August 20, 2014 Draft

To be reviewed by the Governing Board of the Sierra Nevada Conservancy on September 4, 2014 and released, with modifications as necessary, subsequent to that meeting.

THE STATE OF THE SIERRA NEVADA'S FORESTS

SIERRA FORESTS AND WATERSHEDS IN PERIL

This report is intended to inform policy makers, interested parties and the public on the dire current state of many of the forests of the Sierra Nevada, and identify the benefits at risk and key policy and investment issues that must be urgently addressed if these forests are to be returned to a healthy, resilient state. It may be updated from time to time based on new information or changed conditions. It is accompanied by a draft Sierra Nevada Forest and Community Action Plan, which the Sierra Nevada Conservancy will develop in coordination with a wide array of interested parties.

OVERVIEW

In recent years, we have seen a steady increase in the amount of forests lost to large damaging fires, such as the 2013 Rim Fire. The potential for even more of these ”megafires” is increasing in the Sierra Nevada Region. The failure to adequately address this situation threatens many of the benefits that result from healthy forests. Benefits, such as a reliable supply of clean water, clean air, stored carbon, wildlife habitat and recreational opportunities are all at risk. Quite simply, the solution is to dramatically increase the pace and scale of forest restoration efforts aimed at improving forest resiliency.

Forest restoration work removes excess brush and trees, returning the forests to a more *healthy* and *resilient* state

Aggressive fire suppression and conflict over forest management over the past decades have led to a dangerous situation in many parts of the Sierra – with significant areas of overgrown, diseased, dry and threatened forests. While fire is a natural part of the Sierra ecosystem, the

unnatural conditions that currently exist mean that many fires will provide less of the ecological benefits, and more ecological damage than historic fires. Further, the high cost of fire suppression has often resulted in reducing funds available for critically needed restoration efforts (at least on federal lands). Key actions related to funding, policy and process are needed NOW to begin to turn the tide in the Sierra. Failing to understand the urgency of the situation will have devastating consequences to California's environment and economy. Some of the key actions include the following:

Increasing funds available for forest restoration work is essential if critical benefits are to be protected and enhanced. Some example of opportunities include:

- Federal Funding

  Fund suppression costs differently
  Provide adequate funding for projects that don't "pay for themselves"

- State Funding

  Cap and Trade Auction Revenue
  Bond Funding
  Other sources

- Beneficiary Funding

  Water Providers/Users
  Dam Operators/Hydro Electric Producers
  Activities Resulting in Green House Gas (GHG) Emissions

Addressing the policy and process issues discussed in more detail later in this report will also be necessary to increase pace and scale. In summary these include:

- ✓ Restoring larger landscapes more efficiently
- ✓ Using fire to increase restoration (prescribed and managed fire)
- ✓ Use new tools to extend mechanized thinning to steeper slopes when environmentally sound
- ✓ Protect and increase wood and biomass processing facilities to create energy and wood products
- ✓ Fully use contracting tools to assure local communities share in the economic benefits from ongoing restoration in their area

BACKGROUND

The Sierra Nevada Region is an area of great significance to the State of California. Comprising about 25% of California's total land area, the Region is California's principal watershed and provides:

- More than 60% of the State's developed water supply – drinking water for 23 million people and water for millions of acres of agricultural lands
- Up to 50% of the freshwater that flows into the Sacramento – San Joaquin Delta[1]
- 15 million acre feet of natural water storage in the form of snowpack – roughly equal to the storage capacity of the five largest man-made reservoirs in the state combined. This water is slowly released over spring and summer when it is needed the most by urban and agricultural users
- More than 50% of the hydropower generated in California[2]

Giant Sequoias are native to the Sierra Nevada

The Region also provides a number of other benefits to all Californians, including enough annual carbon storage to offset the annual carbon dioxide emissions of almost 2.7 million passenger cars (or 10% of all registered automobiles in CA in 2013). The Region is known for world-class recreation, iconic landscapes and visitor experiences that draw millions of visitors annually from throughout California, and the US. It is home to almost half of California's plant species and 60% of California's animals species – nearly 350 of the plant species are native only to the Sierra Nevada Region, including the world's largest living thing: the Giant Sequoia.

As California grapples with issues such as meeting the State's water supply needs, climate change, mandates for decreasing greenhouse gas emissions, and meeting ecosystem restoration and water reliability goals in the Delta, ensuring the Sierra is able to continue to provide these benefits becomes even more critically important.

Unfortunately, the declining health of many of the Sierra's forests and watersheds is putting these benefits at great risk, because it has created a landscape that is highly susceptible to uncharacteristically large and damaging wildfires. Not only do these events affect everyone in California who relies on the water and other services the Region provides, they are also felt in our pocketbooks as we must often spend large sums to deal with them when they could have been prevented at a lower cost.

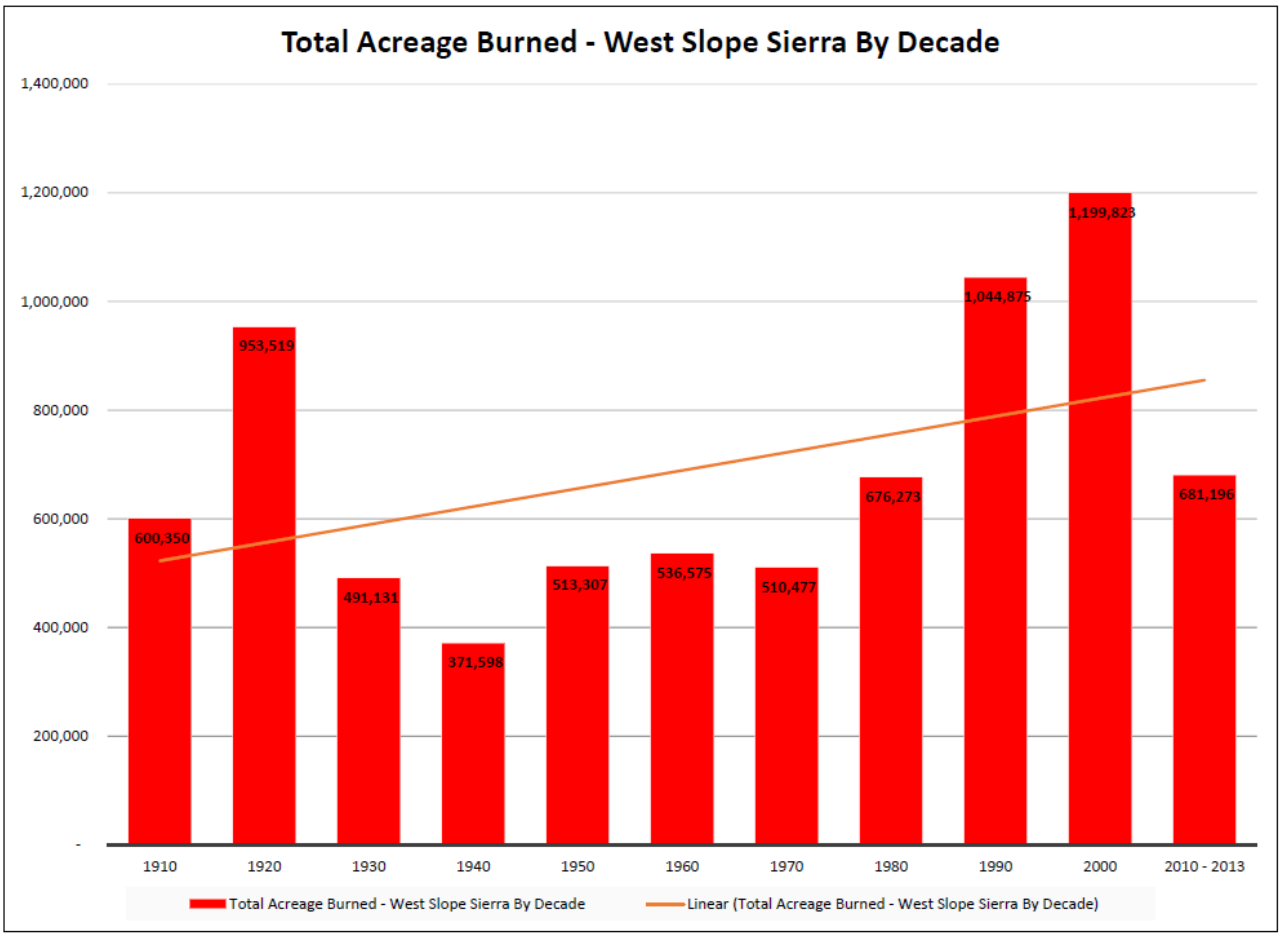
About 60% of the Sierra Nevada's forested lands – 6.3 million acres – are managed by the U.S. Forest Service (USFS). To address the unhealthy state of many of the forests under their management, in March 2011, USFS Region 5 rolled out its *Leadership Intent for Ecological*

Restoration [3], which is a call to action to increase the pace and scale of forest restoration in this region. The Regional Forester estimates the need to be at least two (2) to three (3) times greater than current efforts. Unfortunately, despite the best of intentions, very little progress has been made towards achieving this goal.

Wildfire Threat is Increasing

Fire has historically been a natural and critical component of Sierra landscapes. Prior to 1900, wildfires in the Sierra were predominately low-intensity and removed excess fuel, thinned vegetation, and reduced competition for nutrients and water, resulting in healthy forests resilient against insects and diseases. Unfortunately, a century of fire suppression and conflict over forest management has altered the landscape. As a result, wildfires in California have become larger and more extreme over the last two decades and many predict that this trend will continue to increase unless in the pace and scale of forest restoration dramatically increases. Simply put, there is too much fuel in many of today's forests for them to burn in a safe and ecologically beneficial manner:

- As shown in the chart below, the total acreage burned on the west slope of the Sierra has trended upward over the last century.
- The average size of a wildfire today is nearly five (5) times the average in the 1970s. In 2013, the Sierra Nevada experienced its largest fire in recorded history – the Rim Fire.
- Between 1984 and 2004, there was a significant increase in the number of acres within a forest fire burning at high-intensity; from 14% in 1984 to 23% in the early 2000s, [4] and the trend is continuing upward (the Rim Fire burned at nearly 40% at high intensity).
- The regeneration that occurs after a high-intensity fire leads to forest conditions which are likely to burn again at high-intensity.[5]
- The increase in size and severity of fires in the Sierra has added a new word to our lexicon: Megafire. Megafires, like the Rim Fire, are expensive both economically as well as ecologically. Some of the direct impacts of the Rim Fire included:
    - $127 million for fire suppression
    - Greenhouse gas emissions equal to 2.3 million vehicles for one year
    - $8.5 million for emergency road, trail, and watershed stabilization efforts
    - $35 million for the San Francisco Public Utility Commission to buy alternative energy due to damage to hydroelectric powerhouses and for repairs to its grid
    - Millions in losses to the ranching community as a result of destruction of grazing lands, killed livestock, and damaged infrastructure
    - An estimated $2.75 million loss in revenue from visitor lodging in Tuolumne County
    - Destruction of ¾ of the area's known great gray owl nests sites and 26,000 acres of suitable habitat for Pacific fisher, species that are listed or proposed for listing as endangered species.



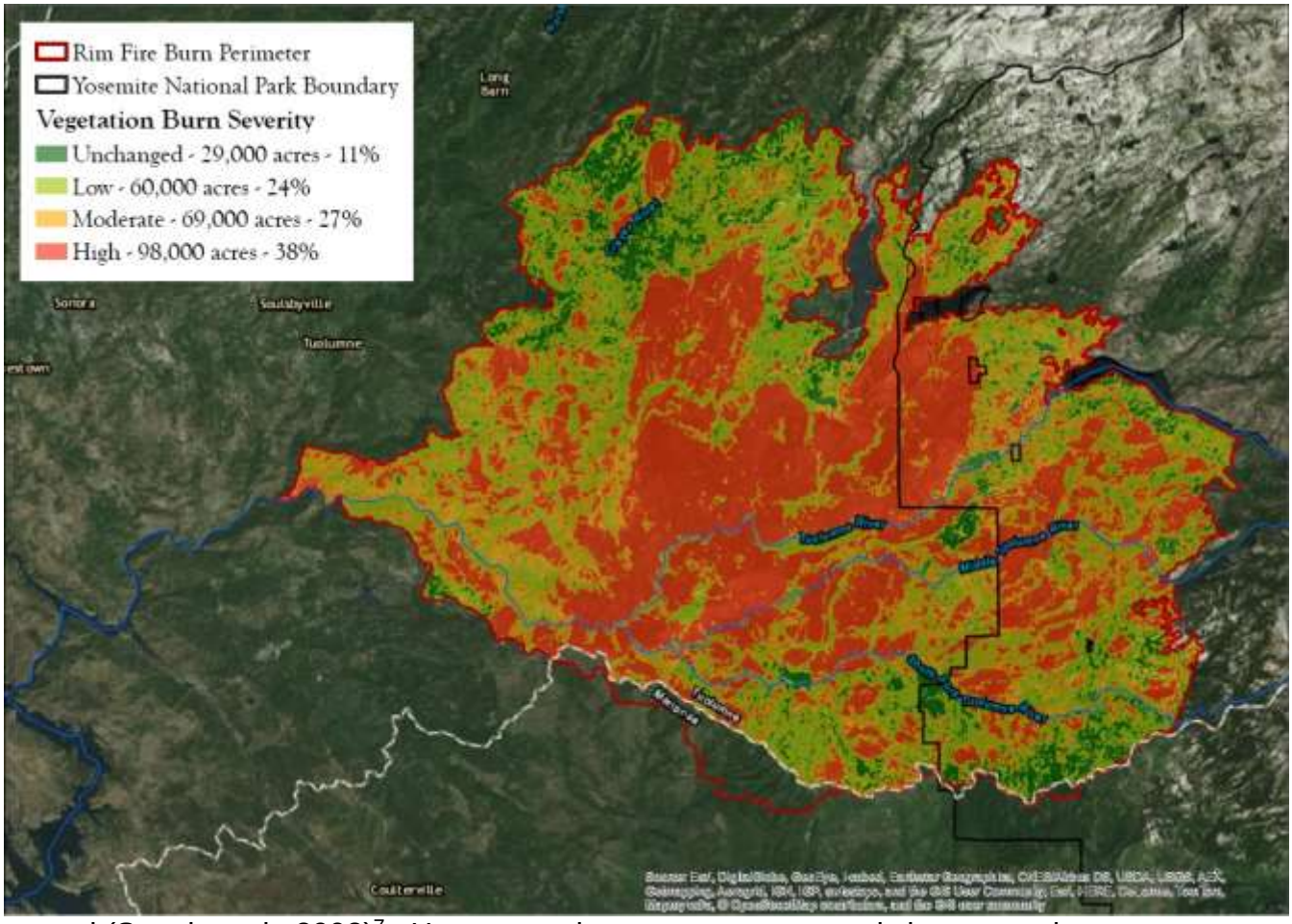
The effects of climate change will only make matters worse. As increasing temperatures bring about drier conditions, it also results in longer fire seasons and increased risk of pest and disease infestation in the forests. The more we improve the health of our forests, the better able they will be to withstand these impacts.

California's Water Supply at Risk

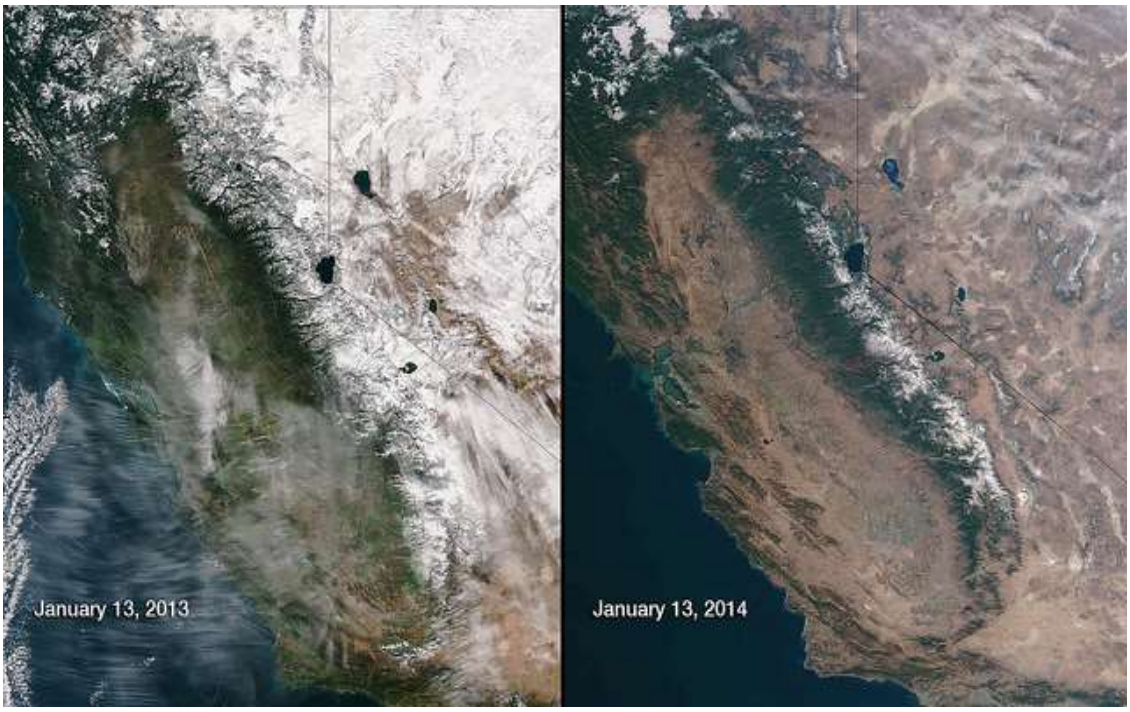
Measuring sediment deposition in Skunk Creek following the 2013 Rim Fire. Photo courtesy of the U.S. Forest Service.

Due to large increases in runoff and the lack of vegetation to stabilize soil, high-intensity burned landscapes erode at rates that are much greater than unburned landscapes. The resulting sediment enters nearby creeks and rivers and can be carried downstream to reservoirs where it impacts operational storage capacity. Plumes of sediment entering reservoirs after post-fire rain events can impact operations of the reservoir until the sediment settles out to the bottom, where it displaces water storage. Sediment delivery has been found to increase by almost 10 times in a watershed that burned at high-intensity.[6] After the Bagley Fire of 2012, which burned just over 46,000 acres of the Shasta-Trinity National Forest, significant erosion, totaling approximately 110,000 cubic meters of sediment (enough to fill 44 Olympic-sized swimming pools), entered the watershed surrounding Lake Shasta.

Better forest management relates to water supply in another important way. Up to 60% of snowfall can't reach the ground when trees are too close together and 75% more of the snow caught in the trees can be lost back into the atmosphere compared to when it falls to the



ground (Storck et al., 2002)[7]. However, adequate canopy cover is important, because snowpack in clearings melts earlier in the year due to direct exposure to sunlight, compared to areas with a forest canopy[8]. Therefore, if a high-intensity wildfire rips through an overgrown forested area and kills everything in its path, the snowpack in that area can melt too early in the year to be useful to California's water needs. Forest management activities could lead to an increase in the snowpack both by reducing the risk of wildfire and creating right-sized gaps in the canopy so that snow can fall to the ground but still receive enough shade to be protected[9].



At 33% of average, the snowpack of the drought year 2014 could become typical by 2100 if the decline is at the worse end of the predicted changes.

Image credit: NASA/LANCE/EOSDIS MODIS Rapid Response Team

Maximizing snowpack and available water storage will become even more important in the face of climate change as the amount of snow fall declines. The Sierra snowpack today is estimated, on average, to be 10% smaller than it was 100 years ago[10] and is predicted to decline by 30 to 70% by the end of the century. A 50% reduction in snowpack is equal to the loss of 7.5 million acre-feet of water, or enough for 14 million families a year. In addition, scientists predict more rain and less snow in some areas, which will shift peak runoff from late spring to early spring or even winter. Earlier snowmelt combined with the larger rain events expected as a part of climate change could result in flooding and increased strain on levees, as well as an inability to capture the flows for later use. Lower water availability in late summer will make it more difficult to manage saltwater surge into the Delta, putting drinking and agricultural water supplies at risk.[11]

Increased Air Pollution and Greenhouse Gas Emission

As wildfires burn, they release carbon dioxide, nitrogen oxide, volatile organic compounds, and particulate matter into the atmosphere.[12] The effects on public health range from eye and respiratory tract irritation to more serious disorders, including reduced lung function, bronchitis, exacerbation of asthma and other pre-existing respiratory and cardiovascular diseases, pulmonary inflammation, a compromised immune system, and even premature death.

With about 420 million tons of carbon stored in Sierra forests, wildfires can emit, within a few weeks, the equivalent of a year's worth of emissions from millions of cars. Initial estimates

Photo Credit – Huffington Post (http://www.huffingtonpost.com/2013/08/28/yosemite-fire-smoke-photo_n_3830612.html)

indicate that the Rim Fire released 11 million metric tons of greenhouse gases (GHGs). Based on the U.S. EPA's web site, that's roughly equivalent to the annual GHG emissions from 2.3 million cars. Computer modeling of the Sierra have found that fuel treatments that alter the size and intensity of wildfires could reduce the amount of carbon emitted by fires from 36-85%. In addition, removing smaller, overgrown biomass from stands reduces the water stress for the remaining trees, enabling them to thrive. This is important, because larger trees accumulate carbon faster than smaller trees.[13]

CURRENT EFFORTS

There are a number of important efforts occurring in an attempt to address the current situation. Building upon and enhancing these efforts provide a sound foundation for increasing pace and scale of restoration.

The Sierra Nevada Forest and Community Initiative. The intensity of the issues facing the Sierra, has led to unprecedented collaboration among groups and stakeholders who previously found themselves in conflict, with litigation often being the outcome. In general, there is consensus that many federally managed forests in the Region are dangerously overgrown and that action needs to be taken now to avert crippling problems in the future. A broad array of interests are actively working with the USFS and industry to develop approaches to remove the excessive growth and turn the resulting wood and biomass into products that have economic value.

At the State level, the Sierra Nevada Conservancy (SNC) is actively working to build on this consensus and is supporting efforts to increase the pace and scale of restoration through the Sierra Nevada Forest and Community Initiative (SNFCI). Established in 2011, the SNFCI Regional Coordinating Council includes a wide range of diverse perspectives, including local government, environmental and conservation organizations, the wood products industry, fire safe councils, and public land management agencies. The work of the Coordinating Council supports and informs local collaborative efforts as they convene, identify issues, develop projects and secure funds to implement projects and processes in local areas in support of Initiative goals. Generally speaking, the Coordinating Council focuses on policy, investment, and science and research issues that affect the success of the SNFCI. Among other activities, the Coordinating Council has been actively working with USFS Region 5 leadership to help them turn the vision of the Leadership Intent into tangible implementation measures, including identifying and coming together to address policy-level barriers that must be overcome for us to reach our goals. This level of support for USFS at the regional and statewide levels is needed, given that, according to the USFS, "Only an environmental restoration program of unprecedented scale can alter the direction of current trends."

Participants at the Rim Fire Restoration EIS meeting, co-facilitated by the SNC and USFS.

At the local level, the Sierra Nevada Region can boast significant collaborative efforts of highly diverse and productive stakeholders. This culture of collaboration has yielded a number of successes at the local level, although much more needs to be done across the Region. Significant efforts include the following:

- Three Collaborative Forest Landscape Restoration Program (CFLRP) Funding Awards went to projects in the Sierra Nevada: the Dinky Creek Collaborative in 2010 ($829,000); and the Amador-Calaveras Collaborative Cornerstone Project ($730,000) and the Burney Hat Creek Basins Project ($605,000) in 2012;
- The Cabin Creek biomass facility in eastern Placer County is nearing commencement of construction activities. The North Fork Biomass Project in eastern Madera County cleared their last planning hurdles in April, 2014 with the approval of a Conditional Use Permit (CUP) that supports the construction of a state-of-the-art bioenergy facility. The SNC is currently tracking numerous other biomass utilization efforts on in different stages of development throughout the Region;
- Significant funding was secured for Biomass Utilization Projects in June, 2013 from the USDA Forest Service's Woody Biomass Utilization Grant Program including the Sierra

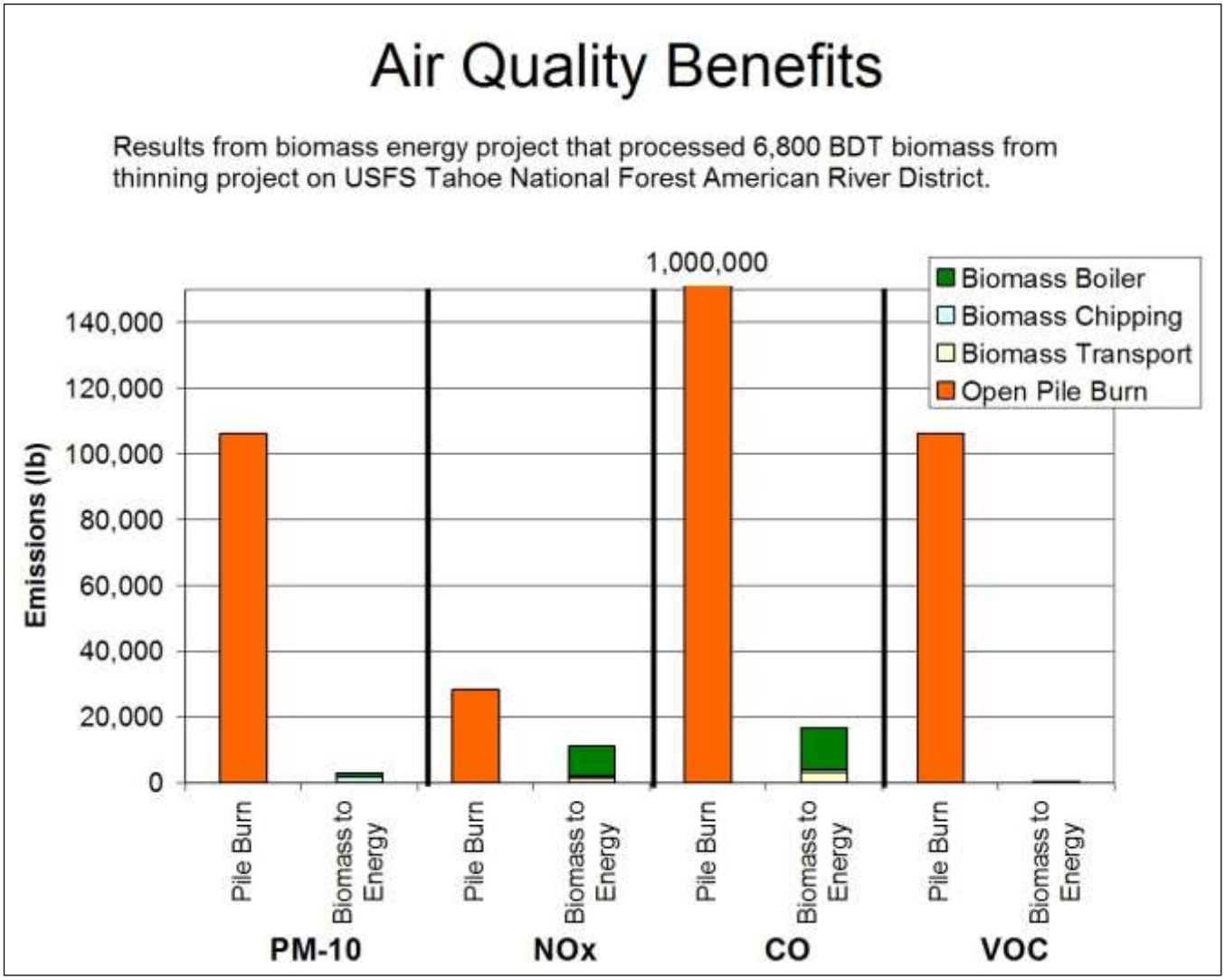
Institute for Community and Environment, in Plumas County ($250,000), and Calaveras Healthy Impact Products Solution, in Wilseyville ($184,405); and

- A highly collaborative expedited National Environmental Policy Act (NEPA) process was developed for Rim Fire Restoration Salvage Environmental Impact Study (EIS) in the spring of 2014.

Biomass Utilization. Although there is a clear need to thin smaller trees and other biomass from the forests to improve ecological function and reduce fire risk, these projects are often not feasible from a financial perspective, because there is often no market value for the biomass that is removed. Converting biomass to clean, renewable energy and value added products, such as landscaping materials, not only creates local economic development opportunities, but also generates revenue that can help fund needed forest restoration projects.

Recent State planning efforts and policies are increasing support for the use of biomass to create renewable energy while reducing the risk of wildfire. California's 2012 Bioenergy Action Plan includes a broad array of action items to promote forest bioenergy. The SNC is identified as one of the key responsible agencies for these action items, particularly in assisting forested communities to develop small scale forest bioenergy facilities.

Shortly following the adoption of the Bioenergy Action Plan, legislation requiring large utilities to purchase bioenergy was signed into law. Senate Bill 1122 (Rubio, 2012)[14] requires the state's three large investor owned utilities to collectively purchase 50 Megawatts (MW) of energy from new facilities sized at 3 MW or less using byproduct of sustainable forest management. This would dispose of forest waste from roughly 31,000 acres of forest restoration annually. The California Public Utilities Commission is currently considering implementation orders for this legislation and at this time it is unclear how helpful this may be in promoting smaller scale biomass energy facilities. Even with the potential assistance provided by SB 1122, additional efforts are needed to promote increased biomass utilization.



An estimated 125,000 acres of 32 million forested acres statewide (0.4%) are currently managed each year with mechanical treatments that remove biomass. On 75,000 of those acres, the removed biomass is disposed of through piling and open burning. This available biomass could sustain over 100 MW of renewable electricity generation if it were brought to a bioenergy facility and diverting pile and burn material to produce renewable energy reduces GHG emissions by over 30%.

It is estimated that about 500,000 acres of treatments on USFS lands annually would restore the health of the forests and help keep pace with future forest growth. Diverting the biomass generated by these forest treatments from pile and burn material to bioenergy facilities could reduce GHG emissions by 3.15 million metric tons annually. This would add up to 18.37 million metric tons of GHGs over 10 years, which is equivalent to eliminating 3.9 million cars from the road.

Integrated Regional Water Management (IRWM). The Department of Water Resources (DWR) developed the IRWM program to promote regional collaboration in managing the many

aspects of water-related issues such as economic vitality, water supply reliability, storm water and flood management, water quality improvements, and ecosystem protection and enhancement. IRWM crosses jurisdictional and political boundaries and involves multiple agencies, stakeholders, individuals and groups. Ultimately, IRWM establishes a prioritization process intended to determine which projects best meet regional needs and to encourage the development of those projects.

There are 23 IRWM groups in the Sierra, covering 47 watersheds. These groups have developed prioritized lists of projects needing funding within these watersheds and are seeking funding for them from DWR and other sources. Because many of these groups recognize the linkages between forest health and water quality and supply as well as other environmental benefits, some of them are seeking funding for projects to implement forest management and watershed protection and restoration projects. Sierra IRWM applications have ranged from forest and forest ecosystem support projects such as fuels reduction and meadow, creek and stream restorations to removal of invasive species and water supply and infrastructure projects. Unfortunately, very few forest related IRWM projects have been funded to date. Nonetheless, the IRWM funding process provides a significant and relevant opportunity for investment in forested watersheds.

The California Water Action Plan. At the end of 2013, the Secretaries for Natural Resources, Environmental Protection, and Food and Agriculture came together, under the Governor's direction, to develop The California Water Action Plan. At a statewide scale, the plan identifies "key actions for the next one to five years that address urgent needs and provide the foundation for sustainable management of California's water resources."

The importance of the Sierra to the State's water resources is clearly recognized in the plan, which identifies a set of activities to reduce the significant risks posed to the water resources flowing from the Sierra and other watersheds in the State. Specifically, it calls for:

- Restoration of forest health through ecologically sound forest management;
- Protection and restoration of degraded stream and meadow ecosystems to assist in natural water management and improved habitat; and,
- Support and expansion of funding for protecting strategically important lands within watersheds to ensure that conversion of these lands does not have a negative impact on our water resources.

Ongoing Research. A significant amount of research has been done on the issues associated with unhealthy forests and there is substantial scientific information available that supports the need for restoration and the benefits associated with such activity. Additional research is also currently underway, which will help us to further understand and quantify the dynamics of the resources within the Region and how specific activities that improve the health of Sierra forests and watersheds impact the resource values they provide. Specific research is aimed at learning more about:

- How management techniques that improve the ecological resilience of forests can enhance and protect the snowpack, thereby increasing water supply reliability;

- The amount of current available storage in our key reservoirs, the rate at which they are filling in, and actions we can take to minimize storage loss though restoring forest and watershed health;
- The impact of forest health treatments on endangered species;
- The carbon benefits of forest health treatments, and how those benefits could be multiplied through the appropriate use of biomass;
- The water storage and release benefits of restoring degraded meadows;
- The water use of overgrown forests and the potential increase in water yield that will result from forest thinning treatments; and,
- More comprehensive quantification of the costs of extreme fire events, including impacts on health, tourism, insurance, and utilities.

ONGOING CHALLENGES

Though there are many positive efforts underway in the Sierra Nevada, the need for restoration is so great that our progress towards restoring balance and health to our forests, communities and economies is inadequate. Major impediments to increasing pace and scale exist, and must be addressed on the appropriate scale if we expect to make meaningful progress towards our goals. There are a multitude of challenges, but we have identified the following five as the most immediate and limiting ones to increasing the pace and scale of restoration:

Insufficient funding and resources

The amount of funding available for forest restoration is inadequate to meet the need. According to USFS Regional Forester Randy Moore, the pace and scale of forest restoration needs to increase 2 to 3 times in order to restore the ecological health of the state's National Forests. Given the nature of the National Forest lands, restoration efforts must include mechanical treatment as well as the increased use of prescribed and managed fire. By strategically conducting mechanical fuels reduction efforts combined with the careful use of fire, costs associated with fire suppression can be reduced significantly over time.

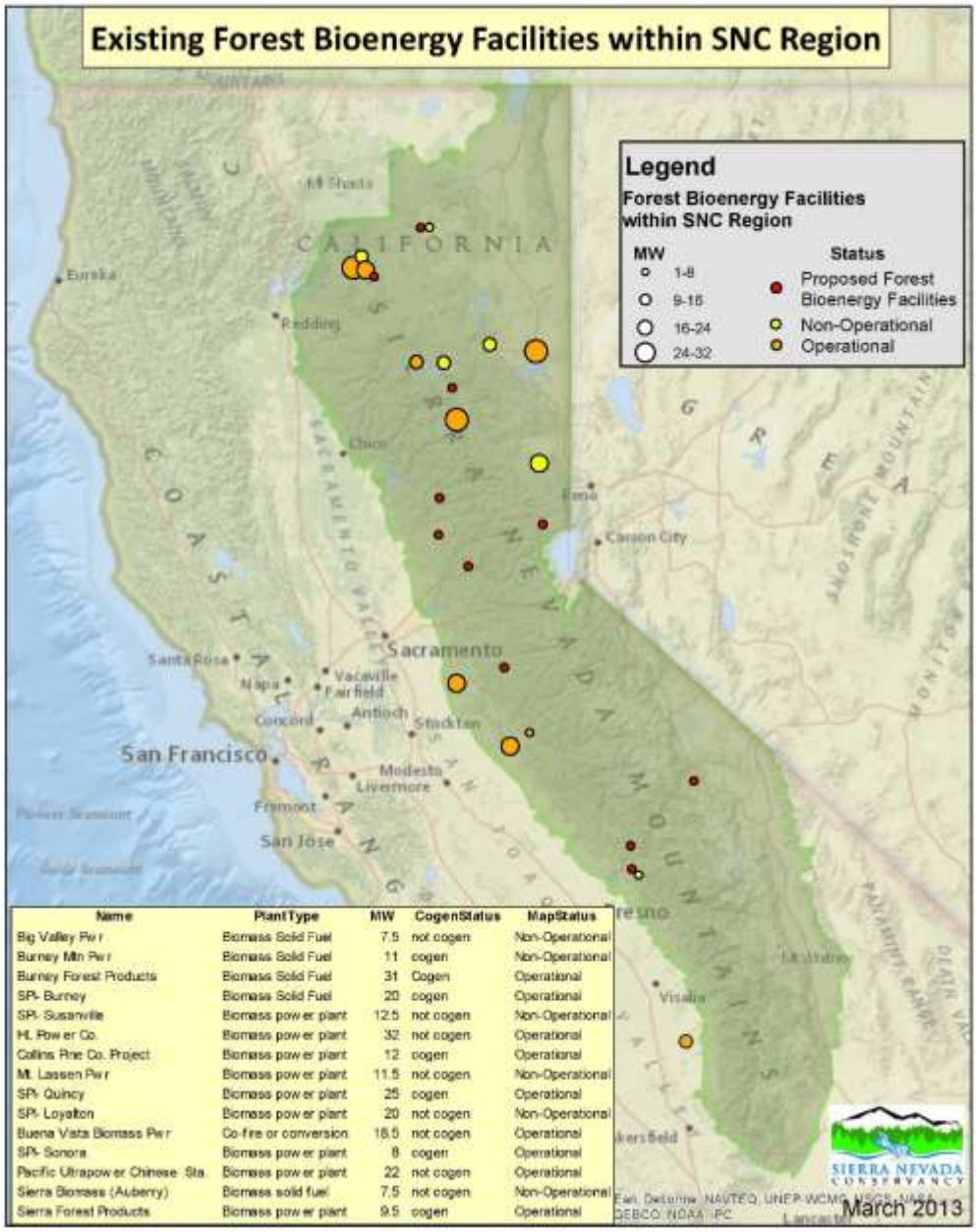
While many projects can "pay for themselves" through the sale of wood products (including biomass), that is not feasible for many other crucially important projects, so that funding is needed to complete them. Not only is the level of funding inadequate to meet the need, federal funding policies often further limit resources for restoration projects. For example, policies related to funding fires suppression often result in funds that would otherwise be available for restoration being "swept" to pay for suppression. The inability to fund restoration projects ultimately leads to higher suppression costs, and the cycle is repeated.

Increasing the harvest of timber in an ecologically sound manner can offset a portion of the need for additional, dedicated funding for restoration efforts. While this subject continues to garner some controversy, progress had been made in an approach to managing federal lands, including timber harvesting which has support from many environmental groups. There is broad consensus support among a wide range of stakeholders for General Technical Report 220 (and associated information). This guidance documents proposes an ecosystem management strategy for Sierran mixed-conifer forests. This Report was published by Forest

Service Pacific Southwest Region scientists, and the management recommendations in it emphasize the ecological role of fire, changing climate conditions, sensitive wildlife habitat, and the importance of forest structure heterogeneity.

Lack of wood/biomass processing infrastructure

The decline in timber output from public lands has also affected the timber industry that was historically a central component of the Sierra Nevada economy, leading to mill closings, lost jobs, and decreasing potential financial capital. Though there is now a focus on re-establishing a smaller-scale, highly distributed wood processing industry to add value to the forest treatment by product and support local economic development, the existing capacity is not adequate to handle the pace and scale of restoration needed in the Sierra Nevada. For instance, last summer, the Honey Lake biomass power plant had a full yard and stopped all chip deliveries for the year on August 1, 2013, at a time when forest restoration was in full swing and biomass outlets were still very much in demand.[15] This resulted in a number of proposed projects not being completed.



Name	PlantType	MW	CogenStatus	MapStatus
Big Valley Pwr	Biomass Solid Fuel	7.5	not cogen	Non-Operational
Burney Mtn Pwr	Biomass Solid Fuel	11	cogen	Non-Operational
Burney Forest Products	Biomass Solid Fuel	31	Cogen	Operational
SPI- Burney	Biomass Solid Fuel	20	cogen	Operational
SPI- Susanville	Biomass power plant	12.5	not cogen	Non-Operational
HL Power Co.	Biomass power plant	32	not cogen	Operational
Collins Pine Co. Project	Biomass power plant	12	cogen	Operational
Mt. Lassen Pwr	Biomass power plant	11.5	not cogen	Non-Operational
SPI- Quincy	Biomass power plant	25	cogen	Operational
SPI- Loyalton	Biomass power plant	20	not cogen	Non-Operational
Buena Vista Biomass Pwr	Co-fire or conversion	18.5	not cogen	Operational
SPI- Sonora	Biomass power plant	8	cogen	Operational
Pacific Ultrapower Chinese Sta.	Biomass power plant	22	not cogen	Operational
Sierra Biomass (Auberry)	Biomass solid fuel	7.5	not cogen	Non-Operational
Sierra Forest Products	Biomass power plant	9.5	cogen	Operational

The increase of large fires, such as the Rim Fire, puts additional pressure on the system as the limited capacity for wood processing in the Sierra Nevada becomes focused on

processing salvage logged timber. This throws into question the fate of the desperately needed restoration treatments slated for unburned but overgrown areas, if there is nowhere for this wood to go for processing.

Lengthy/complex planning processes (NEPA, CEQA, and ESA)

Projects on federally managed lands are subject to review under the National Environmental Policy Act (NEPA) while projects on other lands in California are subject to the California Environmental Quality Act (CEQA). The complexity of completing these processes and the length of time necessary to complete them is usually dependent on the scope and location of the project and may also be impacted if the project is in a sensitive location, impacts sensitive species, or other factors. Completion of the environmental assessment process under NEPA for complex fuel reduction projects can take up to two years or more. Completion of the environmental assessment process under CEQA for complex projects can take up to one year or more. Both processes can also be costly, requiring large amounts of staff time and/or contracts with private consulting firms.

When a project is located on federally managed lands and the project is funded in part or in whole through state or local public funds, both NEPA and CEQA requirements must be met. The best scenario for this requirement is to prepare a joint document incorporating the requirements of both laws simultaneously. When this is not possible, a two tiered environmental review process may be required resulting in additional staff resources, costs, and time.

Projects may also be impacted by the Federal and/or State Endangered Species Act (ESA). The primary goal of the ESA is to prevent extinction of imperiled plant and animal life (listed species) and secondarily, to recover or lessen threats to the survival of listed species. When a listed species or its habitat is present within a project area, measures must be incorporated into the project to ensure protection of the species or a special permit must be obtained.

Developing larger landscape restoration projects has the potential of providing greater efficiency in complying with these laws. Further, addressing environmental issues in a proactive, collaborative manner can significantly reduce conflict, which has often led to delay or non-implementation in the past.

Need for increased use of fire as a management tool for restoration

a significant portion of USFS lands are not able to be treated through mechanical means for a variety of reasons. Even if the current rate of mechanical treatments increased 4 – 5 times it would still be less than 1/3 of what is needed.[16] Therefore, an effective approach to restoration must include conducting mechanical fuels reduction efforts where feasible and, for the high percentage of ground where mechanical thinning is not possible, using planned fires (fires that are set intentionally to remove unwanted vegetation) or managed fire (fires that are started unintentionally but which can be managed to provide ecological benefits) to treat the landscape.[17]

Fire had a much more active role in the Sierra Nevada in the past than it does today and current best science makes a strong case for an expanded managed fire program to increase the pace and scale of restoration. For instance, studies have shown that biodiversity increases

in multiple fire entries.[18] In addition, some local Air Quality Management Districts have been working cooperatively with land managers, understanding that the consequences of uncontrolled wildfires are far more detrimental than fire used as a management tool.

Use of prescribed fire is also cost effective: per acre prescribed fire is the lowest cost treatment, mechanical often 2 – 4 times more and wildfire 6 – 15 times more. Future costs of mechanical treatments are likely to increase, particularly for maintenance (2nd entry and on).

As fuel loads increase, rural home construction expands, and budgets decline, delays in implementation will only make it more difficult to expand the use of managed fire. Without proactively addressing some of these conditions, the status quo will relegate many ecologically important areas (including sensitive species habitat) to continued degradation from either no fire or wildfire burning at high-intensity.[19]

While the case for increasing managed fire on the landscape is strong, there are some challenging issues standing in the way. One of the most formidable is regulatory requirements. The California Air Resources Board (CARB) and local air districts impose very tight restrictions on burn windows and duration of prescribed fires, which can make it difficult to implement them. Unfortunately, this may have the unintended consequence of enabling larger, more damaging fires to occur, which emit far more pollution into the atmosphere than would have been released by the prescribed fires. Providing greater flexibility to use fire to prevent megafires is essential to restoring our forests to resiliency.

One of the best tools available is increasing communication and outreach with regulatory agencies, partners and stakeholders. This outreach should include engaging CARB, Federal Environmental Protection Agency (EPA) and Forest Service leadership more effectively and developing strong messaging that stakeholders must “Pick Your Smoke” given the realities of life in a fire prone environment and the potential for increased fire size and intensity if we don’t take immediate action.

Habitat for species such as the American Marten may be at risk from high intensity fire. Photo courtesy of the U.S. Forest Service.

Need to increase use of contracting tools that maximize local benefits to forest communities

Declines in available timber harvest for local companies to process has significantly impacted the economy of the Sierra Nevada and the well-being of its residents. For example, between 2000 and 2008, the Sierra Nevada Region Gross Domestic Product (GDP) averaged between $14,000 and $17,000 less per person than the rest of California. Despite the USFS's expressed desire to keep economic benefits in local communities and a number of innovative collaborations underway throughout the Sierra Nevada, it has proven very difficult for most local contractors and wood processing businesses to compete successfully for forest service contracts against larger, often out-of-state, businesses with lower overhead and operational costs.

Some forests in Region 5 have begun to identify mechanisms that provide some level of local preference in the bidding process and the SNFCI Regional Coordinating Council is currently working closely with USFS Regional Office and Sierra Cascades All Lands Enhancement group (SCALE) to develop a toolkit that will help forest supervisors and collaboratives throughout the Region give greater weight to local socioeconomic benefit when awarding contracts. While these efforts are a good start, a much larger group of unified, high-level leadership is needed to make the paradigm shift that will be required to overcome institutional barriers and a lack of clear policy direction at the federal level.

Calaveras Healthy Impact Product Solutions, Inc. crews working in the forest.

CONCLUSION

Without bold action to increase the pace and scale of forest restoration in the Sierra Nevada California will face ongoing adverse impacts to its environment and economy. The foundation for such an effort exists, but strong policy and investment actions identified in this document must be taken by federal and state government.

The SNC is developing a Sierra Nevada Forest and Community Action Plan building upon and enhancing existing efforts, both at a Regional and watershed level. The SNC will provide leadership and focus, and engage interested parties who share our vision and commitment to restoring our forest to health and resiliency. The alternative of continuing down the path we are on should not be acceptable to anyone who benefits from, and cares about, this incredible piece of the California landscape.

Above image: Photo courtesy of the Friends of the South Fork Kings River.

---

[1] Water Education Foundation. (2011). *Looking to the Source: Watersheds of the Sierra Nevada* (p. 27). Sacramento.

[2] Vicuna, S., Leonardson, R., Hanemann, M. W., Dale, L. L., & Dracup, J. a. (2007). Climate change impacts on high elevation hydropower generation in California's Sierra Nevada: a case study in the Upper American River. *Climatic Change*, *87*(S1), 123–137. doi:10.1007/s10584-007-9365-x

[3] US Forest Service Pacific Southwest Region. (2011). *Ecological Restoration: Engaging Partners in an All Lands Approach--Region 5 Ecological Restoration* (pp. 1–4).

[4] Miller, J. D., & Safford, H. D. (2008). Sierra Nevada fire severity monitoring 1984-2004. Vallejo, CA, USA: U. S. Departement of Agriculture, Forest Service, Pacific Southwest Region.

[5] Stevens, J. T., Safford, H. D., & Latimer, A. M. (2014). Wildfire-contingent effects of fuel treatments can promote ecological resilience in seasonally dry conifer forests, *854*(April), 843–854. Retrieved from http://www.stevensjt.net/wp-content/uploads/2014/06/Stevens-et-al-CJFR-2014.pdf

[6] Lanini, J. S., Clark, E. A., & Lettenmaier, D. P. (2009). Effects of fire-precipitation timing and regime on post-fire sediment delivery in Pacific Northwest forests. *Geophysical Research Letters*, *36*.

[7] Storck, P., Lettenmaier, D. P., & Bolton, S. M. (2002). Measurement of snow interception and canopy effects on snow accumulation and melt in a mountainous maritime climate, Oregon, United States. *Water Resources Research*, *38*(11), 1123. doi:10.1029/2002WR001281

[8] Koivusalo, H., & Kokkonen, T. (2002). Snow processes in a forest clearing and in a coniferous forest. *Journal of Hydrology*, *262*(1-4), 145–164. doi:10.1016/S0022-1694(02)00031-8

[9] Bales, R. C., Battles, J. J., Chen, Y., Conklin, M. H., Holst, E., O'Hara, K. L., … Stewart, W. (2011). *Forests and Water in the Sierra Nevada: Sierra Nevada Watershed Ecosystem Enhancement Project* (p. 43). Retrieved from http://snri.ucmerced.edu/sites/snri/files/public/documents/SWEEP_published_112911.pdf

[10] California Department of Water Resources. (2008). *Managing An Uncertain Future* (pp. 1–34). Sacramento, CA. Retrieved from http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf

[11] California Department of Water Resources. (2008). *Managing An Uncertain Future* (pp. 1–34). Sacramento, CA. Retrieved from http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf

[12] Pfister, G. G., Wiedinmyer, C., & Emmons, L. K. (2008). Impacts of the fall 2007 California wildfires on surface ozone: Integrating local observations with global model simulations. *Geophysical Research Letters*, *35*(19), 1–5. doi:10.1029/2008GL034747

[13] Stephenson, N. L., Das, A. J., Condit, R., Russo, S. E., Baker, P. J., Beckman, N. G., … Zavala, M. A. (2014). Rate of tree carbon accumulation increases continuously with tree size. *Nature*, *507*(7490), 90–93. Retrieved from http://dx.doi.org/10.1038/nature12914

[14] Senate Bill No. 1122. Rubio (2012). http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_1101 1150/sb_1122_bill_20120927_chaptered.pdf

[15] Anecdotal comment from Region 5 FS/SNFCI Council meeting, 2/18/14
[16] Marc Meyer PPT presentation—Defining Resource Benefits of Wildland Fire in the Southern Sierra Nevada
[17] PSW/R5 PowerPoint, SNFCI Council Meeting, April 2014
[18] Webster and Halpern 2010
[19] North et al. 2012. Using Fire to increase pace and scale of treatments.

---

[21] OFRI. (2006). *Biomass Energy and Biofuels from Oregon's Forests; Sierra Nevada Forest Plan Amendment--Volume 2, Chapter 3, Part 5.9*. Portland, OR.