

Managing Smoke and Carbon: Strategies for minimizing impacts while increasing pace and scale of fire treatments

Leland Tarnay, Ph.D.

Interagency Smoke Ecologist

Pacific Southwest Research Station, USFS

US FOREST SERVICE

Pacific Southwest
Research Station
800 Buchanan Street
Albany, CA 94710-0011
(510) 559-6300



Outline

- Air Quality and megafires
- Greenhouse gas (GHG) emissions and megafires
- Carbon stocks and megafires
- Strategies for reducing air quality impacts and protecting carbon (C) stocks
- Landscape Prioritization: anchor points

2013 American (22,000+ acres)

2014 King Fire (98,000+ acres)

2013 Rim (255,000+ acres)

2014 French (13,000+ acres)

2013 Aspen (22,000+ ac.)

Landscape context: 2013 and 2014 megafires have started at the bottom of major drainages in the Sierra

Legend

- IR Fire
- Perimeter
- National Park Boundaries (for orientation)

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
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Data MBARI

Google earth

Air quality during the Rim and King Fires

Seasonal: 1-hr (points) and 24-hr (line) Rolling Average

PM2.5 Concentrations vs. AQI

Grass Valley

Reno

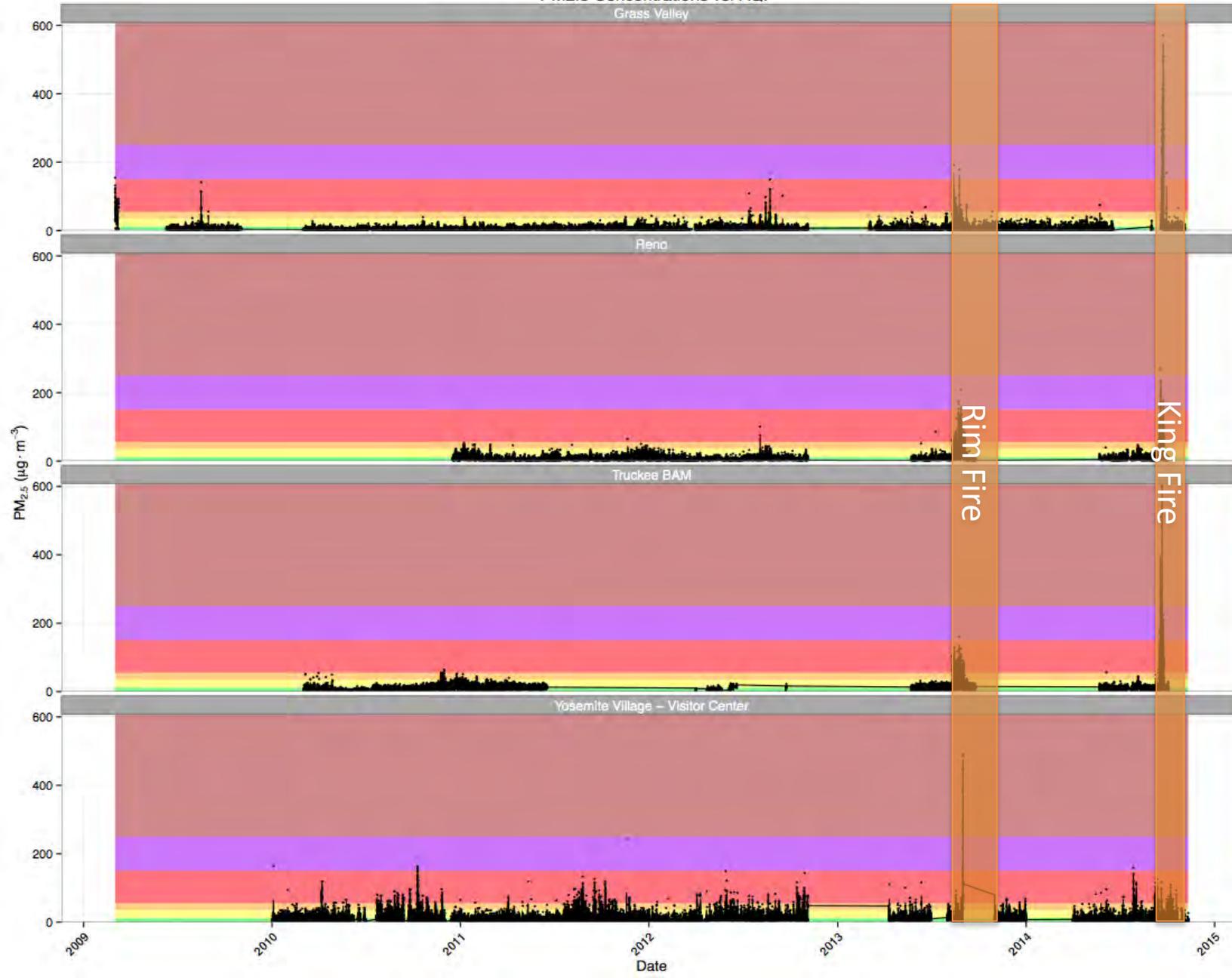
Truckee BAM

Yosemite Village – Visitor Center

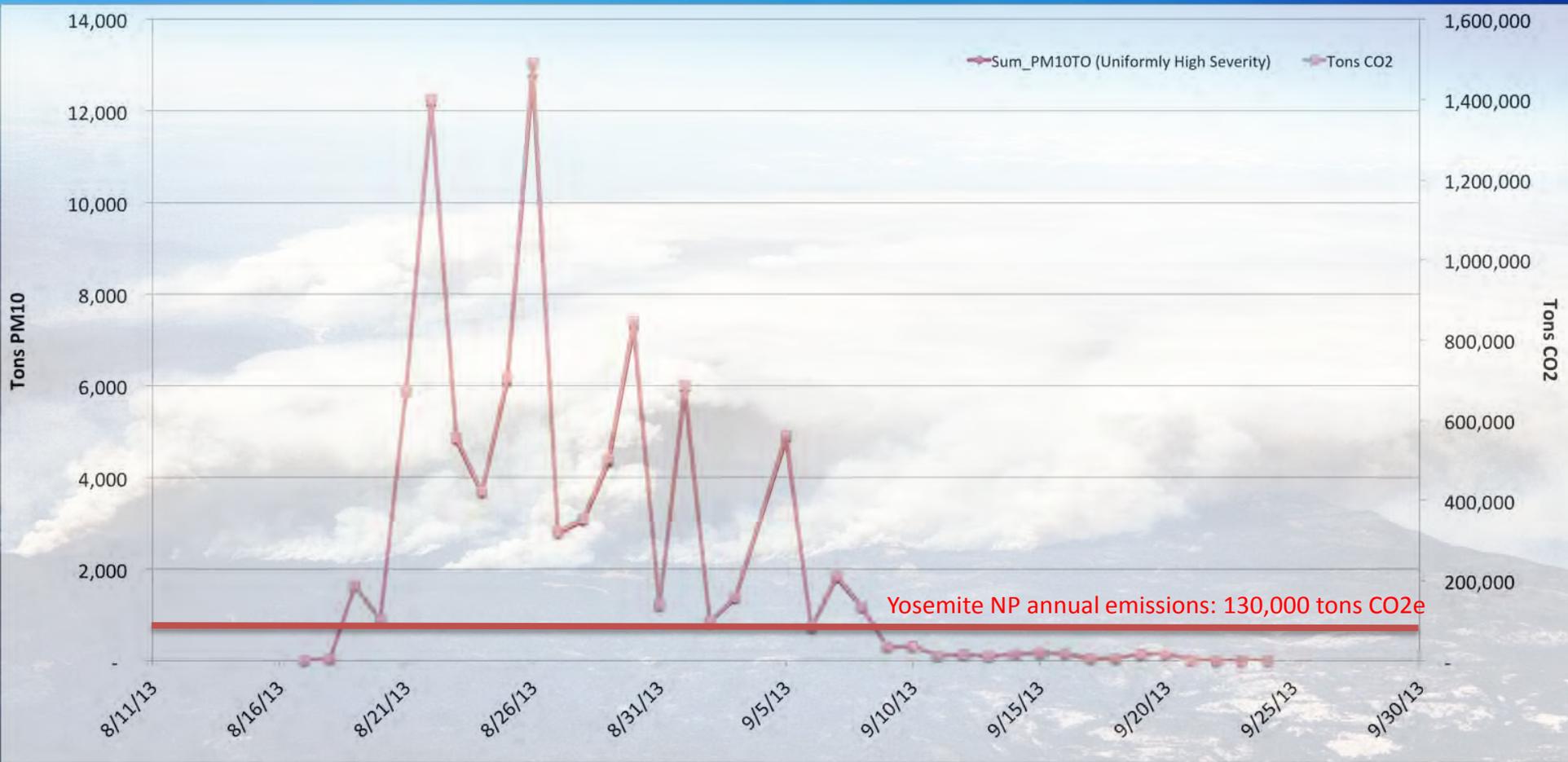


Rim Fire

King Fire

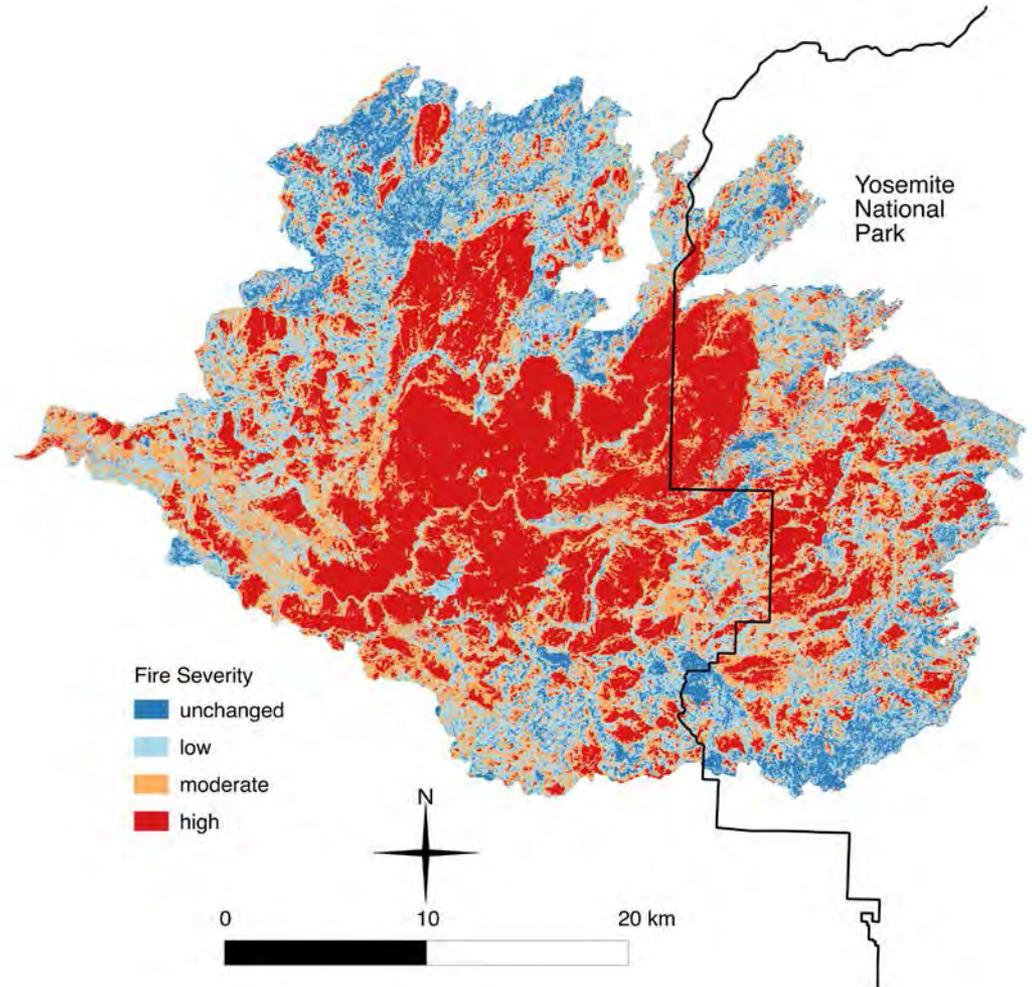


Daily GHG and PM₁₀ emissions from the Rim fire



Yosemite NP annual emissions: 130,000 tons CO2e

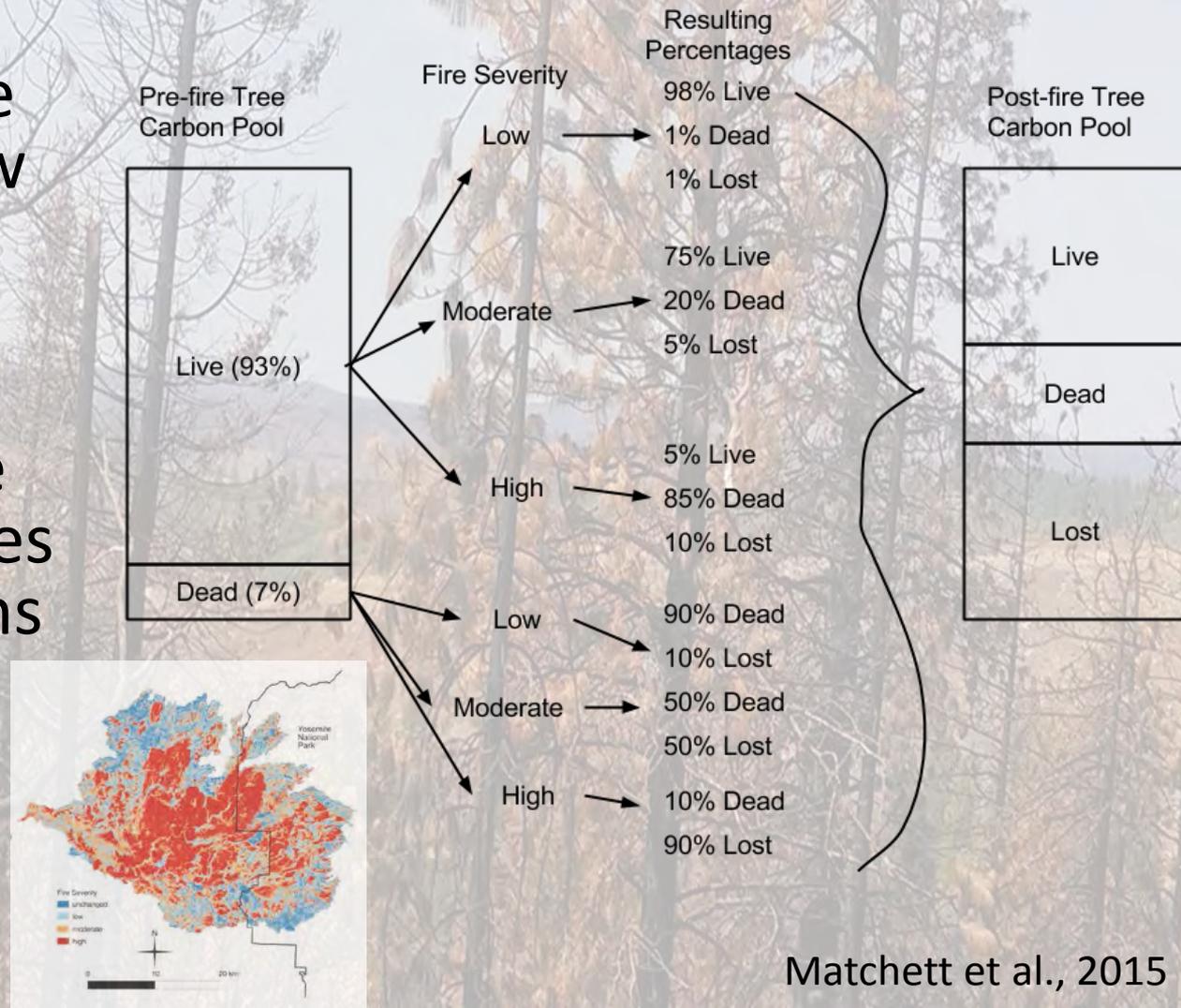
Fire severity in the Rim Fire



View to northwest from Rim of the World pullout, HWY 120

What burns, and what dies, at different fire severities: an illustration

- We have pre-fire plot data on how much live and dead exist (in Yosemite)
- We picked some reasonable values for what happens at different fire severities, post-fire.



Implications for C stocks before and after Rim fire

(within Yosemite only)

- Most smoke emissions are the small live trees and dead stuff lying on the ground...the tree boles and thickest branches often don't burn, even at high severity.
 - BUT, in high severity fire, most trees die, start decaying, and no longer sequester C
 - Opportunity cost



Total PM
could increase
by 50% over
the next 50-
100 years

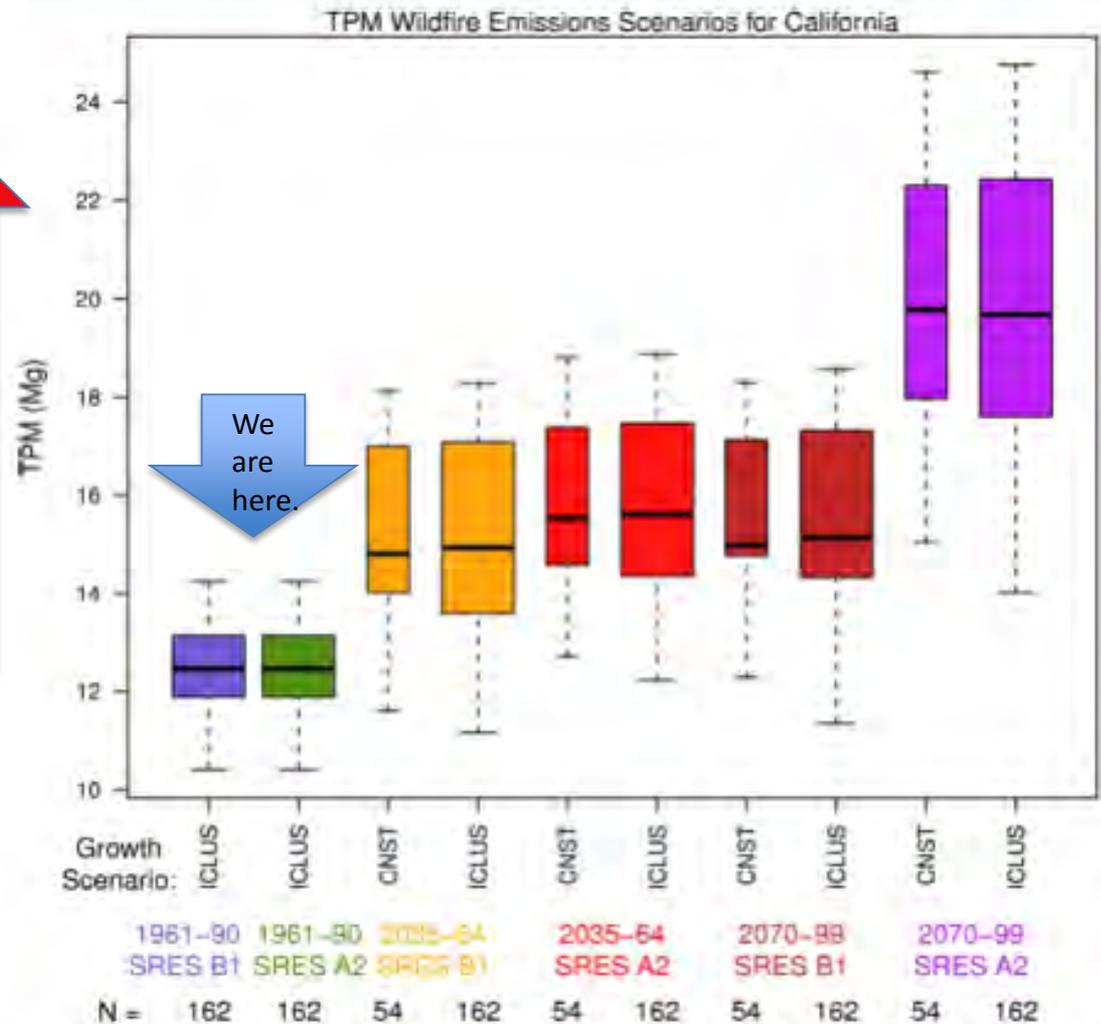


Figure 1. Projected total particulate matter (TPM) aggregated over the state of California, averaged for historical (1961–1990), mid-century (2035–2064), and late-century (2070–2099) time periods for both projected population growth (ICLUS) and population held constant at year 2000 levels (CNST) and SRES B1 and A2 emission scenarios.

Moderating severity has a chance at halving smoke (and GHG) emissions

More smoke in the air

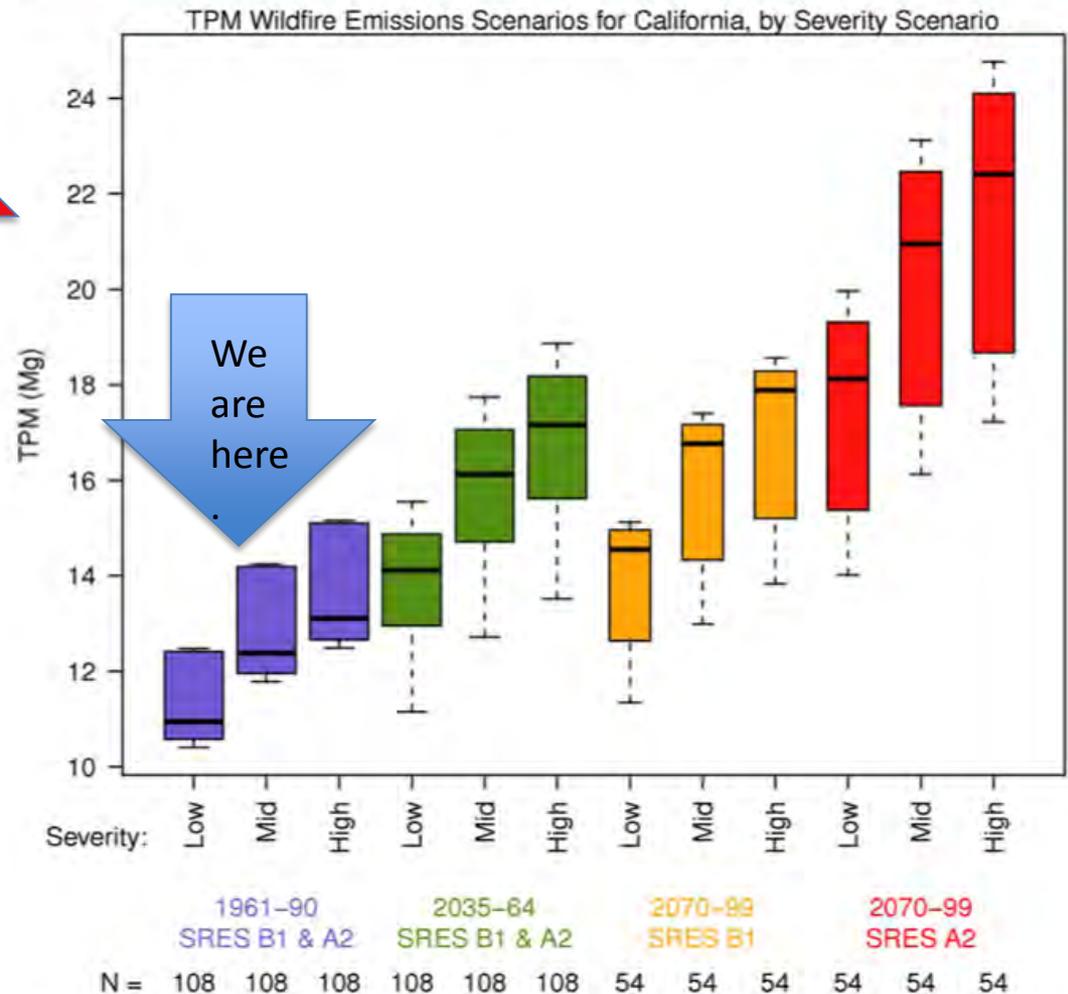
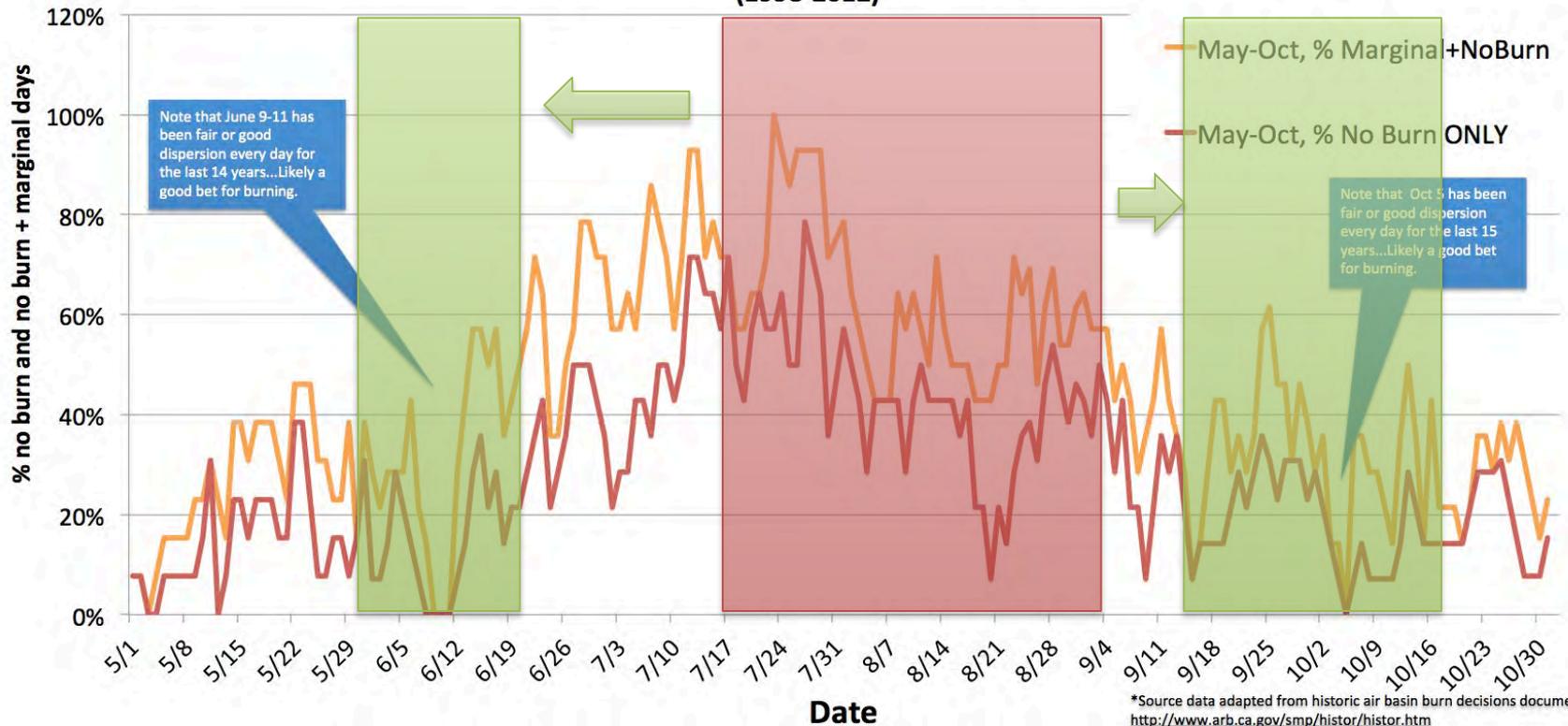


Figure 2. Projected total particulate matter emissions over the historical (1961–1990), mid-century (2035–2064), and late-century (2070–2099) time periods by burn severity. Low severity equals wildfire activity being aggregated in low biomass portions of each grid cell. Mid severity distributes wildfire activity across biomass types within each grid cell and assumes mixed severity fire. High severity aggregates wildfire activity in the highest biomass portions of each grid cell and assumes high severity fire. Hurteau et al., 2014

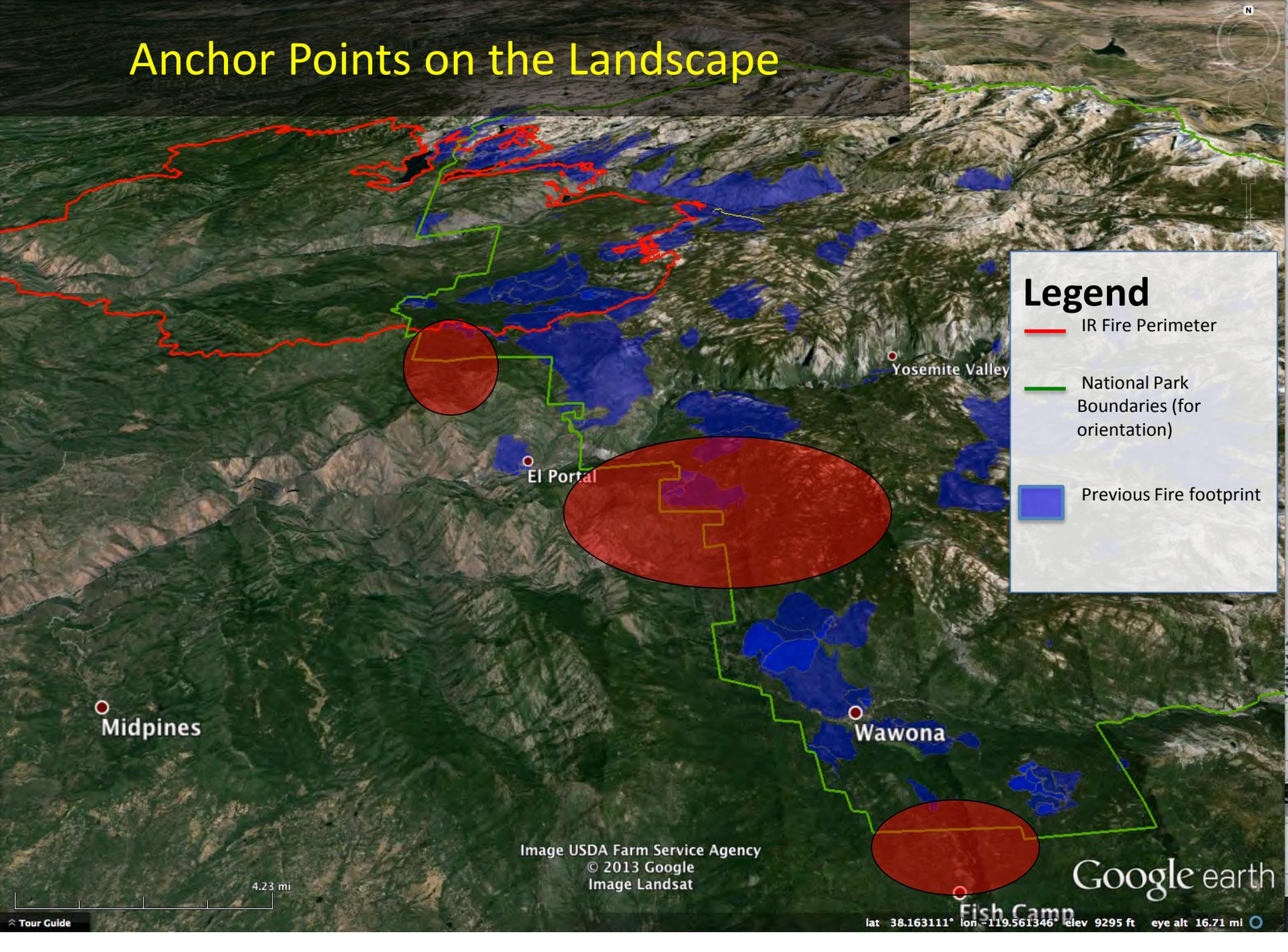
Matching emissions to dispersion

14-Year History of Burn Days for South Mountain Counties: Percent Marginal vs. Percent Marginal+No-Burn (1998-2012)



*Source data adapted from historic air basin burn decisions documented at: <http://www.arb.ca.gov/smp/histor/histor.htm>

Anchor Points on the Landscape



Legend

- IR Fire Perimeter
- National Park Boundaries (for orientation)
- Previous Fire footprint

Image USDA Farm Service Agency
© 2013 Google
Image Landsat

Google earth

lat 38.163111° lon -119.561346° elev 9295 ft eye alt 16.71 mi

Tour Guide

Boulder Rx Context: A proposal to proactively "plug the drainage"

2010 Sheep fire (8700+ acres)

Unit 1 (proposed for fall 2013, 3200+ acres)

Total Boulder Creek Rx Unit (14,000+ acres)

Rest of drainage (95,000+ acres)

Legend

- IR Fire
- Perimeter
- National Park Boundaries (for orientation)

Hume

Wilsonia

Hartland

Badger

Pinehurst

Miramonte

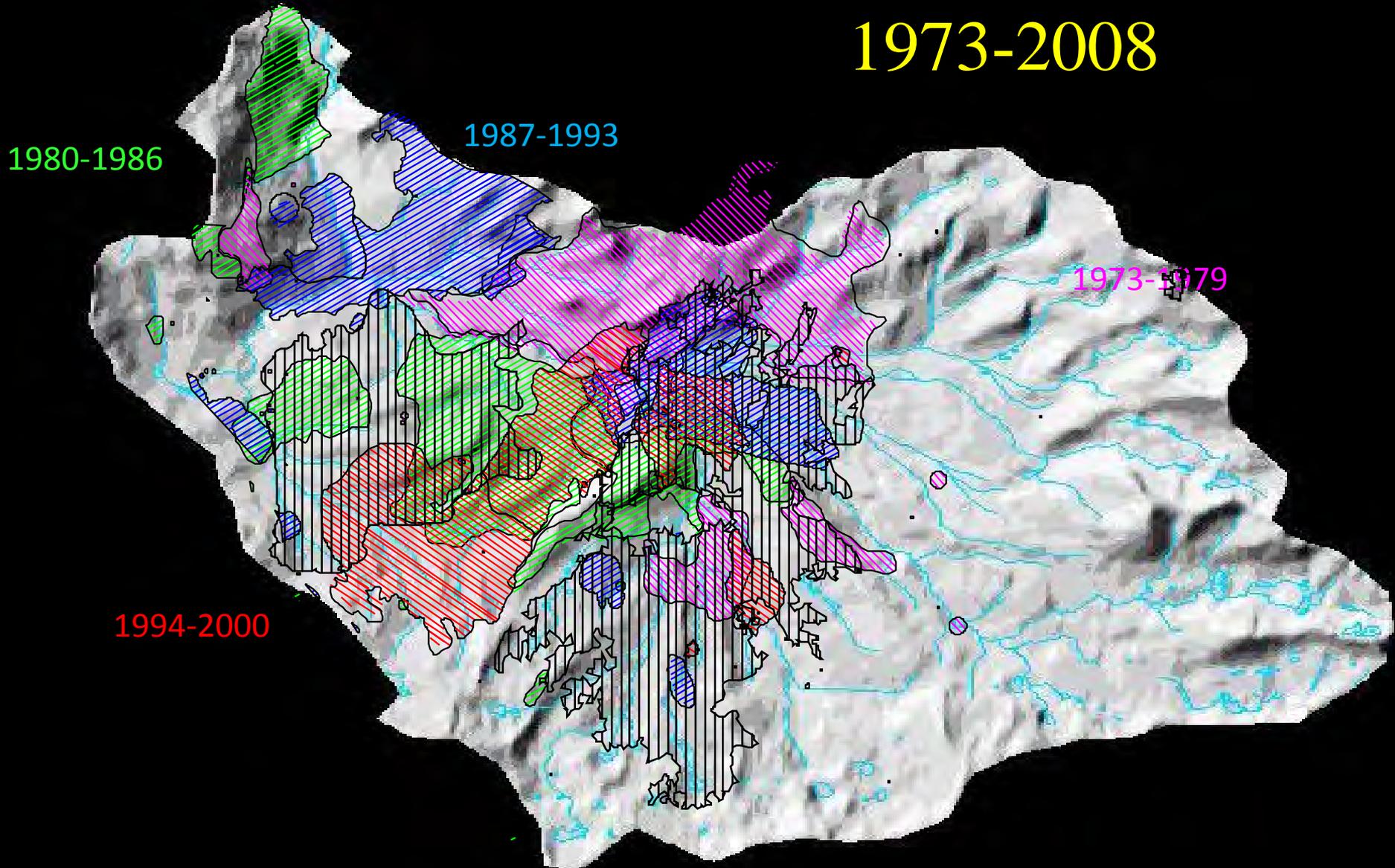
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Image Landsat

Image © 2013 DigitalGlobe

Google earth

3.71 mi

Illilouette Creek Fires 1973-2008



Conclusions

- Protecting carbon stocks and air quality means large(r) scale Rx and managed wildfire.
- Severity matters: lower and more moderate severity fires mean less emissions, and less long-term losses from current carbon stocks.
- Landscape mosaics are key to moderating severity and limiting impacts to air quality and carbon stocks.
- Every patch of forest in the Sierra Nevada will burn--managed and Rx fire projects can shift those emissions into better dispersion, minimizing impacts of the smoke.
- Building landscape mosaics takes decades, and starts with anchor points create by Rx and/or managed wildfire, chosen by a prioritization process that crosses land management agencies.
- California is likely to see more smoke either way, but managing severity and matching emissions with dispersion are promising strategies for mitigation.