Regulatory Compliance, pp. 310-311). Section 208 of the Clean Water Act requires States to prepare nonpoint source pollution plans that are to be certified by the State and approved by the United States Environmental Protection Agency (EPA). In response to this law, and in coordination with the State of California Water Quality Resources Control Board and EPA, the Forest Service, Region 5, began developing best management practices (BMPs) in 1975 for water quality management planning on National Forest System lands in California. This process identified the need to develop a BMP for addressing the cumulative off-site watershed effects of forest management activities on the beneficial use of water.

The Keddie Ridge Project meets this through the incorporation of project design features (FEIS, Chapter 2, Alternative Considered in Detail, Design Criteria Common to All Action Alternatives, pp. 22-32), Scientific Analysis Team (SAT) Guidelines for RHCAs) (USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; Keddie Ridge Project FEIS, Appendix E), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in Appendix H of the FEIS. Refer to the Hydrology and Soils Environmental Consequences section in Chapter 3 of the FEIS for a discussion of environmental consequences

Alternative A includes treatments for improving National Forest System (NFS) roads and a few segments of Plumas County roads. Treatments range from light brushing with no drainage improvements to heavy brushing and large drainage improvements. Refer to the FEIS, Appendix C for more details regarding the proposed treatments and Chapter 3, Hydrology and Soils, Environmental Consequences section for a discussion of effects.

Clean Air Act – The Forest Service is complying with provisions of the Clean Air Act as it pertains to the Keddie Ridge Project. All burning implemented under the Keddie Ridge Project would be completed under approved burn and smoke management plans. Burning permits would be acquired from the Northern Sierra Air Quality Management District. The Air Quality Management District would determine dates when burning is allowed, The California Air Resources Board provides daily information on burning conditions. Burning would be implemented in a way to minimize particulate emissions.

National Historic Preservation Act of 1966 as Amended - The Forest Service is complying with the provisions of the National Historic Preservations Act of 1966 as amended as it pertains to the Keddie Ridge Project. Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment on such undertakings. The Advisory Council on Historic Preservation has defined a Federal undertaking in 36 CFR 800.16(y) as a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to State or local regulation administered pursuant to a delegation or approval by a Federal agency.

Coastal Zone Management Act – There are no coastal management zones within the Keddie Ridge Project area or on the Plumas National Forest. The Coastal Zone Management Act does not apply to the Keddie Ridge Project.

National Forest Management Act – The Forest is in compliance with the National Forest Management Act as it pertains to the Keddie Ridge Project. Projects that occur on National Forest System lands must meet minimum specific management requirements by designing the project to meet standards and guidelines of the Forest Plan and its amendments (FEIS, Chapter 3, Legal and Regulatory Compliance, pg. 311). This project meets all applicable guidelines for land management plans according to 16 U.S.C. 1604 (g) (3).

Indian Sacred Sites, Executive Order 13007 of May 24, 1996 – Section 1. *Accommodation of Sacred Sites*. (a) In managing Federal lands, each executive branch agency with statutory or administrative responsibility for the management of Federal agency functions, (1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites. Where appropriate agencies shall maintain the confidentiality of sacred sites.

Invasive Species, Executive Order 13112 of February 3, 1999 - The Forest Service is complying with the provisions for the Invasive Species Executive Order 13112 as it pertains to the Keddie Ridge Project. The FEIS provides an analysis of the effects of the Keddie Ridge Project on noxious weed introduction and spread. The standard management requirements and proposed weed treatment measures were developed to prevent the introduction of invasive species, control the spread of existing infestations, and minimize adverse impacts to NFS lands.

Recreational Fisheries, Executive Order 12962 of June 6, 1995 – The effects to fish habitat from the project are expected to be so small that direct effects on fish productivity and the quality of the recreational fishery would be negligible.

Migratory Birds, Executive Order 13186 of January 10, 2001 - The Forest Service is complying with the provisions of the Migratory Birds Executive Order 13186 as it pertains to the Keddie Ridge Project (FEIS, Chapter 3, Legal and Regulatory Compliance, pg. 312). The environmental analyses of deferral actions are to evaluate the effects of actions and agency plans on migratory birds, with emphasis on species of concern. There is no interagency determination to be made for migratory birds with Federally listed species. Proposed activities and alternatives are not expected to affect migratory birds.

Floodplain Management, Executive Order 11988of May 24, 1977 – These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating project riparian management objectives; adhering to the Scientific Assessment Team guidelines, as set forth in the HFQLG FEIS and ROD (Keddie Ridge Project FEIS, Appendix E); and implementing best management practices, standard management requirements, and project design criteria.

Protection of Wetlands, Executive Order 11990 of May 24, 1977 – These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be assured by incorporating project riparian management objectives; adhering to the Scientific Assessment Team guidelines, as set forth in the HFQLG FEIS and ROD (Keddie Ridge Project FEIS, Appendix E); and implementing best management practices, standard management requirements, and project design criteria.

Environmental Justice, Executive Order 12898 of February 11, 1994 – Although low-income and minority populations live in the vicinity, activities proposed for the Keddie Ridge Project would not discriminate against these groups. Based on the composition of the affected communities and cultural and economic factors, proposed activities would have no disproportionately adverse effects to human health and safety or environmental effects to minorities, low-income, or any other segments of the population. Scoping was conducted to elicit comments on the proposed action from all potentially interested and affected individuals and groups without regard to income or minority status.

Use of Off-Road Vehicles, Executive Order 11644 of February 8, 1972 – The Keddie Ridge Project is in compliance with the Plumas National Forest Public Motorized Travel Management Final Environmental Impact Statement (FEIS)(August 2010) and Record of Decision (ROD)(September 2010).

Special Area Designations

I have determined that the Keddie Ridge Project complies with laws, regulations, and policies that pertain to the following special areas:

Research Natural Areas -There are no Research Natural Areas within the Keddie Ridge Project area.

Inventoried Roadless Areas - There are no Inventoried Roadless Areas within the Keddie Ridge Project area. There is a very small portion of PNF LRMP Semi-Primitive land allocation within the Keddie Ridge Project area; however no treatment units overlap with this land allocation. Therefore there will be no impacts to the Semi-Primitive land allocation.

Wilderness Areas- There are no Wilderness Areas within the Keddie Ridge Project area.

Wild and Scenic Rivers - A portion of Indian Creek was identified as “eligible” in the PNF LRMP. This portion of Indian Creek is within the Keddie Ridge Project area; however no treatment units overlap with this segment of creek. Therefore, there will be no impacts to the eligible portion of Indian Creek.

Municipal Watersheds (FSM 2540) **-** Round Valley Reservoir is a municipal water supply for Greenville. The activities proposed in the Keddie Ridge Project are expected to be beneficial to Round Valley Reservoir. The Keddie Ridge Project meets this through the incorporation of project design features (FEIS, chapter 2), Scientific Analysis Team (SAT) Guidelines for riparian habitat conservation areas (RHCAs)(USDA 2004b, page 67; USDA 1999a, Appendix L, pages APP L 9-APP L 12; Keddie Ridge Project FEIS, Appendix E), soil standards and guidelines (PNF LRMP, pages 4-43 – 4-45); and best management practices, standard management requirements, and monitoring listed in appendix H of the FEIS.

Special Interest Areas— There are no Special Interest Areas within the project area and would, therefore, not be affected.

Public Involvement

The Keddie Ridge Project has been listed in the Plumas National Forest quarterly Schedule of Proposed Actions (SOPA) since December 6, 2006. A Notice of Intent (NOI) to prepare an Environmental Impact Statement for the Keddie Ridge Project was published in the Federal Register on Thursday, April 1, 2010. As part of the public involvement process and collaboration requirements under the Healthy Forest Restoration Act (HFRA), the Forest Service held two open houses – September 15, 2009 at Mt. Hough Ranger District in Quincy, California and June 16, 2010, at Greenville Town Hall in Greenville, California. Announcements for each open house were published in the *Feather River Bulletin* and informational flyers were sent to the Plumas National Forest key contacts, including media. A diversity of opinion was never present at any one public meeting. Given that those divergent opinions would not meet together, the Plumas National Forest Supervisor drafted and shared with its frequent collaborators (March 2010) the Forest Service’s intended approach to Herger-Feinstein Quincy Library Group (HFQLG) projects under HFRA. The Forest Service also held individual meetings with interest groups from July throughout April 2010 and hosted a field trip for all interested parties on May 26, 2010.

Project information was sent to interested parties, adjacent land owners, mining claimants, Native American tribes, and Federal, State, and local agencies. Those who submitted comments are listed in the FEIS (Chapter 1, Public Involvement, pp. 8-10) and a list of who received a copy of the FEIS are listed in Chapter 4, Consultation and Coordination, pp. 314-316.

One verbal and thirteen written comments on the proposed action were received during the scoping period. The scoping comments and issues presented in the comments are summarized in

Appendix G of the FEIS. A compilation of scoping comments is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The Forest Service did not identify any significant issues, as defined by NEPA, during scoping. This is because the cause and effect relationship identified, although logical, is not expected to have a significant effect. A list of issues and non-significance determinations from comments is available in Appendix G of the FEIS. Two alternatives, D and E, were requested by commenters who submitted scoping comments during the scoping period.

The Forest Service initiated the 45-day comment period for the DEIS with the Notice of Availability published in the Federal Register on February 4, 2011. A comment period notice was also published in the *Feather River Bulletin* on the following Wednesday, February 9, 2011. Ten comments were received from three agencies and six organizations. One organization submitted two comments. A response to comments can be found in Appendix G of the FEIS. A compilation of comments received during the DEIS comment period is located in the project record at Mt. Hough Ranger District in Quincy, CA.

The FEIS was circulated to the public on August 5, 2011. A Notice of Availability was published in the Federal Register on August 19, 2011. A legal notice for the objection period was published in the Feather River Bulletin on August 10, 2011. During the 30-day objection period, four objections were received. Information on the resolutions for these objections is in the Administrative Review section below.

Alternatives Considered in Detail but Not Selected

In addition to the selected alternative, I considered four other alternatives in detail, which are discussed below. A more detailed comparison of these alternatives can be found in chapter 2 of the FEIS.

Alternative B, the no-action alternative, includes current ongoing management activities, but none of this project’s proposed activities. I did not choose this alternative because it does not meet the purpose and need for action. It would not reduce hazardous fuel accumulation. Dense timber stands with heavy fuel loads would continue to put communities and ecosystems at risk to wildfire. This alternative would not improve forest health, protect or enhance sensitive plant and wildlife habitat, improve watershed health or reduce noxious weed infestations.

A court ruling requires that all project with a singular purpose and need for fuels reduction, or with multiple purpose and needs that include fuels reduction, must have a non-commercial funding alternative. A non-commercial alternative is an alternative where the sole purpose is to achieve the fuels reduction element of the purpose and need and where all the proposed treatments are solely directed at reducing hazardous fuels. In a non-commercial funding alternative, there can be no additional timber harvesting added beyond that needed to meet the fuel reduction purpose and need *(Sierra Forest Legacy v. Mark Rey*, Case 2:05-cv-00205-MCE-

GGH, Morrison C. England, Jr., United States District Court Judge, United States District Court, Eastern District of California, November 4, 2009). Alternative C was not selected because one purpose, reduce fuel accumulation, would have been met. Although reducing fuel accumulation is important, other purposes and needs were met and balanced more equitably in Alternative A.

Alternative D is consistent with the 2001 Sierra Nevada Forest Plan Amendment (SNFPA) Record of decision (ROD) with no further modifications or restrictions. Alternative D was not selected because 14 percent of the stands would not meet desired conditions where percent basal area would exceed 25 percent. All stands would retain 100 percent of trees greater than 20 inches DBH while 11 percent of the stands would meet desired conditions for basal area per acres less than or equal to 150 square feet. The minimal intensity of the treatments in Alternative D allow for protection and enhancement of R5 Forest Service sensitive wildlife species habitat; however other purpose and needs were met and balanced more equitably in Alternative A.

Alternative E is consistent with the 2004 SNFPA ROD, like Alternative A, but with no further modifications or restrictions. Alternative E was not selected because prescriptions were developed at a landscape level, rather than at a treatment unit level. Alternative E does not include collaboration efforts and noxious weed treatments. Alternative A provides more balance between prescriptions and treatment intensities.

Environmentally Preferable Alternative

I find Alternative A to be the environmentally preferable alternative. In the long-term, Alternative A would cause the least harm to the biological and physical environment. Alternative A meets all purposes and needs by reducing hazardous fuel accumulation, improving forest health, protecting and enhancing habitat for Region 5 Forest Service sensitive plant and wildlife species, improving watershed health, and reducing noxious weed infestations. By meeting all the purposes and needs, the adverse short-term affects are outweighed by the long-term beneficial effect to the biological and physical environment.

Implementation Date

Implementation may begin immediately.

Administrative Review

This project was planned under authorization of the Healthy Forest Restoration Act (H.R. 1904; Public Law 108-148; 36 CFR 218 – Predecisional Administrative Review Process). It is not subject to the notice, comment and appeal procedures of 36 CFR 215. In accordance with 36 CFR 218, subpart A, I provided an opportunity for submission of objections for 30 days from the date of publication of the legal notice in the Feather River Bulletin on August 10, 2011. During the 30-day objection period, four objections were received. They were from the American Forest

Resource Council, Plumas County Economic Recovery Committee, Plumas Corporation, and Counties' QLG Forester. Two meetings were held and based on discussions with the objectors; Alternative A was modified in this decision. All of the objectors withdrew their objections. Objection records are at the Plumas National Forest Supervisor's Office.

Contact Person

The FEIS and supporting documents are available for public review at the Plumas National Forest, Mt. Hough Ranger District, 39696 Highway 70, Quincy, 95971, (530) 283-0555. For further information on this decision, contact Katherine Carpenter (kacarpenter@fs.fed.us), Keddie Ridge Project Interdisciplinary Team Leader at (530) 283-7619.

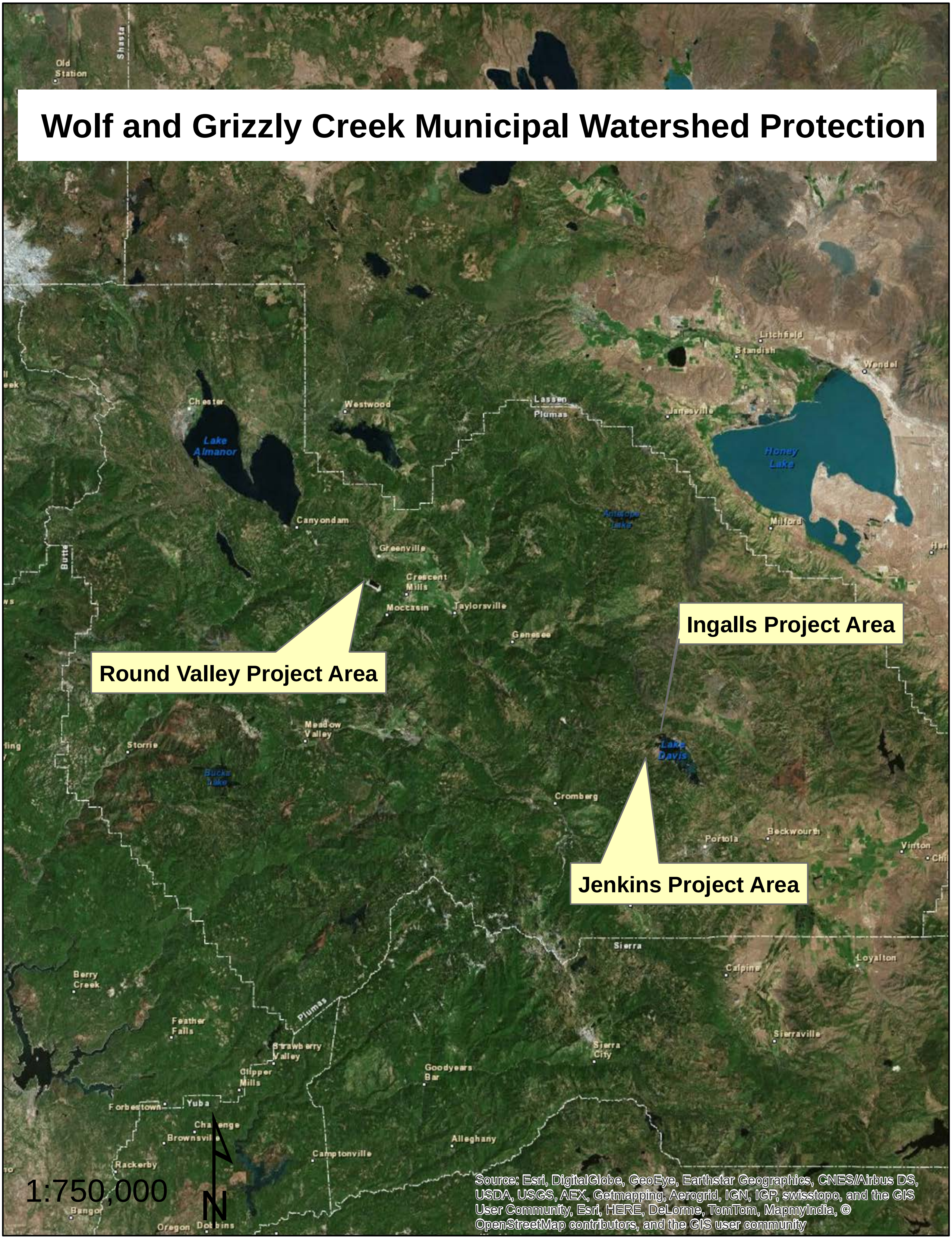
/s/ Earl W. Ford 12/7/2011

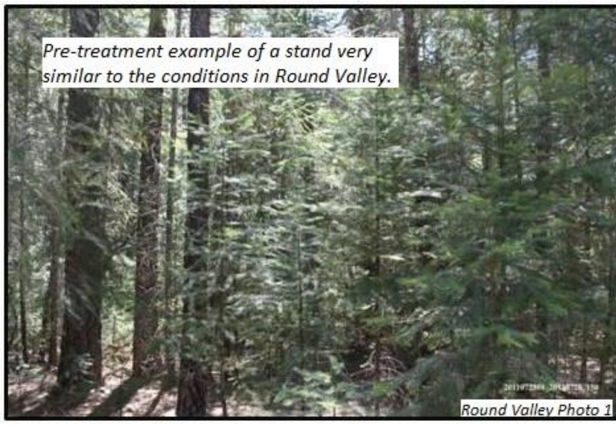
Earl W. Ford *Date*

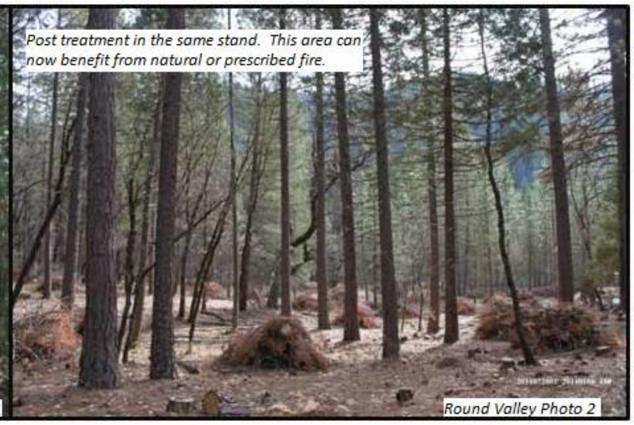
Forest Supervisor, Plumas National Forest

Quincy, CA

Wolf and Grizzly Creek Municipal Watershed Protection



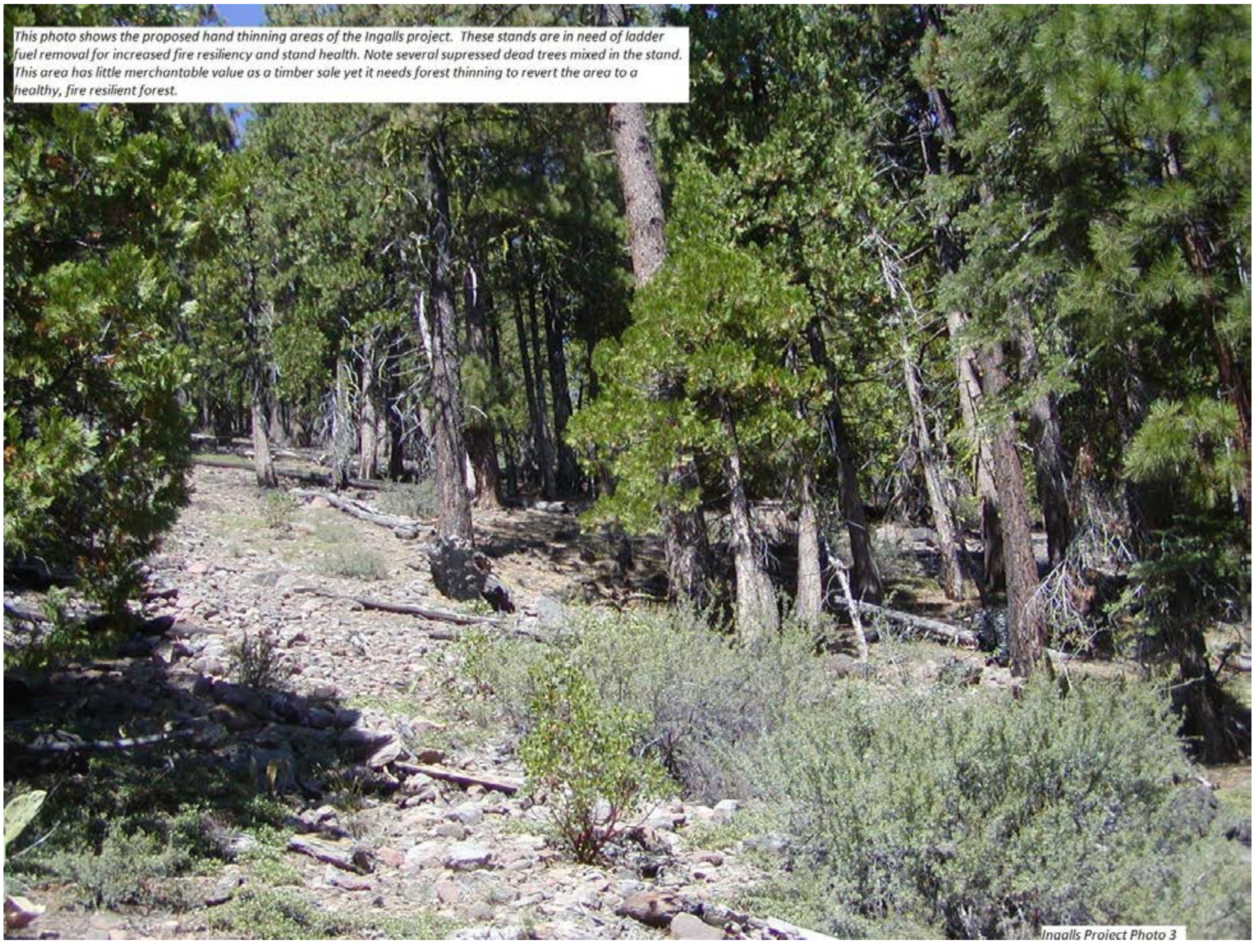

Pre-treatment example of a stand very similar to the conditions in Round Valley.
Round Valley Photo 1


Post treatment in the same stand. This area can now benefit from natural or prescribed fire.
Round Valley Photo 2


This photo shows the current conditions in the Round Valley Project area. Presently, the stand is thick with white fir regeration,which over time will out compete the pines, transforming the stand into another overstocked white fir stand. Treatments will reduce the white fir understory and encourage pine growth, mimicking the natural progression that a wildfire would create.
Round Valley Photo 3


This photo shows the decaying white fir stands in the Ingalls Project area. Note the heavy fuel load of down large material. This is a perfect example of our forested areas that are in need of treatment yet have little monetary value as a timber sale.
Ingalls Project Photo 1


This is another view of the white fir stands in the Ingalls Project Area. Treatments in these stands will greatly the likelyhood of high intensity wildfires by reducing the heavy fuel loads. Treatments will also provide opportunity for pine regeneration, transitioning the forest into a more fire and drought resistant condition.
Ingalls Project Photo 2



This photo shows the proposed hand thinning areas of the Ingalls project. These stands are in need of ladder fuel removal for increased fire resiliency and stand health. Note several supressed dead trees mixed in the stand. This area has little merchantable value as a timber sale yet it needs forest thinning to revert the area to a healthy, fire resilient forest.

Ingalls Project Photo 3


This photo shows an area within the Jenkins Project requiring mechanical thinning. This stand is heavily overstocked with diseaded and dying white fir, creating situations of shading pine regeneration, as well as creating an unnatural buildup of large woody debris on the forest floor.
Jenkins Project Photo 1


Conditions for pine are far from ideal in the Jenkins Project, many of the ponderosa pine in the stand have some disease or physical defect, mainly contributed by the overshading of white fir in the area. If the fir can be removed, the released pine will recover and more ponderosa pine will regenerate. The introduction of fire will also keep the white fir dominance at bay while encouraging more pine regeneration.
Jenkins Project Photo 2


This photo shows a common example within the Jenkins Project of heavily overstocked stands, leading to unnaturally high tree mortality, disease, and fire risk. Treatments in these areas will transform these decaying stands into a healthy, fire resistant, carbon sequestering forest.
Jenkins Project Photo 3

FS Agreement No. 13-PA-11051100-021
Cooperator Agreement No. ____________

PARTICIPATING AGREEMENT
Between
PLUMAS COUNTY FIRE SAFE COUNCIL
And The
USDA, FOREST SERVICE
PLUMAS NATIONAL FOREST

This PARTICIPATING AGREEMENT is hereby entered into by and between the Plumas County Fire Safe Council, hereinafter referred to as "Plumas FSC," and the USDA, Forest Service, Plumas National Forest, hereinafter referred to as the "U.S. Forest Service," under the authority: Secure Rural Schools and Community Self-Determination Act of 2000, Public Law 106-393, 16 U.S.C. 500, as reauthorized and amended by the Emergency Economic Stabilization Act of 2008, Energy Improvement and Extension Act of 2008, and Tax Extenders and Alternative Minimum Tax relief Act of 2008, Section 601(a) in division C of Pub. L. 110-343.

Background: This project will focus on the development of a collaborative process to plan the restoration of the Plumas National Forest watershed and vegetation with potential emphasis on Wildland Urban Interface areas defined in approved Community Wildfire Protection Plans. The project will include educational public meetings and collaborative processes to initiate development of a proposal to the Collaborative Forest Landscape Restoration Program.

Title: Collaborative Forest Landscape Restoration within the Wildland Urban Interface

I. PURPOSE:

The purpose of this agreement is to document the cooperation between the parties to implement a collaborative planning process that results in an application to the Collaborative Forest Landscape Restoration (CLFR) program that focusses on Plumas County wildland-urban interface (WUI) in accordance with the following provisions and the hereby incorporated Title II Project Submission Form, Plumas County, Project Number 12-11 revised August 9, 2013 (Attachment A) and Financial Plan (Attachment B).

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

The U.S. Forest Service is responsible for managing public lands administered by the Plumas NF including the watershed, wildland urban interface, and resource values associated with these lands.

The mission of the Plumas County Fire Safe Council is to reduce the loss of natural and human made resources caused by wildfire through Firewise community programs and pre-fire activities.

Both entities are interested in and will benefit from working together in this collaborative planning process by focusing on the initial steps to develop a Collaborative Forest Landscape Restoration (CFLR) approach to public lands administered by the Plumas NF.

A CFLR project is an "all lands approach to forest restoration" and calls for close coordination with the Plumas NF and other landowners to encourage collaborative solutions through landscape-scale projects. The Collaborative Forest Landscape Restoration Program provides a means to achieve these aims.
The project focus will be to reduce risk of high severity wildfire to lives and property; restore watersheds, meadows and streams; restore forest structure and ecological processes; create more-resilient vegetation conditions; and reduce wildfire suppression costs.

This project will attempt to develop a collaborative dialogue among communities and interest groups that are interested in forest and watershed restoration on national forest lands proximate to Plumas County. It will provide educational opportunities for Plumas County citizens and others interested in national forest management to improve understanding of the need for restoration, what restoration work has been done and what opportunities exist for additional work.

The focus of the project is the development of restoration projects on public lands within the WUI zone and overlapping priority watersheds that would be positioned to be addressed through the CFLR program.

In consideration of the above premises, the parties agree as follows:

III. PLUMAS FSC SHALL:

A. LEGAL AUTHORITY. Plumas FSC shall have the legal authority to enter into this agreement, and the institutional, managerial, and financial capability to ensure proper planning, management, and completion of the project, which includes funds sufficient to pay the nonfederal share of project costs, when applicable.

B. Perform the tasks described in the Title II Project Submission Form, Plumas County, Project Number 12-11 revised July 18, 2013 (Attachment A).

C. Manage meeting communications, and agreement administration.

   a. Maintain regular communication concerning this project between existing and potential contributors (Plumas FSC, Plumas National Forest, and external partners) to encourage cooperation and collaboration. A key partner in the outreach and planning is UC Cooperative Extension.

   b. Manage the agreement, contracts and services and project reporting. This includes supervision of the contractor, coordination with interested collaborating partners, and involving scientists in educational public meetings.

   c. Coordinate to develop and maintain accessible internet presence for the project.

d. Ensure reports are written for a knowledgeable, but non-technical target audience.

e. Submit Quarterly Progress Reports to the U.S. Forest Service using a mutually agreed upon format to capture status, accomplishments, issues/challenges encountered, and next steps of the project.

f. Submit a Draft and Final Report to the U.S. Forest Service synthesizing results within 90 days of completion of the project.

g. Announcements and reports about work completed under this agreement shall be reviewed and approved in cooperation with the U.S. Forest Service and made available on the Plumas FSC and U.S. Forest Service web sites.

D. Schedule, advertise, organize and conduct collaborative public and internal project planning meetings. The PFSC anticipates 5-10 public meetings and 5-10 planning meetings.

a. Schedule, advertise, organize and supervise public and internal planning meetings in consultation with the U.S. Forest Service and input from collaborative partners.

b. Solicit, capture, and synthesize participant viewpoints, recommendations, and next steps about CFLRP proposal and include in the Final Report.

E. Prepare and submit Final report that describes the work completed to date and the steps taken to assist the U.S. Forest Service with the collaborative process, and includes a description of any resulting products prepared as a result of the process.

IV. THE U.S. FOREST SERVICE SHALL:

A. Coordinate with the Plumas FSC to collaborate and contribute to the development and advancement of a potential CFLRP Proposal.

a. Provide a project lead collaborative contact who will be committed to the project through the agreement period.

b. Actively participate in appropriate public and internal planning meetings over the course of the project. The Plumas FSC anticipates 5-10 public meetings and 5-10 planning meetings.

c. Provide contributing staff specialists to collaborative involvement in developing educational information and potential proposal.

d. Provide GIS support to the development of the CFLRP proposal. Anticipated spatial and attribute products include: Data on WUI, past treatments, resource specific data (watershed, wildlife, vegetation, etc.), potential treatment opportunities identified by the collaborative process.

e. Support outreach and collaboration with forest interested contacts and external partners.

B. Facilitate liaison and communication within the U.S. Forest Service to ensure participation in the development of collaborative meetings and the CFLRP proposal.

a. Regularly update the Plumas FSC and other key partners about Forest Service work directly related to the objectives of this agreement.

b. Incorporate other activities and duties mutually agreed upon to advance the goals of this project, within the scope of this Agreement.

C. PAYMENT/REIMBURSEMENT. The U.S. Forest Service shall reimburse Plumas FSC for the U.S. Forest Service's share of actual expenses incurred, not to exceed $20,944, as shown in the Financial Plan. The U.S. Forest Service shall make payment upon receipt of Plumas FSC’s monthly invoice. Each invoice from Plumas FSC shall display the total project costs for the billing period, separated by U.S. Forest Service and Plumas FSC ’s share. In-kind contributions must be displayed as a separate line item and must not be included in the total project costs available for reimbursement. The final invoice must display Plumas FSC’s full match towards the project, as shown in the financial plan, and be submitted no later than 90 days from the expiration date.

Each invoice must include, at a minimum:

1. Plumas FSC’s name, address, and telephone number
2. U.S. Forest Service agreement number
3. Invoice date
4. Performance dates of the work completed (start & end)
5. Total invoice amount for the billing period
6. Statement that the invoice is a request for payment by ‘reimbursement’
7. If using SF-270, a signature is required.
8. Invoice Number, if applicable

The invoice must be sent by one of three methods (email is preferred):

EMAIL: asc_ga@fs.fed.us
FAX: 877-687-4894
POSTAL: USDA Forest Service
Albuquerque Service Center
Payments – Grants & Agreements
101B Sun Ave NE
Albuquerque, NM 87109

Send a copy to: Plumas National Forest
Attention: Ryan Tompkins
P.O. Box 11500
Quincy, CA 95971

Or: rtompkins@fs.fed.us

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

A. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

Principal Cooperator Contacts:

Cooperator Project Contact	Cooperator Financial Contact
Jerry Hurley P.O. Box 1225 Quincy, CA 95971 Telephone: 530-832-4705 Email: jerry.hurley@sbcglobal.net	Diann Jewett 550 Crescent Street Quincy, CA 95971 Telephone: 530-283-3739 Email: diann@plumascounty.org

Principal U.S. Forest Service Contacts:

U.S. Forest Service Program Manager Contact	U.S. Forest Service Administrative Contact
Ryan Tompkins P.O. Box 11500 Quincy, CA 95971 Telephone: 530-283-7841 FAX: 530-283-7716 Email: rtompkins@fs.fed.us	Robin Bryant 631 Coyote Street Nevada City, CA 95959 Telephone: (530) 478-6127 FAX: (530) 478-6121 Email: rbryant01@fs.fed.us

B. ASSURANCE REGARDING FELONY CONVICTION OR TAX DELINQUENT STATUS FOR CORPORATE ENTITIES. This agreement is subject to the provisions contained in the Department of Interior, Environment, and Related Agencies Appropriations Act, 2012, P.L. No. 112-74, Division E, Section 433 and 434 regarding corporate felony convictions and corporate federal tax delinquencies. Accordingly, by entering into this agreement Plumas FSC acknowledges that it: 1) does not have a tax delinquency, meaning that it is not subject to any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, and (2) has not been convicted (or had an officer or agent acting on its behalf convicted) of a felony criminal violation under any Federal law within 24 months preceding the agreement, unless a suspending and debarring official of the United States Department of Agriculture has considered suspension or debarment is not necessary to protect the interests of the Government. If Plumas FSC fails to comply with these provisions, the U.S. Forest Service will annul this agreement and may recover any funds Plumas FSC has expended in violation of sections 433 and 434.

C. NOTICES. Any communications affecting the operations covered by this agreement given by the U.S. Forest Service or Plumas FSC are sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the U.S. Forest Service Program Manager, at the address specified in the agreement.

To Plumas FSC, at Plumas FSC's address shown in the agreement or such other address designated within the agreement.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

D. PARTICIPATION IN SIMILAR ACTIVITIES. This agreement in no way restricts the U.S. Forest Service or Plumas FSC from participating in similar activities with other public or private agencies, organizations, and individuals.

E. ENDORSEMENT. Any of Plumas FSC's contributions made under this agreement do not by direct reference or implication convey U.S. Forest Service endorsement of Plumas FSC's products or activities.

F. USE OF U.S. FOREST SERVICE INSIGNIA. In order for Plumas FSC to use the U.S. Forest Service Insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communications. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

G. NON-FEDERAL STATUS FOR COOPERATOR PARTICIPANT LIABILITY. Plumas FSC agree(s) that any of their employees, volunteers, and program participants shall not be deemed to be Federal employees for any purposes including Chapter 171 of Title 28, United States Code (Federal Tort Claims Act) and Chapter 81 of Title 5, United States Code (OWCP), as Plumas FSC hereby willingly agree(s) to assume these responsibilities.

Further, Plumas FSC shall provide any necessary training to Plumas FSC's employees, volunteers, and program participants to ensure that such personnel are capable of performing tasks to be completed. Plumas FSC shall also supervise and direct the work of its employees, volunteers, and participants performing under this agreement.

H. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no United States member of, or United States delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

I. NONDISCRIMINATION. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

J. ELIGIBLE WORKERS. Plumas FSC shall ensure that all employees complete the I-9 form to certify that they are eligible for lawful employment under the Immigration and Nationality Act (8 USC 1324a). Plumas FSC shall comply with regulations regarding certification and retention of the completed forms. These requirements also apply to any contract awarded under this agreement.

K. STANDARDS FOR FINANCIAL MANAGEMENT.

1. Financial Reporting

Plumas FSC shall provide complete, accurate, and current financial disclosures of the project or program in accordance with any financial reporting requirements, as set forth in the financial provisions.

2. Accounting Records

Plumas FSC shall continuously maintain and update records identifying the source and use of funds. The records shall contain information pertaining to the agreement, authorizations, obligations, unobligated balances, assets, outlays, and income.

3. Internal Control

Plumas FSC shall maintain effective control over and accountability for all U.S. Forest Service funds, real property, and personal property assets. Plumas FSC shall keep effective internal controls to ensure that all United States Federal funds received are separately and properly allocated to the activities described in the agreement. Plumas FSC shall adequately safeguard all such property and shall ensure that it is used solely for authorized purposes.

4. Source Documentation

Plumas FSC shall support all accounting records with source documentation. These documentations include, but are not limited to, cancelled checks, paid bills, payrolls, contract and subgrant/contract documents, and so forth.

L. OVERPAYMENT. Any funds paid to Plumas FSC in excess of the amount entitled under the terms and conditions of this agreement constitute a debt to the Federal Government. The following must also be considered as a debt or debts owed by Plumas FSC to the U.S. Forest Service:

- Any interest or other investment income earned on advances of agreement funds; or

- Any royalties or other special classes of program income which, under the provisions of the agreement, are required to be returned;

If this debt is not paid according to the terms of the bill for collection issued for the overpayment, the U.S. Forest Service may reduce the debt by:

1. Making an administrative offset against other requests for reimbursement.
2. Withholding advance payments otherwise due to Plumas FSC.
3. Taking other action permitted by statute (31 U.S.C. 3716 and 7 CFR, Part 3, Subpart B).

Except as otherwise provided by law, the U.S. Forest Service may charge interest on an overdue debt.

M. AGREEMENT CLOSEOUT. Plumas FSC shall close out the agreement within 90 days after expiration or notice of termination.

Any unobligated balance of cash advanced to Plumas FSC must be immediately refunded to the U.S. Forest Service, including any interest earned in accordance with 7 CFR 3016.21, 7 CFR 3019.22, or other relevant law or regulation.

Within a maximum of 90 days following the date of expiration or termination of this agreement, all financial performance and related reports required by the terms of the agreement must be submitted to the U.S. Forest Service by Plumas FSC.

If this agreement is closed out without audit, the U.S. Forest Service reserves the right to disallow and recover an appropriate amount after fully considering any recommended disallowances resulting from an audit which may be conducted later.

N. PROGRAM PERFORMANCE REPORTS. Plumas FSC shall monitor the performance of the agreement activities to ensure that performance goals are being achieved.

Performance reports must contain information on the following:

- A comparison of actual accomplishments to the goals established for the period. Where the output of the project can be readily expressed in numbers, a computation of the cost per unit of output may be required if that information is useful.

- Reason(s) for delay if established goals were not met.

- Additional pertinent information including, when appropriate, analysis and explanation of cost overruns or high unit costs.

Plumas FSC shall submit quarterly performance reports to the U.S. Forest Service Program Manager. These reports are due 30 days after the reporting period. The final performance report must be submitted either with Plumas FSC's final payment request, or separately, but not later than 90 days from the expiration date of the agreement.

O. RETENTION AND ACCESS REQUIREMENTS FOR RECORDS. Plumas FSC shall retain all records pertinent to this agreement for a period of no less than 3 years from the expiration or termination date. As used in this provision, "records" includes books, documents, accounting procedures and practice, and other data, regardless of the type or format. Plumas FSC shall provide access and the right to examine all records related to this agreement to the U.S. Forest Service Inspector General, or Comptroller General or their authorized representative.

If any litigation, claim, negotiation, audit, or other action involving the records has been started before the end of the 3-year period, the records must be kept until all issues are resolved, or until the end of the regular 3-year period, whichever is later.

Records for nonexpendable property acquired in whole or in part, with Federal funds must be retained for 3 years after its final disposition.

Plumas FSC shall provide access to any project site(s) to the U.S. Forest Service or any of their authorized representatives. The rights of access in this section shall not be limited to the required retention period but shall last as long as the records are kept.

P. FREEDOM OF INFORMATION ACT (FOIA). Public access to grant or agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552).

Q. TEXT MESSAGING WHILE DRIVING. In accordance with Executive Order (EO) 13513, "Federal Leadership on Reducing Text Messaging While Driving," any and all text messaging by Federal employees is banned: a) while driving a Government owned vehicle (GOV) or driving a privately owned vehicle (POV) while on official Government business; or b) using any electronic equipment supplied by the Government when driving any vehicle at any time. All cooperators, their employees,

volunteers, and contractors are encouraged to adopt and enforce policies that ban text messaging when driving company owned, leased or rented vehicles, POVs or GOVs when driving while on official Government business or when performing any work for or on behalf of the Government.

R. PUBLIC NOTICES. It is The U.S. Forest Service's policy to inform the public as fully as possible of its programs and activities. Plumas FSC is/are encouraged to give public notice of the receipt of this agreement and, from time to time, to announce progress and accomplishments. Press releases or other public notices should include a statement substantially as follows:

" Funding for this project is provided in part under the recommendation of the Plumas County Resource Advisory Committee of the Plumas National Forest, of the U.S. Forest Service, Department of Agriculture Secure Rural Schools and Community Self Determination Act Title II Program."

Plumas FSC may call on The U.S. Forest Service's Office of Communication for advice regarding public notices. Plumas FSC is/are requested to provide copies of notices or announcements to the U.S. Forest Service Program Manager and to The U.S. Forest Service's Office of Communications as far in advance of release as possible.

S. FUNDING EQUIPMENT. Federal funding under this agreement is not available for reimbursement of Plumas FSC’s purchase of equipment. Equipment is defined as having a fair market value of $5,000 or more per unit and a useful life of over one year. Supplies are those items that are not equipment.

T. CONTRACT REQUIREMENTS. Any contract under this agreement must be awarded following established Plumas FSC’s procurement procedures, to ensure free and open competition, and avoid any conflict of interest (or appearance of conflict). Plumas FSC must maintain cost and price analysis documentation for potential U.S. Forest Service review. Plumas FSC is/are encouraged to utilize small businesses, minority-owned firms, and women’s business enterprises.

Additionally, federal wage provisions (Davis-Bacon or Service Contract Act) are applicable to any contract developed and awarded under this agreement where all or part of the funding is provided with U.S. Forest Service funds. Davis-Bacon wage rates apply on all public works contracts in excess of $2,000 and Service Contract Act wage provisions apply to service contracts in excess of $2,500

U. U.S. FOREST SERVICE ACKNOWLEDGED IN PUBLICATIONS, AUDIOVISUALS AND ELECTRONIC MEDIA. Plumas FSC shall acknowledge U.S. Forest Service support in any publications, audiovisuals, and electronic media developed as a result of this agreement.

V. NONDISCRIMINATION STATEMENT – PRINTED, ELECTRONIC, OR AUDIOVISUAL MATERIAL. Plumas FSC shall include the following statement, in full, in any printed, audiovisual material, or electronic media for public distribution developed or printed with any Federal funding.

In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

"This institution is an equal opportunity provider."

W. REMEDIES FOR COMPLIANCE RELATED ISSUES. If Plumas FSC materially fail(s) to comply with any term of the agreement, whether stated in a Federal statute or regulation, an assurance, or the agreement, the U.S. Forest Service may take one or more of the following actions:

1. Temporarily withhold cash payments pending correction of the deficiency by Plumas FSC or more severe enforcement action by the U.S. Forest Service;

2. Disallow (that is, deny both use of funds and matching credit for) all or part of the cost of the activity or action not in compliance;

3. Wholly or partly suspend or terminate the current agreement for Plumas FSC's program;

4. Withhold further awards for the program, or

5. Take other remedies that may be legally available, including debarment procedures under 7 CFR part 3017.

X. TERMINATION BY MUTUAL AGREEMENT. This agreement may be terminated, in whole or part, as follows:

1. When the U.S. Forest Service and Plumas FSC agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated.

2. By 30 days written notification by Plumas FSC to the U.S. Forest Service setting forth the reasons for termination, effective date, and in the case of partial termination, the portion to be terminated.

If, in the case of a partial termination, the U.S. Forest Service determines that the remaining portion of the agreement will not accomplish the purposes for which the agreement was made, the U.S. Forest Service may terminate the agreement in its entirety.

Upon termination of an agreement, Plumas FSC shall not incur any new obligations for the terminated portion of the agreement after the effective date, and shall cancel as many outstanding obligations as possible. The U.S. Forest Service shall allow full credit to Plumas FSC for the United States Federal share of the non-cancelable obligations properly incurred by Plumas FSC up to the effective date of the termination. Excess funds must be refunded within 60 days after the effective date of termination.

Y. ALTERNATE DISPUTE RESOLUTION – PARTNERSHIP AGREEMENT. In the event of any issue of controversy under this agreement, the parties may pursue Alternate Dispute Resolution procedures to voluntarily resolve those issues. These procedures may include, but are not limited to conciliation, facilitation, mediation, and fact finding.

Z. DEBARMENT AND SUSPENSION. Plumas FSC shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR Part 180. Additionally, should Plumas FSC or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

AA. MODIFICATIONS. Modifications within the scope of this agreement must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 60 days prior to implementation of the requested change. The U.S. Forest Service is not obligated to fund any changes not properly approved in advance.

BB. COMMENCEMENT/EXPIRATION DATE. This agreement is executed as of the date of the last signature and is effective through December 31, 2014 at which time it will expire, unless extended by an executed modification, signed and dated by all properly authorized, signatory officials.

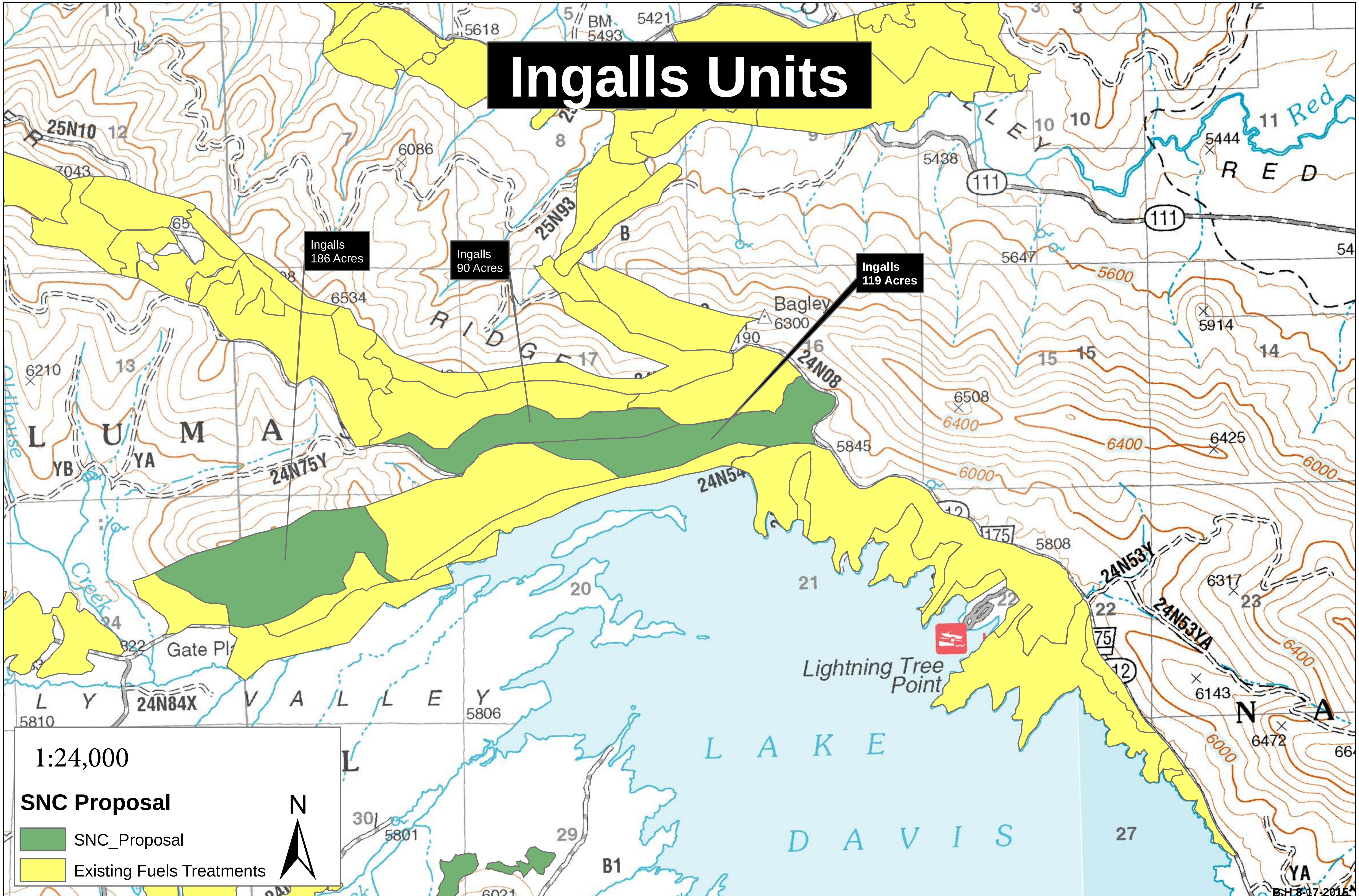
CC. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this agreement. In witness whereof, the parties hereto have executed this agreement as of the last date written below.

MICHAEL DE LASAUX, Chair — Date: 8/20/13
Plumas County Fire Safe Council

EARL W. FORD, Forest Supervisor — Date: 8/20/13
U.S. Forest Service, Plumas National Forest

The authority and format of this agreement has been reviewed and approved for signature.

ROBIN BRYANT — Date: 8/14/2013
U.S. Forest Service Grants Management Specialist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90 Acres
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119 Acres
Bagley
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SNC Proposal
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Existing Fuels Treatments
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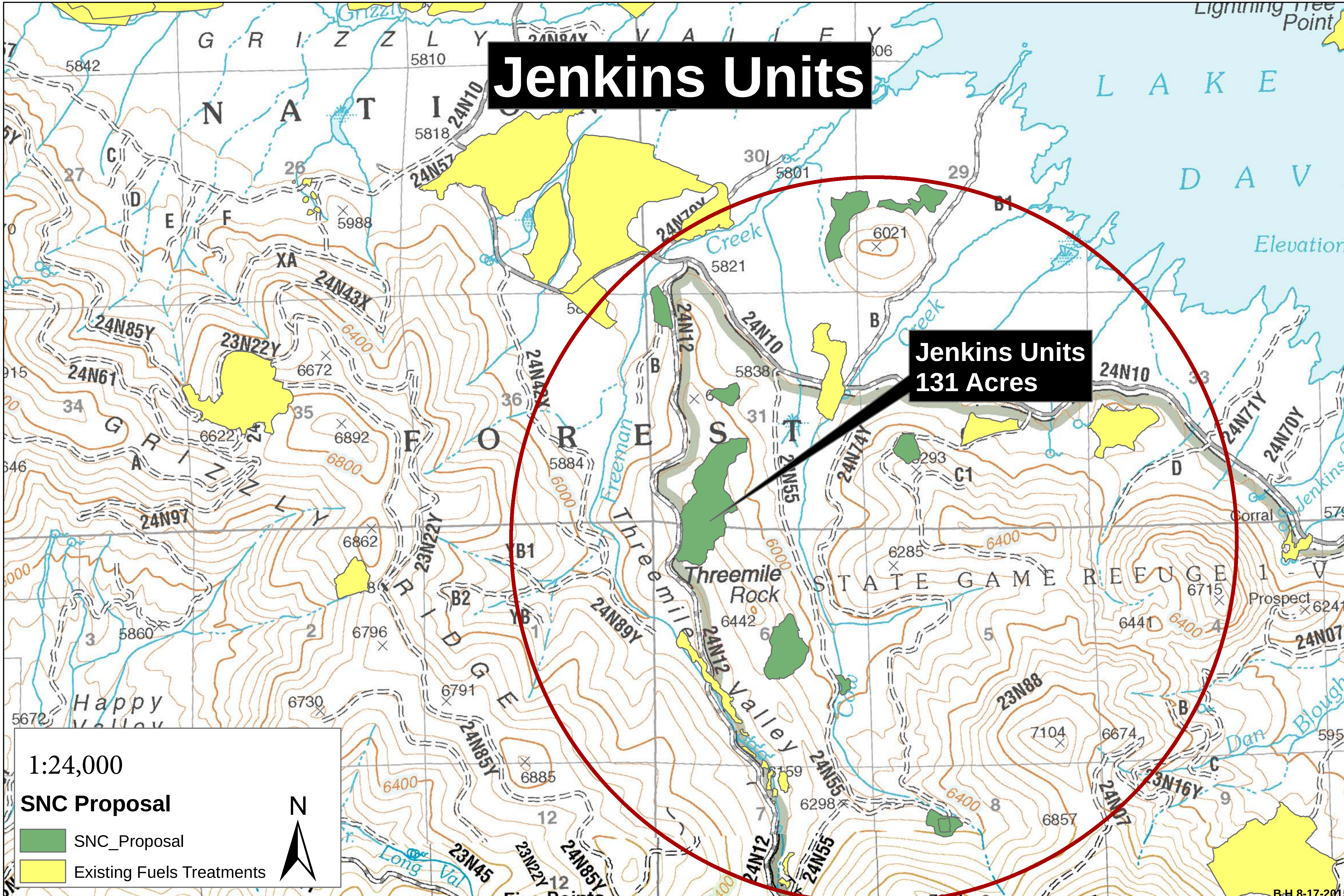

Jenkins Units
Jenkins Units
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SNC Proposal
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Existing Fuels Treatments
N
B.H 8-17-2015
LAKE
DAVI
Elevation
Lightning Tree Point
GRIZZLY VALLEY
NATIONAL FOREST
STATE GAME REFUGE
Threemile Rock
Threemile Valley
GRIZZLY RIDGE
Freeman
Creek
Happy Valley
Five Points
Corral
Prospect
24N10
24N12
24N55
24N74Y
24N71Y
24N70Y
24N07
23N88
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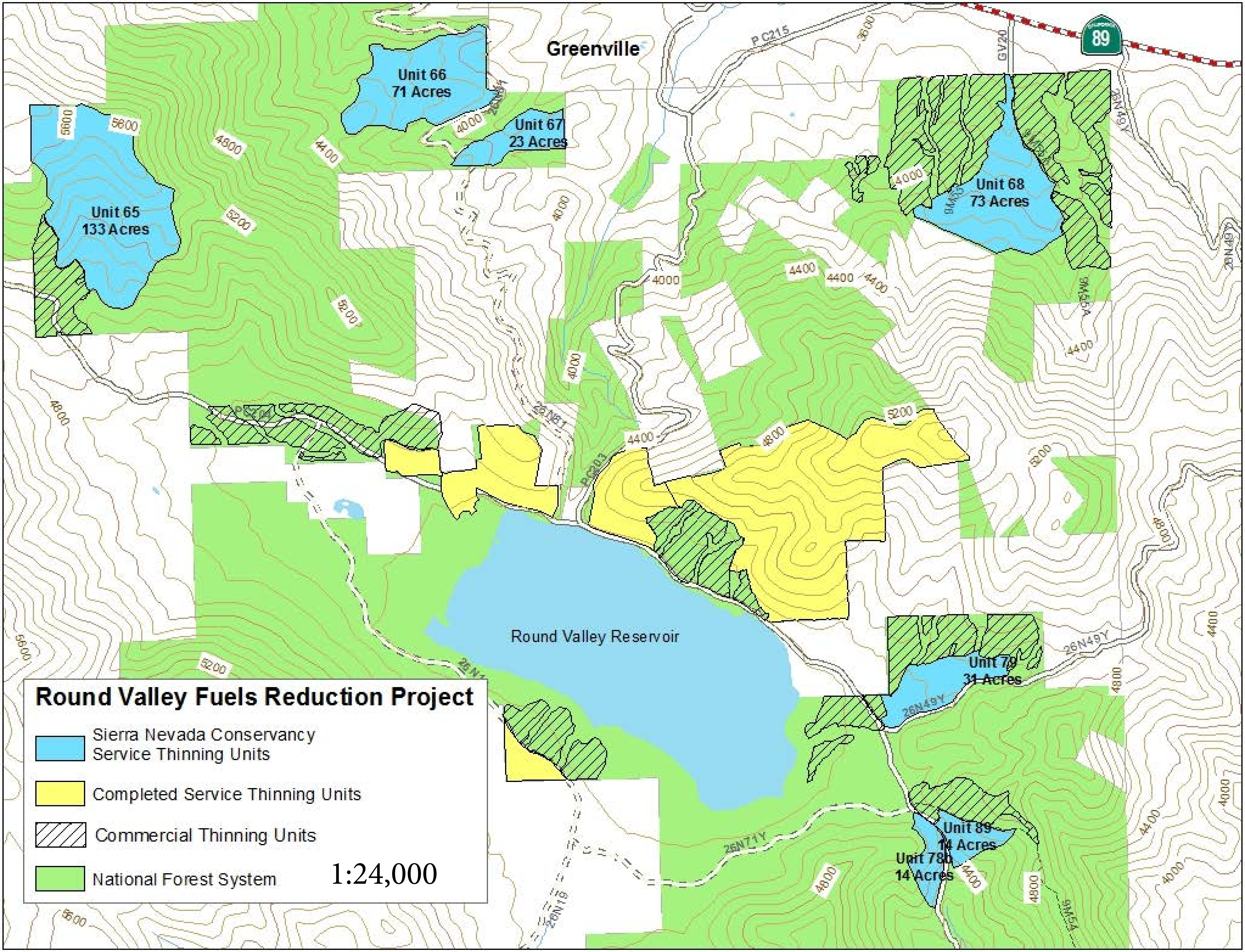
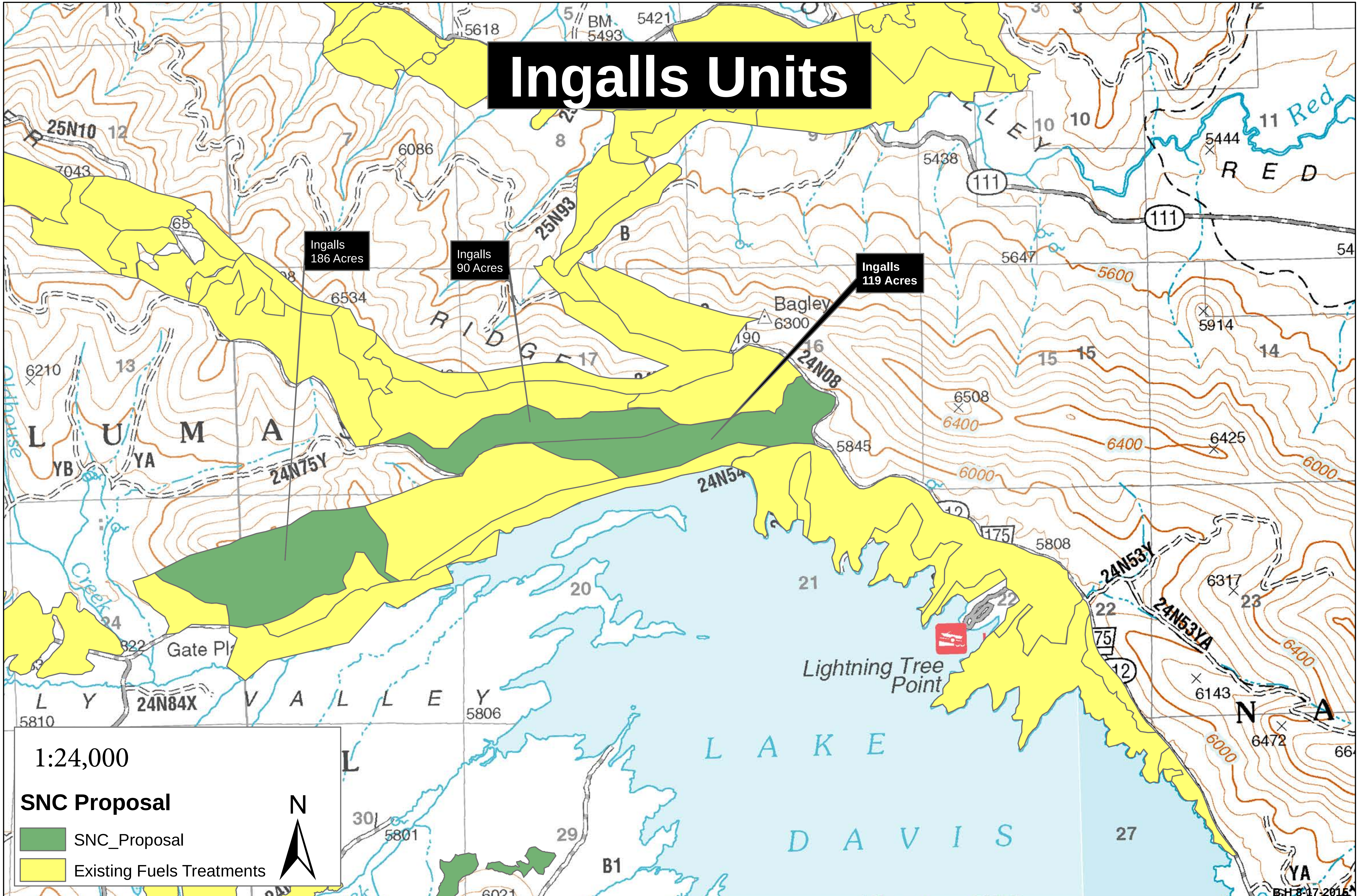

Greenville
89
Unit 66
71 Acres
Unit 67
23 Acres
Unit 65
133 Acres
Unit 68
73 Acres
Round Valley Reservoir
Unit 70
31 Acres
Unit 89
14 Acres
Unit 78b
14 Acres
Round Valley Fuels Reduction Project
Sierra Nevada Conservancy
Service Thinning Units
Completed Service Thinning Units
Commercial Thinning Units
National Forest System
1:24,000



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SNC Proposal
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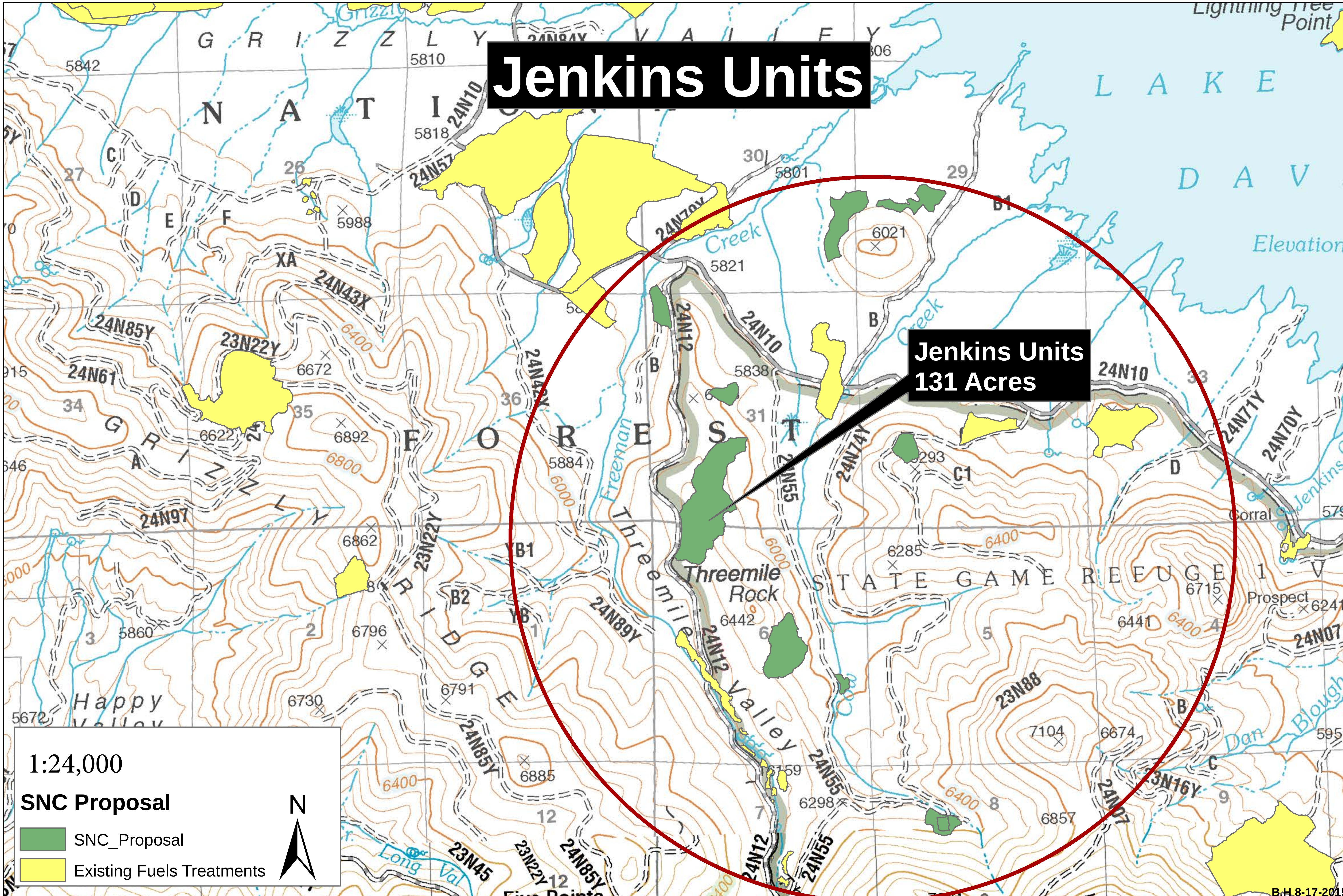
VALLEY
B.H 8-17-2015


Jenkins Units
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SNC Proposal
SNC_Proposal
Existing Fuels Treatments
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Threemile Rock
Threemile Valley
STATE GAME REFUGE
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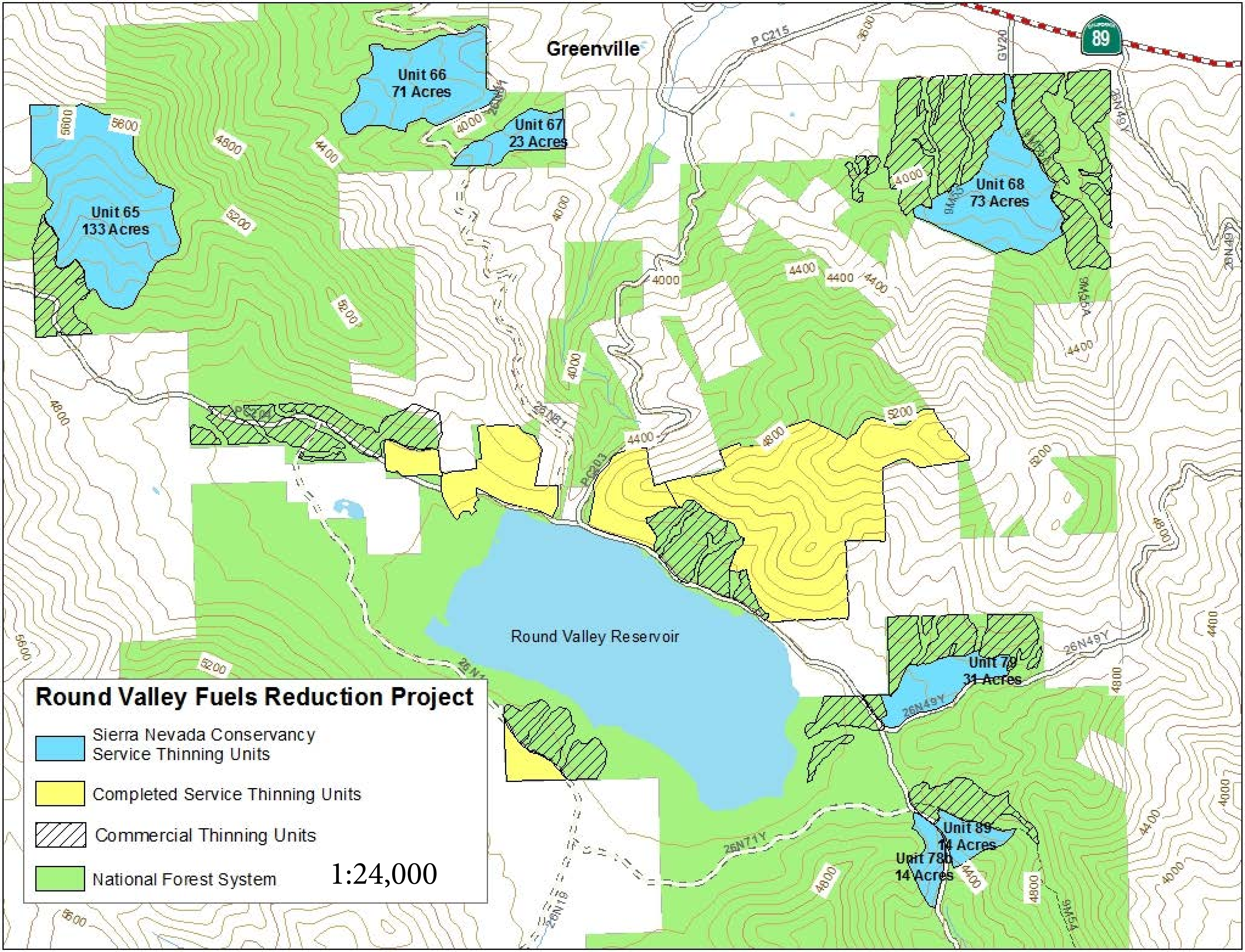
Five Points
B.H 8-17-2015


Round Valley Fuels Reduction Project
Sierra Nevada Conservancy Service Thinning Units
Completed Service Thinning Units
Commercial Thinning Units
National Forest System
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71 Acres
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23 Acres
Unit 65
133 Acres
Unit 68
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Round Valley Reservoir
Unit 70
31 Acres
Unit 89
14 Acres
Unit 78b
14 Acres
89

FS Agreement No. 13-PA-11051100-021
Cooperator Agreement No. ____________

PARTICIPATING AGREEMENT
Between
PLUMAS COUNTY FIRE SAFE COUNCIL
And The
USDA, FOREST SERVICE
PLUMAS NATIONAL FOREST

This PARTICIPATING AGREEMENT is hereby entered into by and between the Plumas County Fire Safe Council, hereinafter referred to as "Plumas FSC," and the USDA, Forest Service, Plumas National Forest, hereinafter referred to as the "U.S. Forest Service," under the authority: Secure Rural Schools and Community Self-Determination Act of 2000, Public Law 106-393, 16 U.S.C. 500, as reauthorized and amended by the Emergency Economic Stabilization Act of 2008, Energy Improvement and Extension Act of 2008, and Tax Extenders and Alternative Minimum Tax relief Act of 2008, Section 601(a) in division C of Pub. L. 110-343.

Background: This project will focus on the development of a collaborative process to plan the restoration of the Plumas National Forest watershed and vegetation with potential emphasis on Wildland Urban Interface areas defined in approved Community Wildfire Protection Plans. The project will include educational public meetings and collaborative processes to initiate development of a proposal to the Collaborative Forest Landscape Restoration Program.

Title: Collaborative Forest Landscape Restoration within the Wildland Urban Interface

I. PURPOSE:

The purpose of this agreement is to document the cooperation between the parties to implement a collaborative planning process that results in an application to the Collaborative Forest Landscape Restoration (CLFR) program that focusses on Plumas County wildland-urban interface (WUI) in accordance with the following provisions and the hereby incorporated Title II Project Submission Form, Plumas County, Project Number 12-11 revised August 9, 2013 (Attachment A) and Financial Plan (Attachment B).

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

The U.S. Forest Service is responsible for managing public lands administered by the Plumas NF including the watershed, wildland urban interface, and resource values associated with these lands.

The mission of the Plumas County Fire Safe Council is to reduce the loss of natural and human made resources caused by wildfire through Firewise community programs and pre-fire activities.

Both entities are interested in and will benefit from working together in this collaborative planning process by focusing on the initial steps to develop a Collaborative Forest Landscape Restoration (CFLR) approach to public lands administered by the Plumas NF.

A CFLR project is an "all lands approach to forest restoration" and calls for close coordination with the Plumas NF and other landowners to encourage collaborative solutions through landscape-scale projects. The Collaborative Forest Landscape Restoration Program provides a means to achieve these aims.
The project focus will be to reduce risk of high severity wildfire to lives and property; restore watersheds, meadows and streams; restore forest structure and ecological processes; create more-resilient vegetation conditions; and reduce wildfire suppression costs.

This project will attempt to develop a collaborative dialogue among communities and interest groups that are interested in forest and watershed restoration on national forest lands proximate to Plumas County. It will provide educational opportunities for Plumas County citizens and others interested in national forest management to improve understanding of the need for restoration, what restoration work has been done and what opportunities exist for additional work.

The focus of the project is the development of restoration projects on public lands within the WUI zone and overlapping priority watersheds that would be positioned to be addressed through the CFLR program.

In consideration of the above premises, the parties agree as follows:

III. PLUMAS FSC SHALL:

A. LEGAL AUTHORITY. Plumas FSC shall have the legal authority to enter into this agreement, and the institutional, managerial, and financial capability to ensure proper planning, management, and completion of the project, which includes funds sufficient to pay the nonfederal share of project costs, when applicable.

B. Perform the tasks described in the Title II Project Submission Form, Plumas County, Project Number 12-11 revised July 18, 2013 (Attachment A).

C. Manage meeting communications, and agreement administration.

   a. Maintain regular communication concerning this project between existing and potential contributors (Plumas FSC, Plumas National Forest, and external partners) to encourage cooperation and collaboration. A key partner in the outreach and planning is UC Cooperative Extension.

   b. Manage the agreement, contracts and services and project reporting. This includes supervision of the contractor, coordination with interested collaborating partners, and involving scientists in educational public meetings.

   c. Coordinate to develop and maintain accessible internet presence for the project.

d. Ensure reports are written for a knowledgeable, but non-technical target audience.

e. Submit Quarterly Progress Reports to the U.S. Forest Service using a mutually agreed upon format to capture status, accomplishments, issues/challenges encountered, and next steps of the project.

f. Submit a Draft and Final Report to the U.S. Forest Service synthesizing results within 90 days of completion of the project.

g. Announcements and reports about work completed under this agreement shall be reviewed and approved in cooperation with the U.S. Forest Service and made available on the Plumas FSC and U.S. Forest Service web sites.

D. Schedule, advertise, organize and conduct collaborative public and internal project planning meetings. The PFSC anticipates 5-10 public meetings and 5-10 planning meetings.

a. Schedule, advertise, organize and supervise public and internal planning meetings in consultation with the U.S. Forest Service and input from collaborative partners.

b. Solicit, capture, and synthesize participant viewpoints, recommendations, and next steps about CFLRP proposal and include in the Final Report.

E. Prepare and submit Final report that describes the work completed to date and the steps taken to assist the U.S. Forest Service with the collaborative process, and includes a description of any resulting products prepared as a result of the process.

IV. THE U.S. FOREST SERVICE SHALL:

A. Coordinate with the Plumas FSC to collaborate and contribute to the development and advancement of a potential CFLRP Proposal.

a. Provide a project lead collaborative contact who will be committed to the project through the agreement period.

b. Actively participate in appropriate public and internal planning meetings over the course of the project. The Plumas FSC anticipates 5-10 public meetings and 5-10 planning meetings.

c. Provide contributing staff specialists to collaborative involvement in developing educational information and potential proposal.

d. Provide GIS support to the development of the CFLRP proposal. Anticipated spatial and attribute products include: Data on WUI, past treatments, resource specific data (watershed, wildlife, vegetation, etc.), potential treatment opportunities identified by the collaborative process.

e. Support outreach and collaboration with forest interested contacts and external partners.

B. Facilitate liaison and communication within the U.S. Forest Service to ensure participation in the development of collaborative meetings and the CFLRP proposal.

a. Regularly update the Plumas FSC and other key partners about Forest Service work directly related to the objectives of this agreement.

b. Incorporate other activities and duties mutually agreed upon to advance the goals of this project, within the scope of this Agreement.

C. PAYMENT/REIMBURSEMENT. The U.S. Forest Service shall reimburse Plumas FSC for the U.S. Forest Service's share of actual expenses incurred, not to exceed $20,944, as shown in the Financial Plan. The U.S. Forest Service shall make payment upon receipt of Plumas FSC's monthly invoice. Each invoice from Plumas FSC shall display the total project costs for the billing period, separated by U.S. Forest Service and Plumas FSC 's share. In-kind contributions must be displayed as a separate line item and must not be included in the total project costs available for reimbursement. The final invoice must display Plumas FSC's full match towards the project, as shown in the financial plan, and be submitted no later than 90 days from the expiration date.

Each invoice must include, at a minimum:

1. Plumas FSC's name, address, and telephone number
2. U.S. Forest Service agreement number
3. Invoice date
4. Performance dates of the work completed (start & end)
5. Total invoice amount for the billing period
6. Statement that the invoice is a request for payment by 'reimbursement'
7. If using SF-270, a signature is required.
8. Invoice Number, if applicable

The invoice must be sent by one of three methods (email is preferred):

EMAIL: asc_ga@fs.fed.us
FAX: 877-687-4894
POSTAL: USDA Forest Service
Albuquerque Service Center
Payments – Grants & Agreements
101B Sun Ave NE
Albuquerque, NM 87109

Send a copy to: Plumas National Forest
Attention: Ryan Tompkins
P.O. Box 11500
Quincy, CA 95971

Or: rtompkins@fs.fed.us

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

A. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

Principal Cooperator Contacts:

Cooperator Project Contact	Cooperator Financial Contact
Jerry Hurley P.O. Box 1225 Quincy, CA 95971 Telephone: 530-832-4705 Email: jerry.hurley@sbcglobal.net	Diann Jewett 550 Crescent Street Quincy, CA 95971 Telephone: 530-283-3739 Email: diann@plumascounty.org

Principal U.S. Forest Service Contacts:

U.S. Forest Service Program Manager Contact	U.S. Forest Service Administrative Contact
Ryan Tompkins P.O. Box 11500 Quincy, CA 95971 Telephone: 530-283-7841 FAX: 530-283-7716 Email: rtompkins@fs.fed.us	Robin Bryant 631 Coyote Street Nevada City, CA 95959 Telephone: (530) 478-6127 FAX: (530) 478-6121 Email: rbryant01@fs.fed.us

B. ASSURANCE REGARDING FELONY CONVICTION OR TAX DELINQUENT STATUS FOR CORPORATE ENTITIES. This agreement is subject to the provisions contained in the Department of Interior, Environment, and Related Agencies Appropriations Act, 2012, P.L. No. 112-74, Division E, Section 433 and 434 regarding corporate felony convictions and corporate federal tax delinquencies. Accordingly, by entering into this agreement Plumas FSC acknowledges that it: 1) does not have a tax delinquency, meaning that it is not subject to any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, and (2) has not been convicted (or had an officer or agent acting on its behalf convicted) of a felony criminal violation under any Federal law within 24 months preceding the agreement, unless a suspending and debarring official of the United States Department of Agriculture has considered suspension or debarment is not necessary to protect the interests of the Government. If Plumas FSC fails to comply with these provisions, the U.S. Forest Service will annul this agreement and may recover any funds Plumas FSC has expended in violation of sections 433 and 434.

C. NOTICES. Any communications affecting the operations covered by this agreement given by the U.S. Forest Service or Plumas FSC are sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the U.S. Forest Service Program Manager, at the address specified in the agreement.

To Plumas FSC, at Plumas FSC's address shown in the agreement or such other address designated within the agreement.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

D. PARTICIPATION IN SIMILAR ACTIVITIES. This agreement in no way restricts the U.S. Forest Service or Plumas FSC from participating in similar activities with other public or private agencies, organizations, and individuals.

E. ENDORSEMENT. Any of Plumas FSC's contributions made under this agreement do not by direct reference or implication convey U.S. Forest Service endorsement of Plumas FSC's products or activities.

F. USE OF U.S. FOREST SERVICE INSIGNIA. In order for Plumas FSC to use the U.S. Forest Service Insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communications. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

G. NON-FEDERAL STATUS FOR COOPERATOR PARTICIPANT LIABILITY. Plumas FSC agree(s) that any of their employees, volunteers, and program participants shall not be deemed to be Federal employees for any purposes including Chapter 171 of Title 28, United States Code (Federal Tort Claims Act) and Chapter 81 of Title 5, United States Code (OWCP), as Plumas FSC hereby willingly agree(s) to assume these responsibilities.

Further, Plumas FSC shall provide any necessary training to Plumas FSC's employees, volunteers, and program participants to ensure that such personnel are capable of performing tasks to be completed. Plumas FSC shall also supervise and direct the work of its employees, volunteers, and participants performing under this agreement.

H. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no United States member of, or United States delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

I. NONDISCRIMINATION. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

J. ELIGIBLE WORKERS. Plumas FSC shall ensure that all employees complete the I-9 form to certify that they are eligible for lawful employment under the Immigration and Nationality Act (8 USC 1324a). Plumas FSC shall comply with regulations regarding certification and retention of the completed forms. These requirements also apply to any contract awarded under this agreement.

K. STANDARDS FOR FINANCIAL MANAGEMENT.

1. Financial Reporting

Plumas FSC shall provide complete, accurate, and current financial disclosures of the project or program in accordance with any financial reporting requirements, as set forth in the financial provisions.

2. Accounting Records

Plumas FSC shall continuously maintain and update records identifying the source and use of funds. The records shall contain information pertaining to the agreement, authorizations, obligations, unobligated balances, assets, outlays, and income.

3. Internal Control

Plumas FSC shall maintain effective control over and accountability for all U.S. Forest Service funds, real property, and personal property assets. Plumas FSC shall keep effective internal controls to ensure that all United States Federal funds received are separately and properly allocated to the activities described in the agreement. Plumas FSC shall adequately safeguard all such property and shall ensure that it is used solely for authorized purposes.

4. Source Documentation

Plumas FSC shall support all accounting records with source documentation. These documentations include, but are not limited to, cancelled checks, paid bills, payrolls, contract and subgrant/contract documents, and so forth.

L. OVERPAYMENT. Any funds paid to Plumas FSC in excess of the amount entitled under the terms and conditions of this agreement constitute a debt to the Federal Government. The following must also be considered as a debt or debts owed by Plumas FSC to the U.S. Forest Service:

- Any interest or other investment income earned on advances of agreement funds; or

- Any royalties or other special classes of program income which, under the provisions of the agreement, are required to be returned;

If this debt is not paid according to the terms of the bill for collection issued for the overpayment, the U.S. Forest Service may reduce the debt by:

1. Making an administrative offset against other requests for reimbursement.
2. Withholding advance payments otherwise due to Plumas FSC.
3. Taking other action permitted by statute (31 U.S.C. 3716 and 7 CFR, Part 3, Subpart B).

Except as otherwise provided by law, the U.S. Forest Service may charge interest on an overdue debt.

M. AGREEMENT CLOSEOUT. Plumas FSC shall close out the agreement within 90 days after expiration or notice of termination.

Any unobligated balance of cash advanced to Plumas FSC must be immediately refunded to the U.S. Forest Service, including any interest earned in accordance with 7 CFR 3016.21, 7 CFR 3019.22, or other relevant law or regulation.

Within a maximum of 90 days following the date of expiration or termination of this agreement, all financial performance and related reports required by the terms of the agreement must be submitted to the U.S. Forest Service by Plumas FSC.

If this agreement is closed out without audit, the U.S. Forest Service reserves the right to disallow and recover an appropriate amount after fully considering any recommended disallowances resulting from an audit which may be conducted later.

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- A comparison of actual accomplishments to the goals established for the period. Where the output of the project can be readily expressed in numbers, a computation of the cost per unit of output may be required if that information is useful.

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O. RETENTION AND ACCESS REQUIREMENTS FOR RECORDS. Plumas FSC shall retain all records pertinent to this agreement for a period of no less than 3 years from the expiration or termination date. As used in this provision, "records" includes books, documents, accounting procedures and practice, and other data, regardless of the type or format. Plumas FSC shall provide access and the right to examine all records related to this agreement to the U.S. Forest Service Inspector General, or Comptroller General or their authorized representative.

If any litigation, claim, negotiation, audit, or other action involving the records has been started before the end of the 3-year period, the records must be kept until all issues are resolved, or until the end of the regular 3-year period, whichever is later.

Records for nonexpendable property acquired in whole or in part, with Federal funds must be retained for 3 years after its final disposition.

Plumas FSC shall provide access to any project site(s) to the U.S. Forest Service or any of their authorized representatives. The rights of access in this section shall not be limited to the required retention period but shall last as long as the records are kept.

P. FREEDOM OF INFORMATION ACT (FOIA). Public access to grant or agreement records must not be limited, except when such records must be kept confidential and would have been exempted from disclosure pursuant to Freedom of Information regulations (5 U.S.C. 552).

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" Funding for this project is provided in part under the recommendation of the Plumas County Resource Advisory Committee of the Plumas National Forest, of the U.S. Forest Service, Department of Agriculture Secure Rural Schools and Community Self Determination Act Title II Program."

Plumas FSC may call on The U.S. Forest Service's Office of Communication for advice regarding public notices. Plumas FSC is/are requested to provide copies of notices or announcements to the U.S. Forest Service Program Manager and to The U.S. Forest Service's Office of Communications as far in advance of release as possible.

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Additionally, federal wage provisions (Davis-Bacon or Service Contract Act) are applicable to any contract developed and awarded under this agreement where all or part of the funding is provided with U.S. Forest Service funds. Davis-Bacon wage rates apply on all public works contracts in excess of $2,000 and Service Contract Act wage provisions apply to service contracts in excess of $2,500

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V. NONDISCRIMINATION STATEMENT – PRINTED, ELECTRONIC, OR AUDIOVISUAL MATERIAL. Plumas FSC shall include the following statement, in full, in any printed, audiovisual material, or electronic media for public distribution developed or printed with any Federal funding.

> ***In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)***

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

> ***"This institution is an equal opportunity provider."***

W. REMEDIES FOR COMPLIANCE RELATED ISSUES. If Plumas FSC materially fail(s) to comply with any term of the agreement, whether stated in a Federal statute or regulation, an assurance, or the agreement, the U.S. Forest Service may take one or more of the following actions:

1. Temporarily withhold cash payments pending correction of the deficiency by Plumas FSC or more severe enforcement action by the U.S. Forest Service;

2. Disallow (that is, deny both use of funds and matching credit for) all or part of the cost of the activity or action not in compliance;

3. Wholly or partly suspend or terminate the current agreement for Plumas FSC's program;

4. Withhold further awards for the program, or

5. Take other remedies that may be legally available, including debarment procedures under 7 CFR part 3017.

X. TERMINATION BY MUTUAL AGREEMENT. This agreement may be terminated, in whole or part, as follows:

1. When the U.S. Forest Service and Plumas FSC agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated.

2. By 30 days written notification by Plumas FSC to the U.S. Forest Service setting forth the reasons for termination, effective date, and in the case of partial termination, the portion to be terminated.

If, in the case of a partial termination, the U.S. Forest Service determines that the remaining portion of the agreement will not accomplish the purposes for which the agreement was made, the U.S. Forest Service may terminate the agreement in its entirety.

Upon termination of an agreement, Plumas FSC shall not incur any new obligations for the terminated portion of the agreement after the effective date, and shall cancel as many outstanding obligations as possible. The U.S. Forest Service shall allow full credit to Plumas FSC for the United States Federal share of the non-cancelable obligations properly incurred by Plumas FSC up to the effective date of the termination. Excess funds must be refunded within 60 days after the effective date of termination.

Y. ALTERNATE DISPUTE RESOLUTION – PARTNERSHIP AGREEMENT. In the event of any issue of controversy under this agreement, the parties may pursue Alternate Dispute Resolution procedures to voluntarily resolve those issues. These procedures may include, but are not limited to conciliation, facilitation, mediation, and fact finding.

Z. DEBARMENT AND SUSPENSION. Plumas FSC shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR Part 180. Additionally, should Plumas FSC or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

AA. MODIFICATIONS. Modifications within the scope of this agreement must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 60 days prior to implementation of the requested change. The U.S. Forest Service is not obligated to fund any changes not properly approved in advance.

BB. COMMENCEMENT/EXPIRATION DATE. This agreement is executed as of the date of the last signature and is effective through December 31, 2014 at which time it will expire, unless extended by an executed modification, signed and dated by all properly authorized, signatory officials.

CC. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this agreement. In witness whereof, the parties hereto have executed this agreement as of the last date written below.

8/20/13

MICHAEL DE LASAUX, Chair — Date
Plumas County Fire Safe Council

8/20/13

EARL W. FORD, Forest Supervisor — Date
U.S. Forest Service, Plumas National Forest

The authority and format of this agreement has been reviewed and approved for signature.

8/14/2013

ROBIN BRYANT — Date
U.S. Forest Service Grants Management Specialist

FS Agreement No. 13-PA-11051100-021
Cooperator Agreement No. ____________

PARTICIPATING AGREEMENT
Between
PLUMAS COUNTY FIRE SAFE COUNCIL
And The
USDA, FOREST SERVICE
PLUMAS NATIONAL FOREST

This PARTICIPATING AGREEMENT is hereby entered into by and between the Plumas County Fire Safe Council, hereinafter referred to as "Plumas FSC," and the USDA, Forest Service, Plumas National Forest, hereinafter referred to as the "U.S. Forest Service," under the authority: Secure Rural Schools and Community Self-Determination Act of 2000, Public Law 106-393, 16 U.S.C. 500, as reauthorized and amended by the Emergency Economic Stabilization Act of 2008, Energy Improvement and Extension Act of 2008, and Tax Extenders and Alternative Minimum Tax relief Act of 2008, Section 601(a) in division C of Pub. L. 110-343.

Background: This project will focus on the development of a collaborative process to plan the restoration of the Plumas National Forest watershed and vegetation with potential emphasis on Wildland Urban Interface areas defined in approved Community Wildfire Protection Plans. The project will include educational public meetings and collaborative processes to initiate development of a proposal to the Collaborative Forest Landscape Restoration Program.

Title: Collaborative Forest Landscape Restoration within the Wildland Urban Interface

I. PURPOSE:

The purpose of this agreement is to document the cooperation between the parties to implement a collaborative planning process that results in an application to the Collaborative Forest Landscape Restoration (CLFR) program that focusses on Plumas County wildland-urban interface (WUI) in accordance with the following provisions and the hereby incorporated Title II Project Submission Form, Plumas County, Project Number 12-11 revised August 9, 2013 (Attachment A) and Financial Plan (Attachment B).

II. STATEMENT OF MUTUAL BENEFIT AND INTERESTS:

The U.S. Forest Service is responsible for managing public lands administered by the Plumas NF including the watershed, wildland urban interface, and resource values associated with these lands.

The mission of the Plumas County Fire Safe Council is to reduce the loss of natural and human made resources caused by wildfire through Firewise community programs and pre-fire activities.

Both entities are interested in and will benefit from working together in this collaborative planning process by focusing on the initial steps to develop a Collaborative Forest Landscape Restoration (CFLR) approach to public lands administered by the Plumas NF.

A CFLR project is an "all lands approach to forest restoration" and calls for close coordination with the Plumas NF and other landowners to encourage collaborative solutions through landscape-scale projects. The Collaborative Forest Landscape Restoration Program provides a means to achieve these aims.
The project focus will be to reduce risk of high severity wildfire to lives and property; restore watersheds, meadows and streams; restore forest structure and ecological processes; create more-resilient vegetation conditions; and reduce wildfire suppression costs.

This project will attempt to develop a collaborative dialogue among communities and interest groups that are interested in forest and watershed restoration on national forest lands proximate to Plumas County. It will provide educational opportunities for Plumas County citizens and others interested in national forest management to improve understanding of the need for restoration, what restoration work has been done and what opportunities exist for additional work.

The focus of the project is the development of restoration projects on public lands within the WUI zone and overlapping priority watersheds that would be positioned to be addressed through the CFLR program.

In consideration of the above premises, the parties agree as follows:

III. PLUMAS FSC SHALL:

A. LEGAL AUTHORITY. Plumas FSC shall have the legal authority to enter into this agreement, and the institutional, managerial, and financial capability to ensure proper planning, management, and completion of the project, which includes funds sufficient to pay the nonfederal share of project costs, when applicable.

B. Perform the tasks described in the Title II Project Submission Form, Plumas County, Project Number 12-11 revised July 18, 2013 (Attachment A).

C. Manage meeting communications, and agreement administration.

   a. Maintain regular communication concerning this project between existing and potential contributors (Plumas FSC, Plumas National Forest, and external partners) to encourage cooperation and collaboration. A key partner in the outreach and planning is UC Cooperative Extension.

   b. Manage the agreement, contracts and services and project reporting. This includes supervision of the contractor, coordination with interested collaborating partners, and involving scientists in educational public meetings.

   c. Coordinate to develop and maintain accessible internet presence for the project.

d. Ensure reports are written for a knowledgeable, but non-technical target audience.

e. Submit Quarterly Progress Reports to the U.S. Forest Service using a mutually agreed upon format to capture status, accomplishments, issues/challenges encountered, and next steps of the project.

f. Submit a Draft and Final Report to the U.S. Forest Service synthesizing results within 90 days of completion of the project.

g. Announcements and reports about work completed under this agreement shall be reviewed and approved in cooperation with the U.S. Forest Service and made available on the Plumas FSC and U.S. Forest Service web sites.

D. Schedule, advertise, organize and conduct collaborative public and internal project planning meetings. The PFSC anticipates 5-10 public meetings and 5-10 planning meetings.

a. Schedule, advertise, organize and supervise public and internal planning meetings in consultation with the U.S. Forest Service and input from collaborative partners.

b. Solicit, capture, and synthesize participant viewpoints, recommendations, and next steps about CFLRP proposal and include in the Final Report.

E. Prepare and submit Final report that describes the work completed to date and the steps taken to assist the U.S. Forest Service with the collaborative process, and includes a description of any resulting products prepared as a result of the process.

IV. THE U.S. FOREST SERVICE SHALL:

A. Coordinate with the Plumas FSC to collaborate and contribute to the development and advancement of a potential CFLRP Proposal.

a. Provide a project lead collaborative contact who will be committed to the project through the agreement period.

b. Actively participate in appropriate public and internal planning meetings over the course of the project. The Plumas FSC anticipates 5-10 public meetings and 5-10 planning meetings.

c. Provide contributing staff specialists to collaborative involvement in developing educational information and potential proposal.

d. Provide GIS support to the development of the CFLRP proposal. Anticipated spatial and attribute products include: Data on WUI, past treatments, resource specific data (watershed, wildlife, vegetation, etc.), potential treatment opportunities identified by the collaborative process.

e. Support outreach and collaboration with forest interested contacts and external partners.

B. Facilitate liaison and communication within the U.S. Forest Service to ensure participation in the development of collaborative meetings and the CFLRP proposal.

a. Regularly update the Plumas FSC and other key partners about Forest Service work directly related to the objectives of this agreement.

b. Incorporate other activities and duties mutually agreed upon to advance the goals of this project, within the scope of this Agreement.

C. PAYMENT/REIMBURSEMENT. The U.S. Forest Service shall reimburse Plumas FSC for the U.S. Forest Service's share of actual expenses incurred, not to exceed $20,944, as shown in the Financial Plan. The U.S. Forest Service shall make payment upon receipt of Plumas FSC’s monthly invoice. Each invoice from Plumas FSC shall display the total project costs for the billing period, separated by U.S. Forest Service and Plumas FSC ’s share. In-kind contributions must be displayed as a separate line item and must not be included in the total project costs available for reimbursement. The final invoice must display Plumas FSC’s full match towards the project, as shown in the financial plan, and be submitted no later than 90 days from the expiration date.

Each invoice must include, at a minimum:

1. Plumas FSC’s name, address, and telephone number
2. U.S. Forest Service agreement number
3. Invoice date
4. Performance dates of the work completed (start & end)
5. Total invoice amount for the billing period
6. Statement that the invoice is a request for payment by ‘reimbursement’
7. If using SF-270, a signature is required.
8. Invoice Number, if applicable

The invoice must be sent by one of three methods (email is preferred):

EMAIL: asc_ga@fs.fed.us
FAX: 877-687-4894
POSTAL: USDA Forest Service
Albuquerque Service Center
Payments – Grants & Agreements
101B Sun Ave NE
Albuquerque, NM 87109

Send a copy to: Plumas National Forest
Attention: Ryan Tompkins
P.O. Box 11500
Quincy, CA 95971

Or: rtompkins@fs.fed.us

V. IT IS MUTUALLY UNDERSTOOD AND AGREED BY AND BETWEEN THE PARTIES THAT:

A. PRINCIPAL CONTACTS. Individuals listed below are authorized to act in their respective areas for matters related to this agreement.

Principal Cooperator Contacts:

Cooperator Project Contact	Cooperator Financial Contact
Jerry Hurley P.O. Box 1225 Quincy, CA 95971 Telephone: 530-832-4705 Email: jerry.hurley@sbcglobal.net	Diann Jewett 550 Crescent Street Quincy, CA 95971 Telephone: 530-283-3739 Email: diann@plumascounty.org

Principal U.S. Forest Service Contacts:

U.S. Forest Service Program Manager Contact	U.S. Forest Service Administrative Contact
Ryan Tompkins P.O. Box 11500 Quincy, CA 95971 Telephone: 530-283-7841 FAX: 530-283-7716 Email: rtompkins@fs.fed.us	Robin Bryant 631 Coyote Street Nevada City, CA 95959 Telephone: (530) 478-6127 FAX: (530) 478-6121 Email: rbryant01@fs.fed.us

B. ASSURANCE REGARDING FELONY CONVICTION OR TAX DELINQUENT STATUS FOR CORPORATE ENTITIES. This agreement is subject to the provisions contained in the Department of Interior, Environment, and Related Agencies Appropriations Act, 2012, P.L. No. 112-74, Division E, Section 433 and 434 regarding corporate felony convictions and corporate federal tax delinquencies. Accordingly, by entering into this agreement Plumas FSC acknowledges that it: 1) does not have a tax delinquency, meaning that it is not subject to any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, and (2) has not been convicted (or had an officer or agent acting on its behalf convicted) of a felony criminal violation under any Federal law within 24 months preceding the agreement, unless a suspending and debarring official of the United States Department of Agriculture has considered suspension or debarment is not necessary to protect the interests of the Government. If Plumas FSC fails to comply with these provisions, the U.S. Forest Service will annul this agreement and may recover any funds Plumas FSC has expended in violation of sections 433 and 434.

C. NOTICES. Any communications affecting the operations covered by this agreement given by the U.S. Forest Service or Plumas FSC are sufficient only if in writing and delivered in person, mailed, or transmitted electronically by e-mail or fax, as follows:

To the U.S. Forest Service Program Manager, at the address specified in the agreement.

To Plumas FSC, at Plumas FSC's address shown in the agreement or such other address designated within the agreement.

Notices are effective when delivered in accordance with this provision, or on the effective date of the notice, whichever is later.

D. PARTICIPATION IN SIMILAR ACTIVITIES. This agreement in no way restricts the U.S. Forest Service or Plumas FSC from participating in similar activities with other public or private agencies, organizations, and individuals.

E. ENDORSEMENT. Any of Plumas FSC's contributions made under this agreement do not by direct reference or implication convey U.S. Forest Service endorsement of Plumas FSC's products or activities.

F. USE OF U.S. FOREST SERVICE INSIGNIA. In order for Plumas FSC to use the U.S. Forest Service Insignia on any published media, such as a Web page, printed publication, or audiovisual production, permission must be granted from the U.S. Forest Service's Office of Communications. A written request must be submitted and approval granted in writing by the Office of Communications (Washington Office) prior to use of the insignia.

G. NON-FEDERAL STATUS FOR COOPERATOR PARTICIPANT LIABILITY. Plumas FSC agree(s) that any of their employees, volunteers, and program participants shall not be deemed to be Federal employees for any purposes including Chapter 171 of Title 28, United States Code (Federal Tort Claims Act) and Chapter 81 of Title 5, United States Code (OWCP), as Plumas FSC hereby willingly agree(s) to assume these responsibilities.

Further, Plumas FSC shall provide any necessary training to Plumas FSC's employees, volunteers, and program participants to ensure that such personnel are capable of performing tasks to be completed. Plumas FSC shall also supervise and direct the work of its employees, volunteers, and participants performing under this agreement.

H. MEMBERS OF U.S. CONGRESS. Pursuant to 41 U.S.C. 22, no United States member of, or United States delegate to, Congress shall be admitted to any share or part of this agreement, or benefits that may arise therefrom, either directly or indirectly.

I. NONDISCRIMINATION. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

J. ELIGIBLE WORKERS. Plumas FSC shall ensure that all employees complete the I-9 form to certify that they are eligible for lawful employment under the Immigration and Nationality Act (8 USC 1324a). Plumas FSC shall comply with regulations regarding certification and retention of the completed forms. These requirements also apply to any contract awarded under this agreement.

K. STANDARDS FOR FINANCIAL MANAGEMENT.

1. Financial Reporting

Plumas FSC shall provide complete, accurate, and current financial disclosures of the project or program in accordance with any financial reporting requirements, as set forth in the financial provisions.

2. Accounting Records

Plumas FSC shall continuously maintain and update records identifying the source and use of funds. The records shall contain information pertaining to the agreement, authorizations, obligations, unobligated balances, assets, outlays, and income.

3. Internal Control

Plumas FSC shall maintain effective control over and accountability for all U.S. Forest Service funds, real property, and personal property assets. Plumas FSC shall keep effective internal controls to ensure that all United States Federal funds received are separately and properly allocated to the activities described in the agreement. Plumas FSC shall adequately safeguard all such property and shall ensure that it is used solely for authorized purposes.

4. Source Documentation

Plumas FSC shall support all accounting records with source documentation. These documentations include, but are not limited to, cancelled checks, paid bills, payrolls, contract and subgrant/contract documents, and so forth.

L. OVERPAYMENT. Any funds paid to Plumas FSC in excess of the amount entitled under the terms and conditions of this agreement constitute a debt to the Federal Government. The following must also be considered as a debt or debts owed by Plumas FSC to the U.S. Forest Service:

- Any interest or other investment income earned on advances of agreement funds; or

- Any royalties or other special classes of program income which, under the provisions of the agreement, are required to be returned;

If this debt is not paid according to the terms of the bill for collection issued for the overpayment, the U.S. Forest Service may reduce the debt by:

1. Making an administrative offset against other requests for reimbursement.
2. Withholding advance payments otherwise due to Plumas FSC.
3. Taking other action permitted by statute (31 U.S.C. 3716 and 7 CFR, Part 3, Subpart B).

Except as otherwise provided by law, the U.S. Forest Service may charge interest on an overdue debt.

M. AGREEMENT CLOSEOUT. Plumas FSC shall close out the agreement within 90 days after expiration or notice of termination.

Any unobligated balance of cash advanced to Plumas FSC must be immediately refunded to the U.S. Forest Service, including any interest earned in accordance with 7 CFR 3016.21, 7 CFR 3019.22, or other relevant law or regulation.

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- A comparison of actual accomplishments to the goals established for the period. Where the output of the project can be readily expressed in numbers, a computation of the cost per unit of output may be required if that information is useful.

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> ***In accordance with Federal law and U.S. Department of Agriculture policy, this institution is prohibited from discriminating on the basis of race, color, national origin, sex, age, or disability. (Not all prohibited bases apply to all programs.)***

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 1400 Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice and TDD). USDA is an equal opportunity provider and employer.

If the material is too small to permit the full statement to be included, the material must, at minimum, include the following statement, in print size no smaller than the text:

> ***"This institution is an equal opportunity provider."***

W. REMEDIES FOR COMPLIANCE RELATED ISSUES. If Plumas FSC materially fail(s) to comply with any term of the agreement, whether stated in a Federal statute or regulation, an assurance, or the agreement, the U.S. Forest Service may take one or more of the following actions:

1. Temporarily withhold cash payments pending correction of the deficiency by Plumas FSC or more severe enforcement action by the U.S. Forest Service;

2. Disallow (that is, deny both use of funds and matching credit for) all or part of the cost of the activity or action not in compliance;

3. Wholly or partly suspend or terminate the current agreement for Plumas FSC's program;

4. Withhold further awards for the program, or

5. Take other remedies that may be legally available, including debarment procedures under 7 CFR part 3017.

X. TERMINATION BY MUTUAL AGREEMENT. This agreement may be terminated, in whole or part, as follows:

1. When the U.S. Forest Service and Plumas FSC agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated.

2. By 30 days written notification by Plumas FSC to the U.S. Forest Service setting forth the reasons for termination, effective date, and in the case of partial termination, the portion to be terminated.

If, in the case of a partial termination, the U.S. Forest Service determines that the remaining portion of the agreement will not accomplish the purposes for which the agreement was made, the U.S. Forest Service may terminate the agreement in its entirety.

Upon termination of an agreement, Plumas FSC shall not incur any new obligations for the terminated portion of the agreement after the effective date, and shall cancel as many outstanding obligations as possible. The U.S. Forest Service shall allow full credit to Plumas FSC for the United States Federal share of the non-cancelable obligations properly incurred by Plumas FSC up to the effective date of the termination. Excess funds must be refunded within 60 days after the effective date of termination.

Y. ALTERNATE DISPUTE RESOLUTION – PARTNERSHIP AGREEMENT. In the event of any issue of controversy under this agreement, the parties may pursue Alternate Dispute Resolution procedures to voluntarily resolve those issues. These procedures may include, but are not limited to conciliation, facilitation, mediation, and fact finding.

Z. DEBARMENT AND SUSPENSION. Plumas FSC shall immediately inform the U.S. Forest Service if they or any of their principals are presently excluded, debarred, or suspended from entering into covered transactions with the federal government according to the terms of 2 CFR Part 180. Additionally, should Plumas FSC or any of their principals receive a transmittal letter or other official Federal notice of debarment or suspension, then they shall notify the U.S. Forest Service without undue delay. This applies whether the exclusion, debarment, or suspension is voluntary or involuntary.

AA. MODIFICATIONS. Modifications within the scope of this agreement must be made by mutual consent of the parties, by the issuance of a written modification signed and dated by all properly authorized, signatory officials, prior to any changes being performed. Requests for modification should be made, in writing, at least 60 days prior to implementation of the requested change. The U.S. Forest Service is not obligated to fund any changes not properly approved in advance.

BB. COMMENCEMENT/EXPIRATION DATE. This agreement is executed as of the date of the last signature and is effective through December 31, 2014 at which time it will expire, unless extended by an executed modification, signed and dated by all properly authorized, signatory officials.

CC. AUTHORIZED REPRESENTATIVES. By signature below, each party certifies that the individuals listed in this document as representatives of the individual parties are authorized to act in their respective areas for matters related to this agreement. In witness whereof, the parties hereto have executed this agreement as of the last date written below.

8/20/13

MICHAEL DE LASAUX, Chair — Date
Plumas County Fire Safe Council

8/20/13

EARL W. FORD, Forest Supervisor — Date
U.S. Forest Service, Plumas National Forest

The authority and format of this agreement has been reviewed and approved for signature.

8/14/2013

ROBIN BRYANT — Date
U.S. Forest Service Grants Management Specialist