Restoring forest resilience after wildfire on private land

UC Center Sacramento Speakers Series - Adapting to Drought and Extreme Heat

April 19th, 2023

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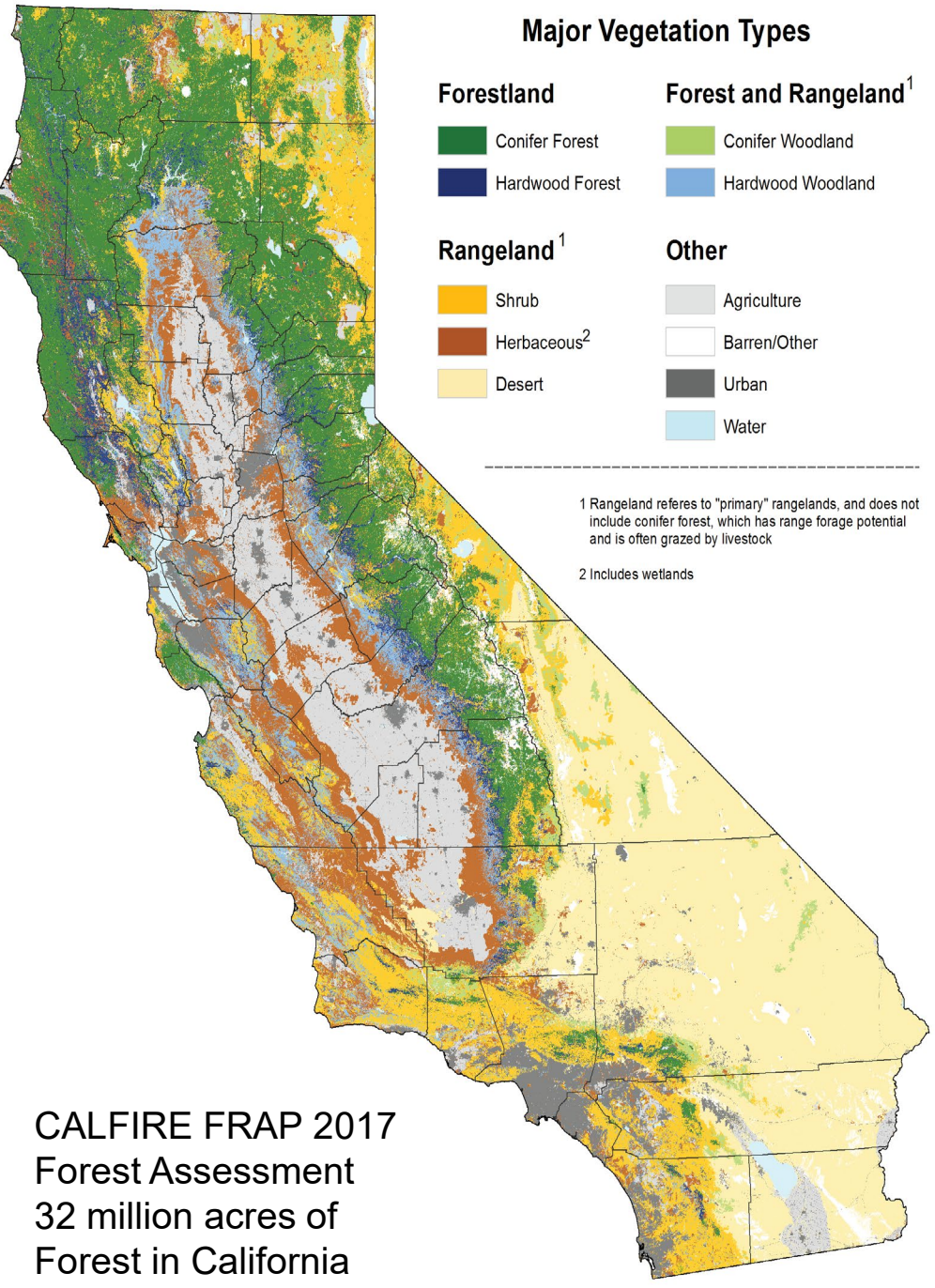
Talk outline - California forests

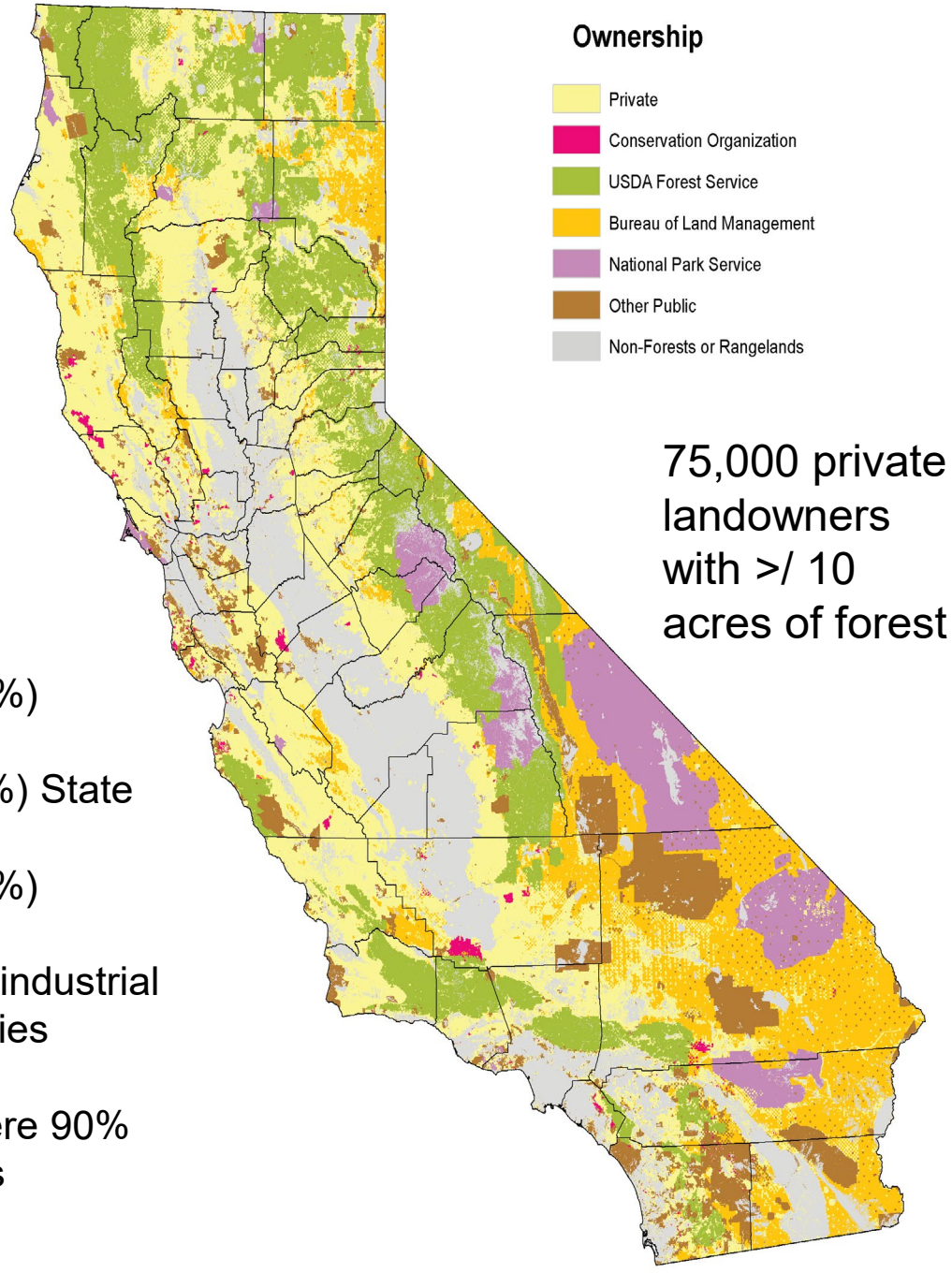
- California forests and ownership
- Expanding forest disturbances
  - Wildfire and insects
- Increasing need for reforestation
- Reforestation process
- Small landowner's experience with high severity wildfire
- California response to forest loss
- Landowner assistance
- Post fire forest resilience assistance



CALFIRE FRAP 2017
Forest Assessment
32 million acres of
Forest in California

Who owns the forest?

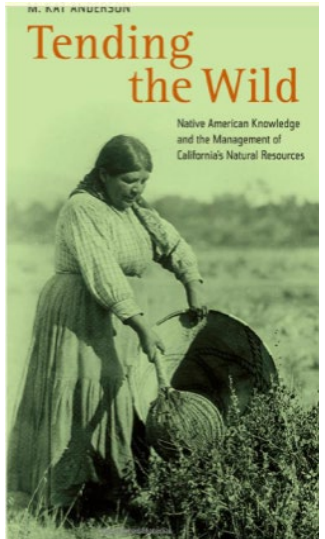
- 19 million acres (57%) federal agencies
- < 1 million acres (3%) State and local
- 12 million acres (40%) private
  - 5 million acres industrial timber companies
  - 7 million acres individuals where 90% own < 50 acres

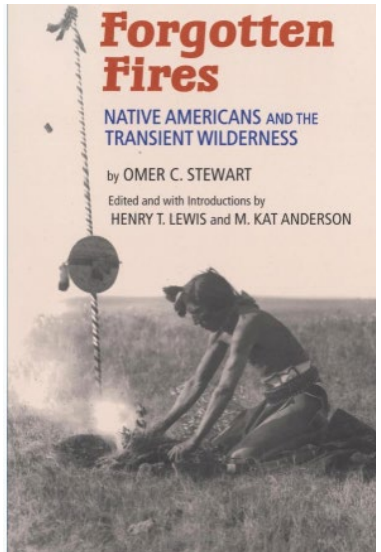


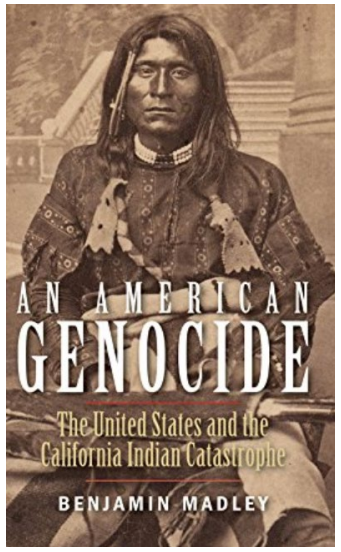
75,000 private landowners with >/ 10 acres of forest

Sierra Nevada forests are frequent fire forests

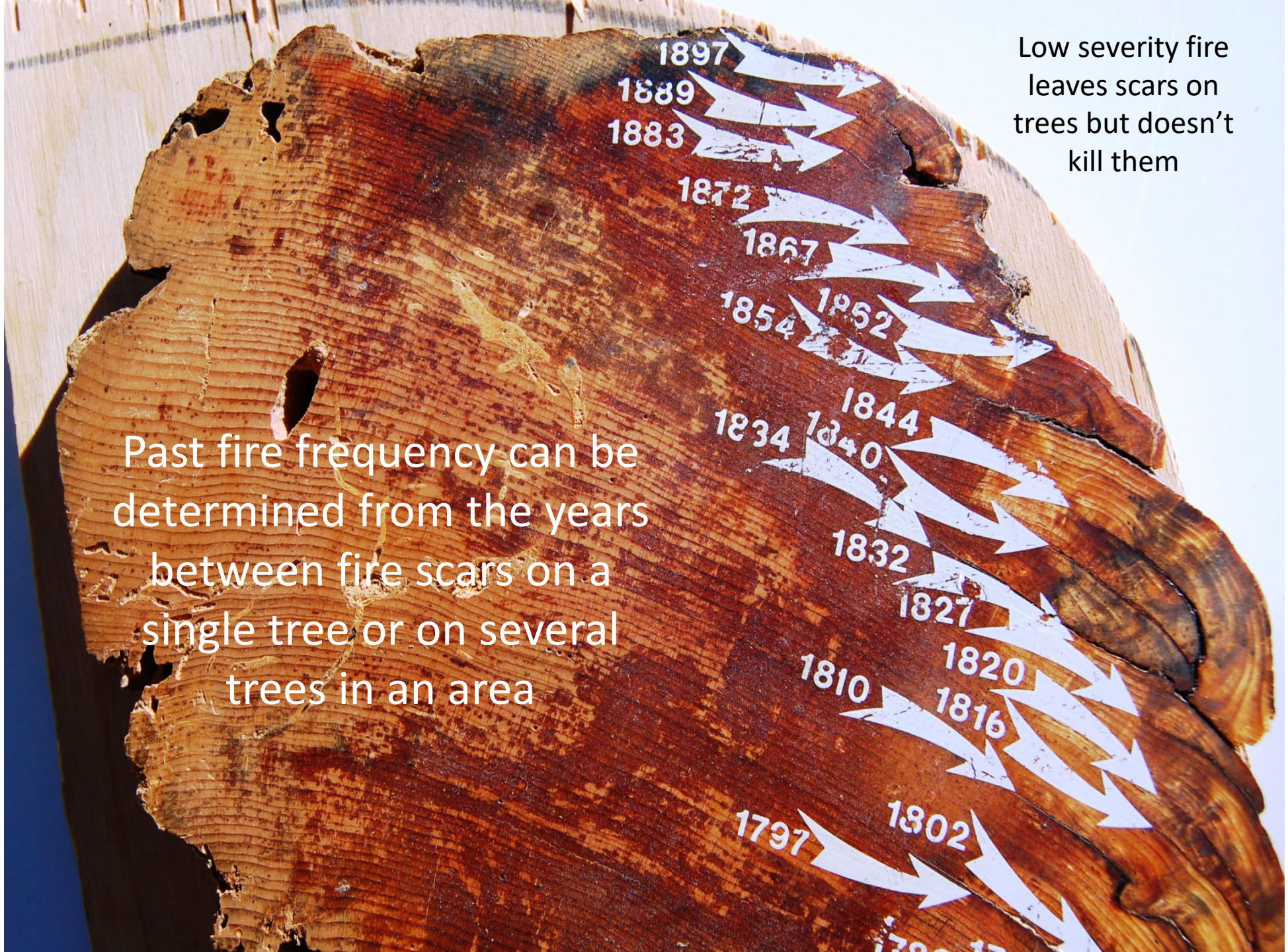
- Both natural (lightning) and anthropogenic starts
- California Indians managed the landscape with fire for at least 10,000 years before colonization
- Practices and population mostly maintained under Spain & Mexico
- 1849 California Gold Rush led to widespread genocide and fire exclusion







Pocket of white fir being torched in prescribed burn

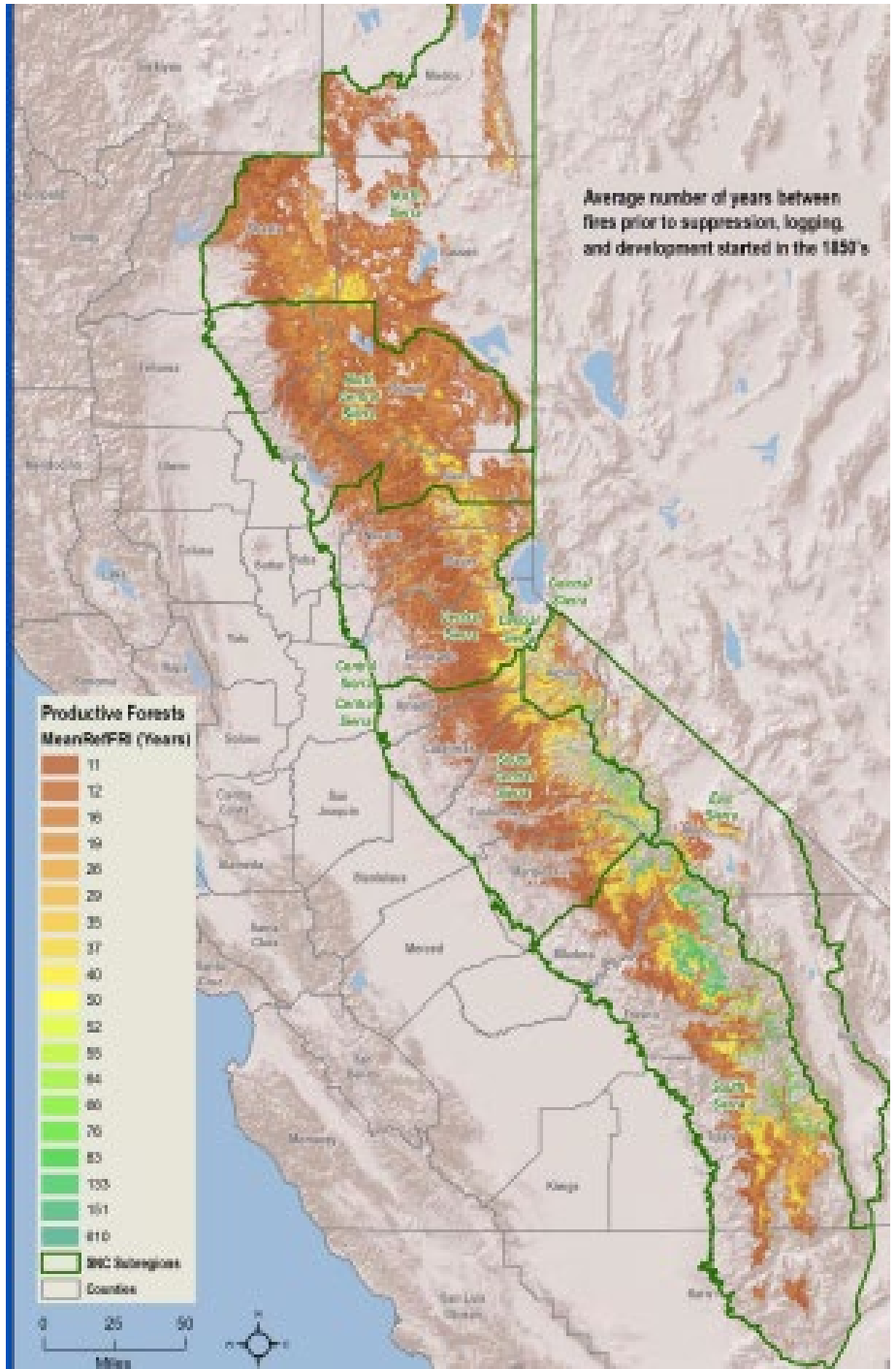


Low severity fire leaves scars on trees but doesn't kill them

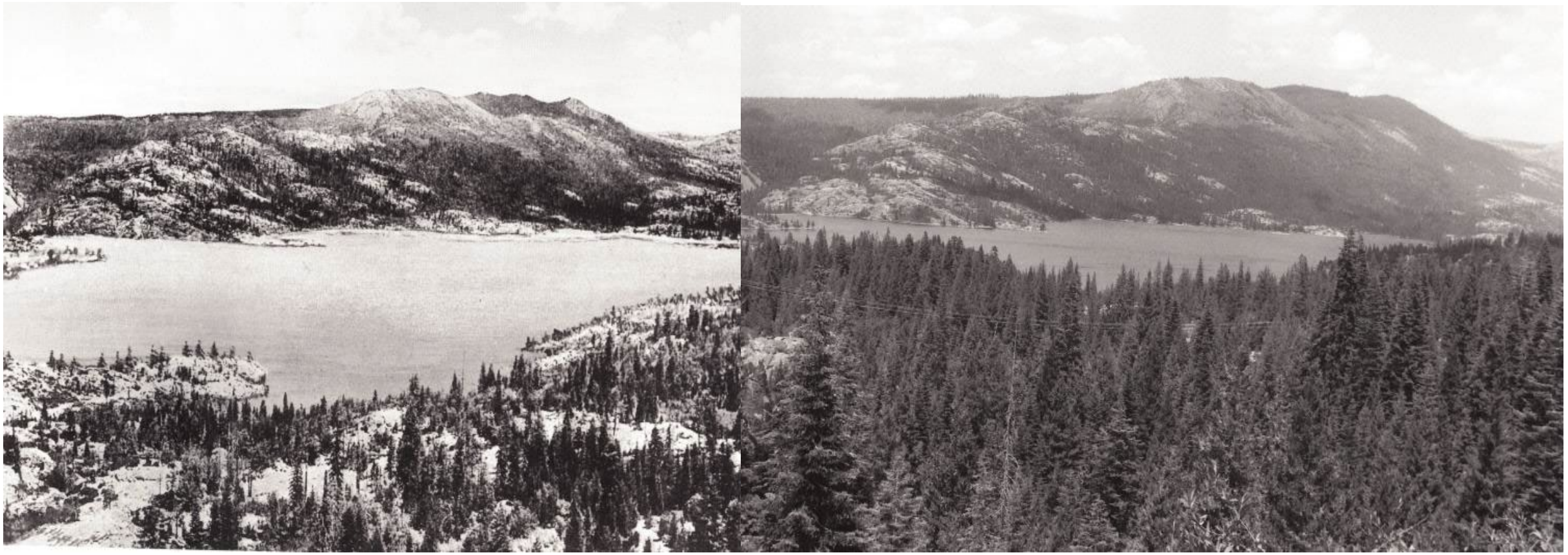
Past fire frequency can be determined from the years between fire scars on a single tree or on several trees in an area

Fire Return Interval

- Time between two successive fire events at a given site or area
- Ponderosa 5 – 12 years
- Mixed conifer 8 - 20 years
- Red fir 15 - 50 years
- Sub-alpine 25 - 60 years
- 4.4 -11.9 million acres/ year or 5% - 12% of California's lands burned annually pre-settlement
- Fire suppression starting in early 1900's was very successful



Consequences of fire suppression



Spaulding Lake in Nevada County, 1919 and 1993. Source: Gruel 2001

Consequences of Fire Suppression

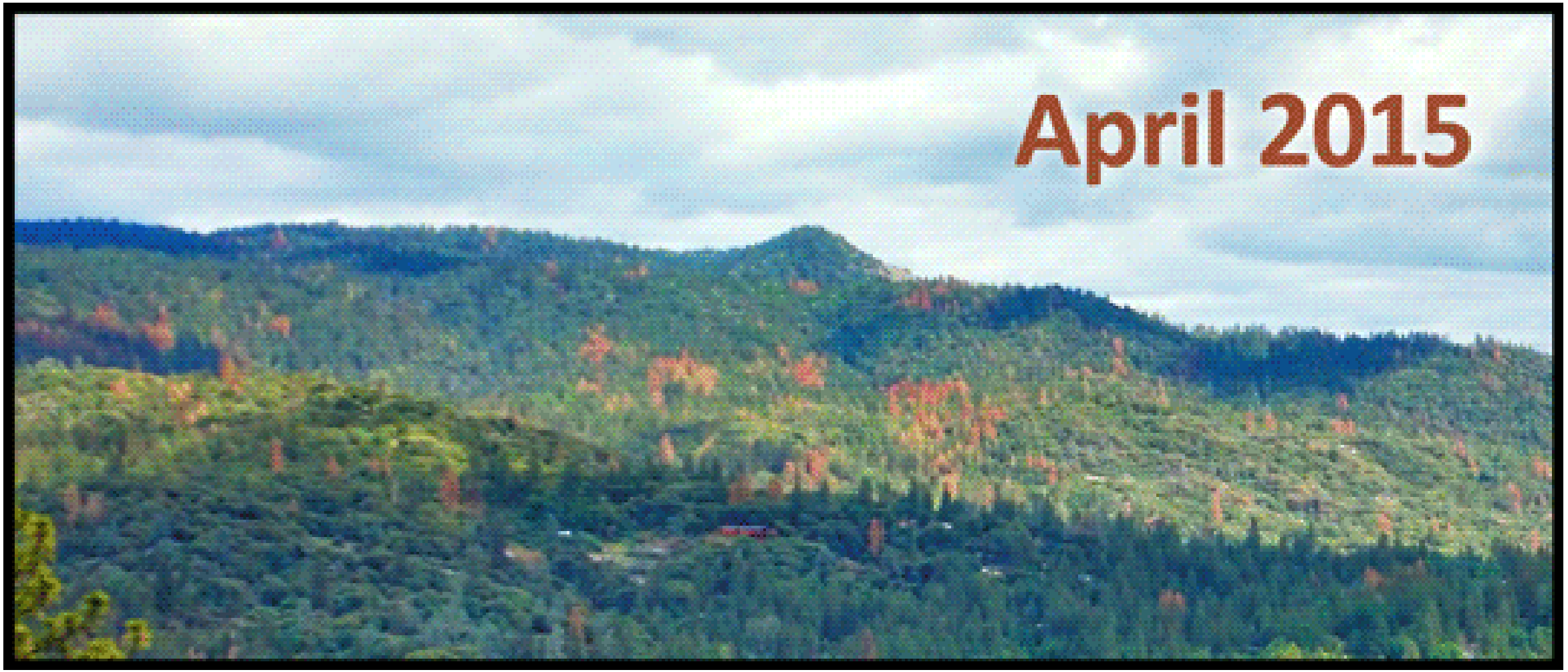
View from Union Point west down Yosemite Valley, 1866. Source: Gruel 2001.

Same location 1961. Inset 1994. Source: Gruel 2001.

Fire suppression and exclusion has led to overcrowded & unhealthy forests

- Increased competition and mortality
- Increased susceptibility to native bark beetle outbreaks
- Fires now more likely to be high severity meaning most or all trees are killed
- Conifer encroachment in oak woodlands, meadows, aspen, shrub habitat

Add in climate change



Location in Madera County before and after tree mortality began spreading.
Photos: Margarita Gordus, CA Department of Fish and Wildlife

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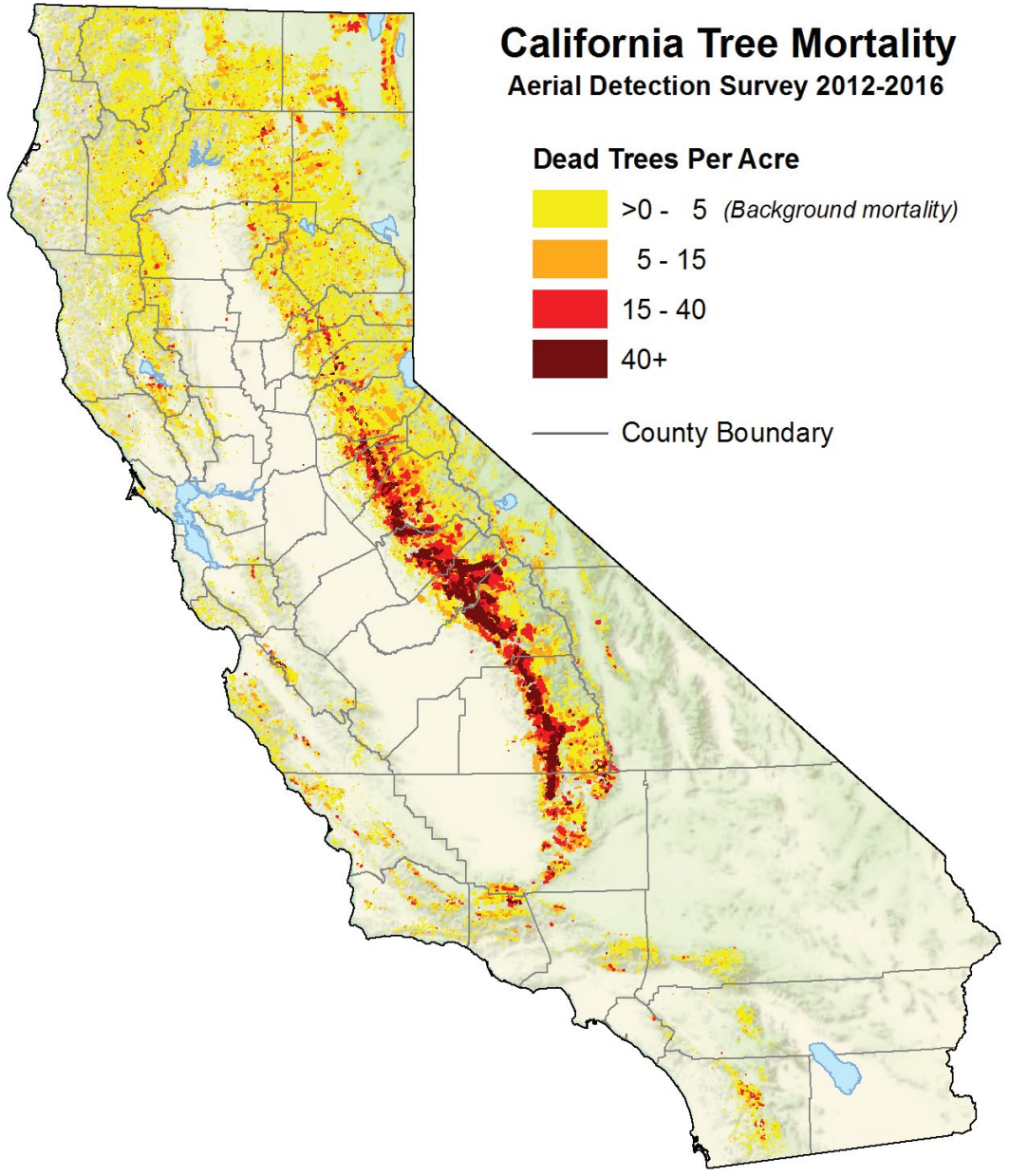
Drought caused water stress in trees

- Warm drought of 2012 to 2016 caused moisture stress throughout the state, especially at lower elevations in southern Sierra Nevada
    - Plants need more moisture when its hotter
- In overcrowded forests individual trees get less soil moisture and produce less pitch
- Weakened trees less able to fight off attack by native bark beetles



Hotter and drier

- 2023 precipitation is good news
- 2021 hottest summer on record
  - Average temperature in CA reached 77.4º F from June to August. Broke record of 76.5º F from 2017.

The Palmer Drought Severity Index estimates dryness based on temperature and precipitation data. Higher numbers indicate less dryness.

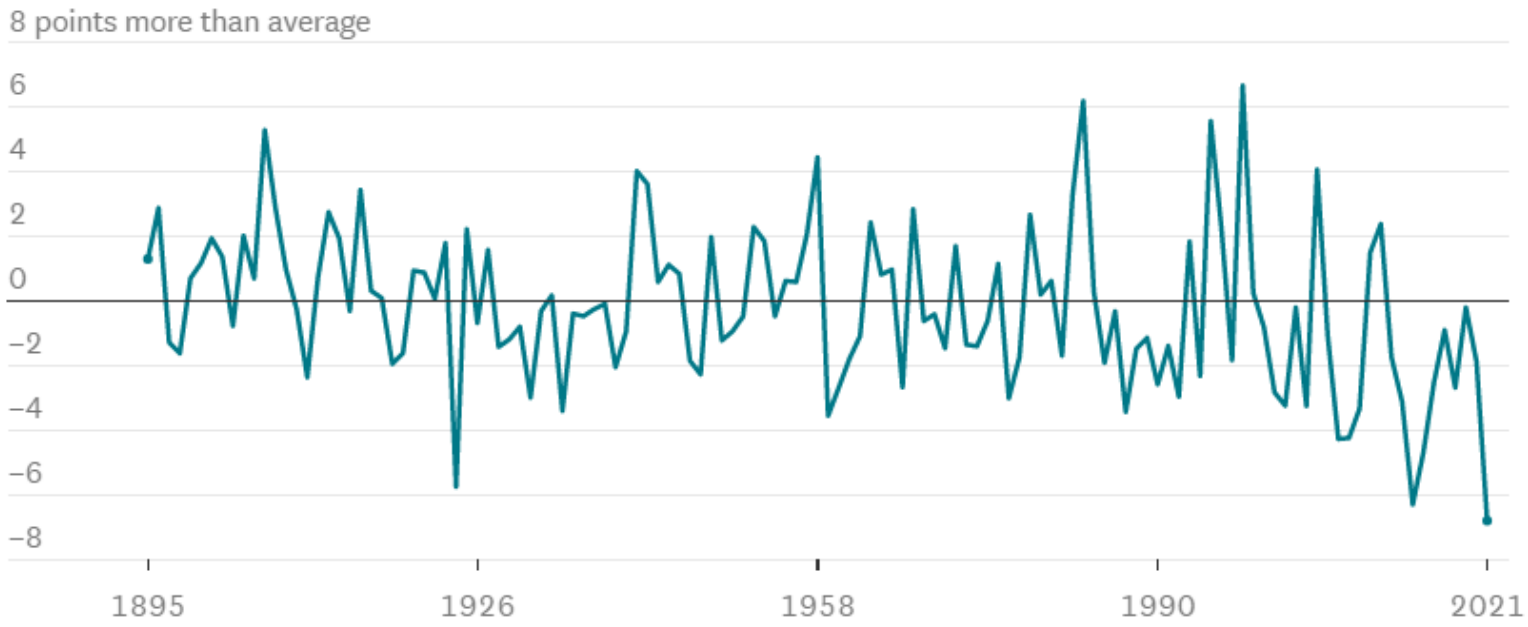


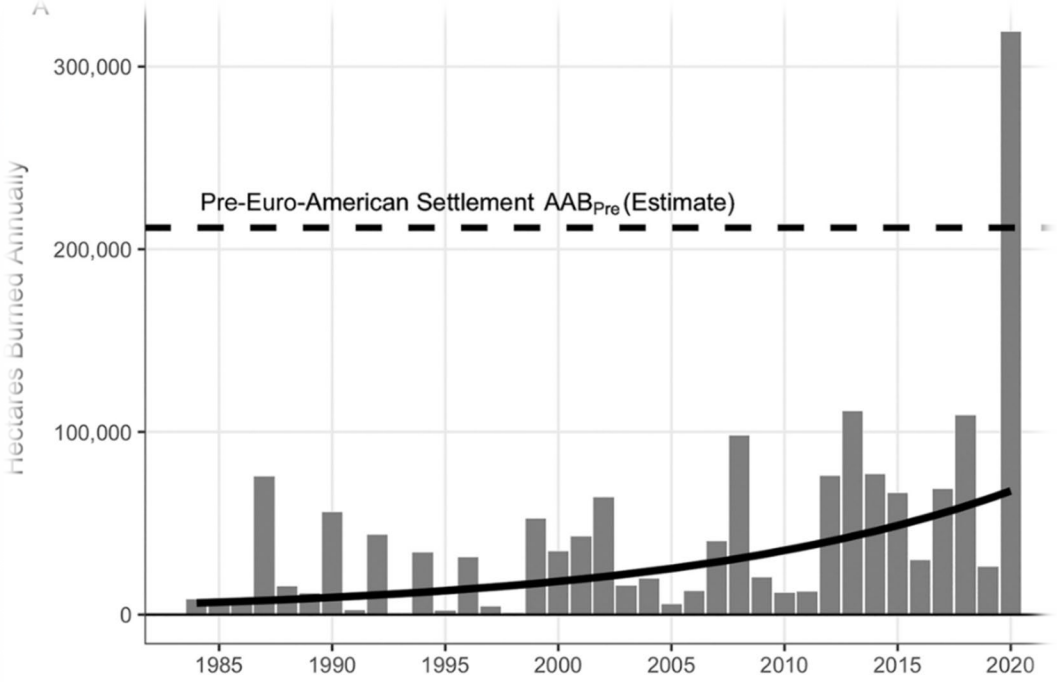
Chart: Yoohyun Jung / The Chronicle · Source: NOAA National Centers for Climate Information

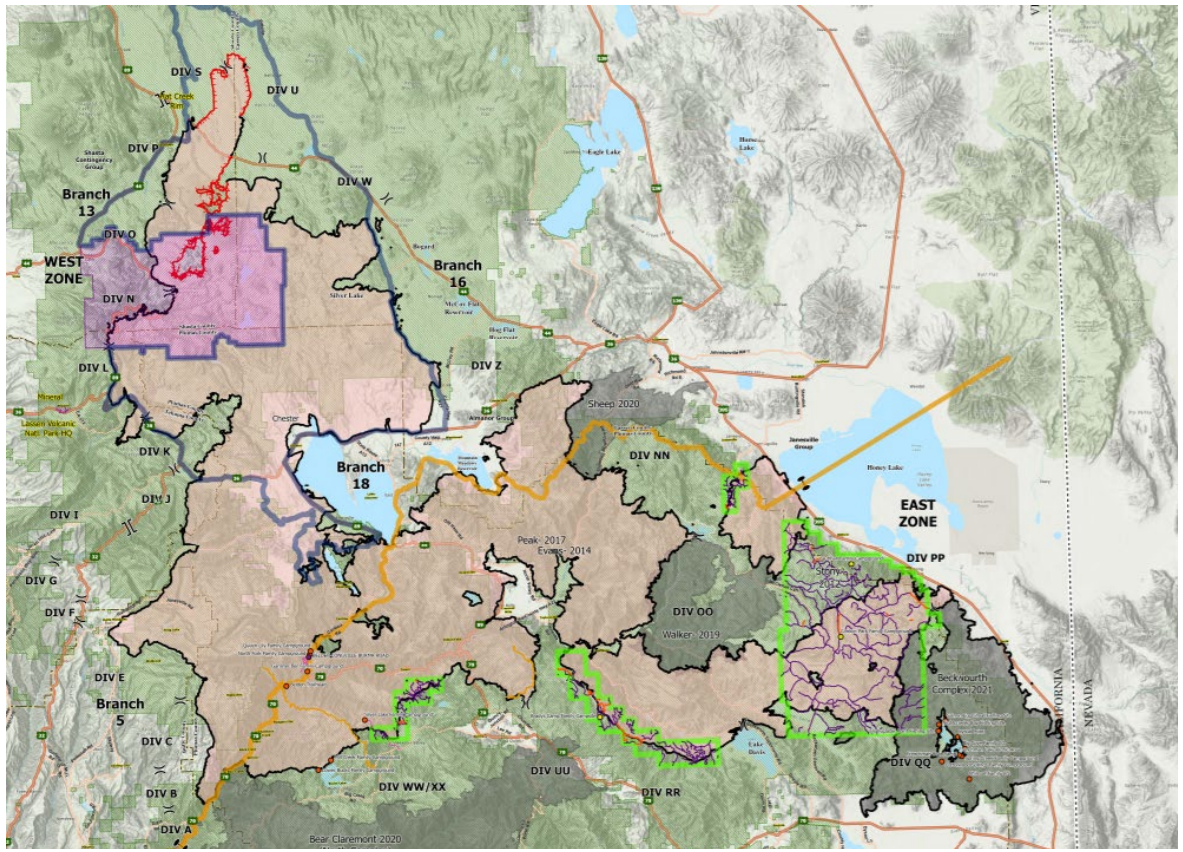
- 2021 driest year on record

"The future is already here – it's just not evenly distributed." William Gibson, maybe

Wildfires becoming impossible to contain

- Fires showing extreme behavior
  - Fires 8 largest wildfires in CA have all burned since 2017.
  - 1 of every 8 acres in CA has burned in the last 10 years – 12 mil of 100 mil acres
- 2020 fire season
  - 4.4 mil acres, 4% of state





- 2021 fire season
  - 2.5 mil acres, Dixie fire 1 mil acres, destruction of Greenville,
  - Caldor fire 220,000 acres, destruction of Grizzly Flats

Too much high severity fire

% of all Forest Types burning at High Severity (SN & Cascades)	
<1850	7%
1984 - 2009	29%
2010 – 2020	36%

"30% of conifer forests in the southern Sierra Nevada are no longer considered forests…They're either sparsely treed landscapes or, more often, are transitioning either in the short term or long term to more of a shrubland-type system."

Steel, Z.L., Jones, G.M., Collins, B.M., Green, R., Koltunov, A., Purcell, K.L., Sawyer, S.C., Slaton, M.R., Stephens, S.L., Stine, P., and C. Thompson. 2022. Mega-disturbances cause rapid decline of mature conifer forest habitat in California. Ecological Applications e2763.

Williams, J. N., Safford, H. D., Enstice, N., Steel, Z. L., and Paulson, A. K.. 2023. " High-Severity Burned Area and Proportion Exceed Historic Conditions in Sierra Nevada, California, and Adjacent Ranges." Ecosphere 14(1): e4397.

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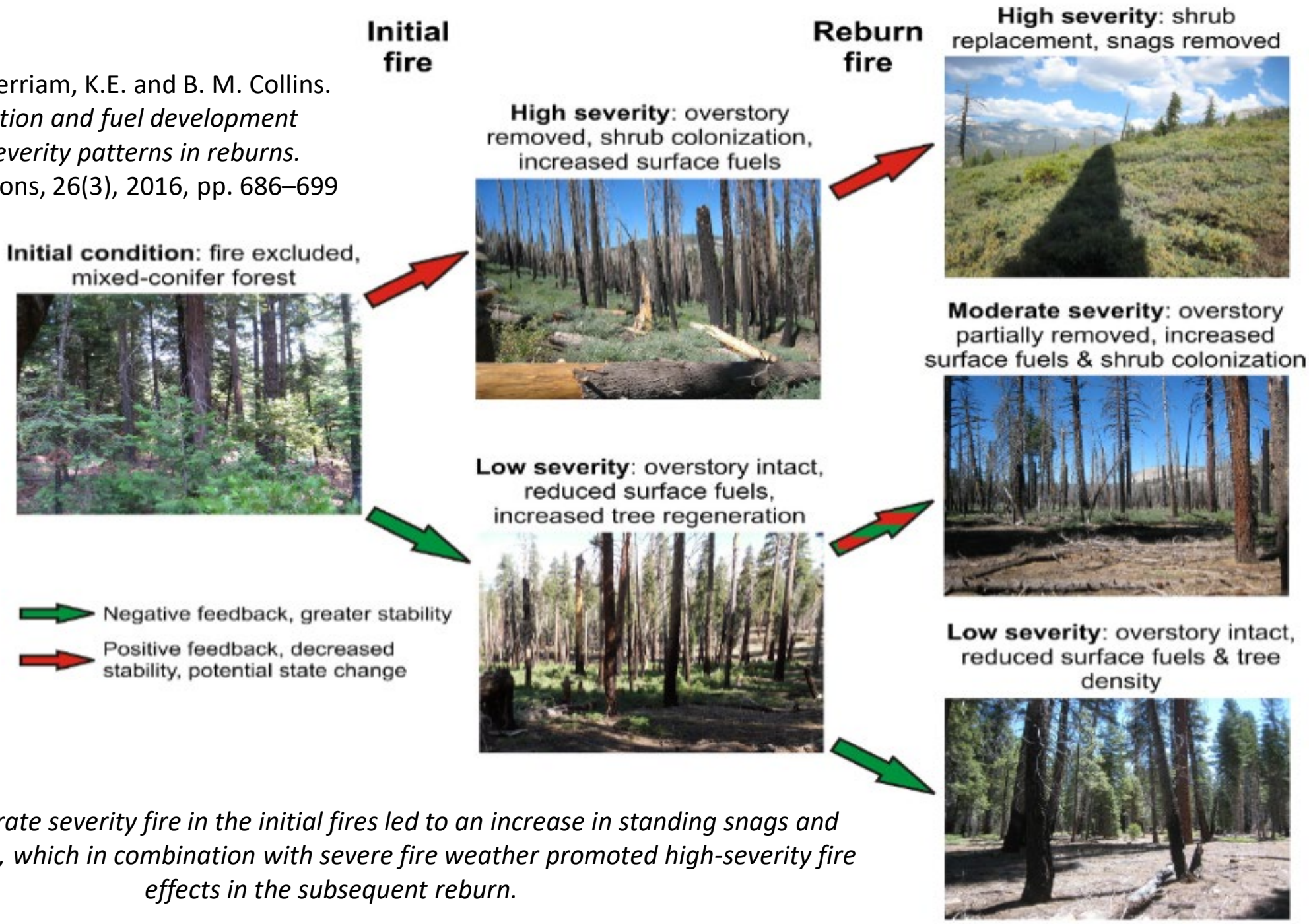
High severity fire can lead to more high severity fire

- Burned in the 2000 Storrie fire

- Reburned in the 2012 Chips fire

Thanks to Ryan Tompkins
Photo Credits: David Kinateder, Plumas NF

Coppoletta, M., Merriam, K.E. and B. M. Collins. *Post-fire vegetation and fuel development influences fire severity patterns in reburns.* Ecological Applications, 26(3), 2016, pp. 686–699



"high- to moderate severity fire in the initial fires led to an increase in standing snags and shrub vegetation, which in combination with severe fire weather promoted high-severity fire effects in the subsequent reburn.

Active reforestation is needed

After the 2007 Moonlight Fire. Left post fire conditions in 2009, industrial lands treated on left USFS not treated. Right – same area in 2019. Photos from Ryan Tompkins

2007 Angora fire

Untreated 2014

Treated 2016

Treated area - Planted trees are outcompeting shrubs

Reforestation must be done in a timely manner

Active reforestation in the first one to two years has been shown to successfully re-establish forests even during climate change

- Requires fewer resources if done sooner

Reforestation involves a complicated and costly series of steps to be taken in a timely fashion

- ordering tree seedlings to be grown in a nursery
- removing dead trees and woody debris to reduce fuels and prepare the planting site
- planting trees
- controlling vegetation that may compete with trees

Photo: Wildfire Resilience Task Force

Removing dead trees

- Merchantable trees removed
- Some private landowners may make enough off logging to pay for site clean up and replanting but many may not
- Local mills glutted with fire salvaged timber all at the same time so market is typically bad

Removing woody debris to prep for planting

- 2 years – some site prep done - slash and sub merchantable trees have been removed or masticated
- 3 years later - deer brush resprouting vigorously. Tree seedlings would not be able to compete against this.

Planting trees

- May take several plantings over several years
- Competing vegetation should be controlled for several years til trees outcompete shrubs and herbaceous plants
- Hand grubbing, grazing, herbicide

Post-fire forest management challenges

For private landowners

- Lack of knowledge
- Lack of funding
- Lack of contractors
- Lack of seedlings
- Other pressing needs after wildfire

Private landowners experience many losses in fires

Emotional impact - Landowners experienced wildfire as major life–disrupting event

- Lost homes, structures, business
- Sadness over loss of landscapes "solastalgia"
- Landscape and emotional healing talked about as connected

"The biggest loss for my family, and me in particular, was emotional – the structures I could've cared less about, it was the trees that really broke my heart. Trees that I grew up with."

"There's nothing pleasurable about going back there now. There's no forest..... We used to sit outside and watch - you could hear the wind coming from below before it would come through the tops of the trees. That was one of my favorite things to do - was to sit out on the deck, and you could hear it, and then you'd see the tops of the trees start to sway. It was just stunning. We'll never have that again."

Waks, L., Kocher, S.D., & L. Huntsinger. 2019. Landowner Perspectives on Reforestation following a High-Severity Wildfire in California, *Journal of Forestry*, 117 (1, 30–37)

Private landowners want to reforest

Reforestation - All landowners wanted to re-establish forests.

- Aesthetics, improved air quality, greenhouse gas reduction, wildlife habitat, erosion control, the benefit to future generations, increased land value, love of trees
- People frequently said they wanted to *put things back the way it had been before the fire*.

"We want everything back. It won't ever be like it was but we want to do as much as we can to make it as close as possible."

"If we were to leave it alone, it would just be a brush field of manzanita and ceanothus. Very little environment for the larger wildlife like bears and deer. So I think a timber environment, which was the natural environment prior to the fire, is the right way to go in recovery."

Private landowners need help with reforestation

Assistance program – Landowners offered a no-cost reforestation program by RCD.

- RCD took care of contracting and monitoring

Without it:

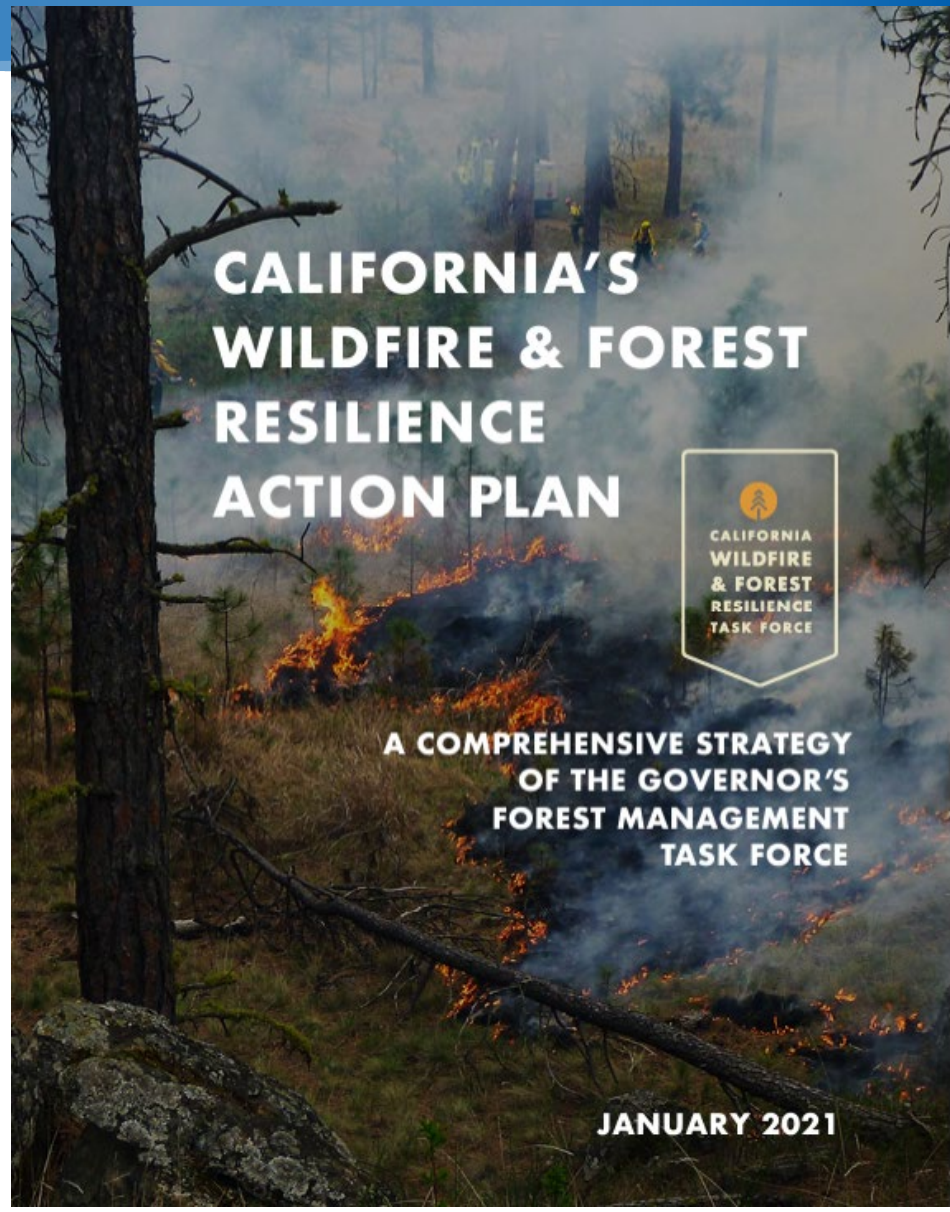
- 1/3rd would have taken no reforestation actions at all because didn't have equipment, funds, energy or knowhow
- 1/3rd would have tried to do it themselves
- 1/3rd would have applied for standard assistance programs

"I think I probably would have selected some very small but high-value areas in the viewshed to do my own mechanical clearing, go to battle with the weeds, and plant 20 trees one summer, plant 20 trees the next."

"If that grant had not come through, we would be doing nothing. There is no way. The heavy equipment that is required to move those logs around - no, we can't operate it. Hiring somebody to do it is so expensive. We would be doing nothing.

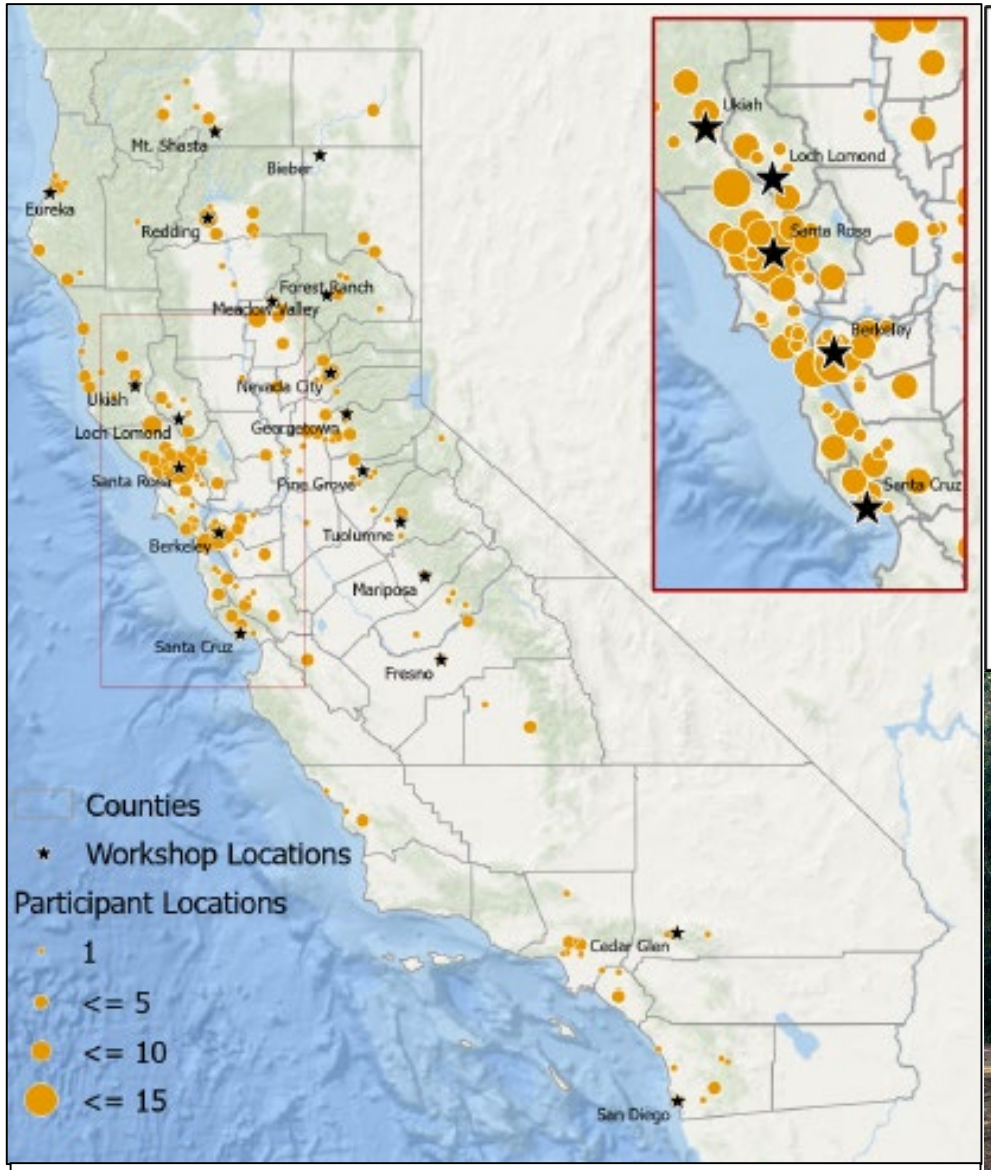
California responds to forest loss

- 2015 Tree Mortality Task Force – Response to mortality event (150 million dead trees from 2012-2016 drought)
  - Coordinate funding for tree removal
- 2018 Forest Management Task Force
  - Recommend actions to increase pace & scale of management
  - Forest Landowner Outreach & Education Work Group – 2 recommendations
    - Increase forest stewardship education – funding to UC ANR
    - Develop emergency forest restoration teams – funding to UC ANR
- 2019 Wildfire & Forest Resilience Task Force
  - 2021 California Wildfire and Forest Resilience Action Plan
  - Small Landowner Work Group, Reforestation Work Group
- 2020 Funding dramatically expanded
- Treatment goal for state
  - 500K acre of treatment goal on private lands + 500K acres on public land

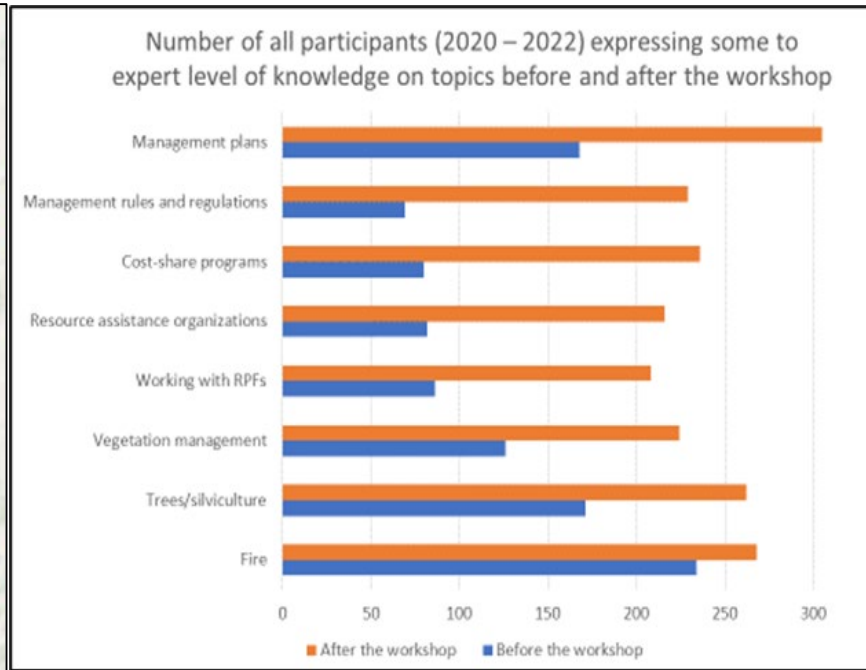


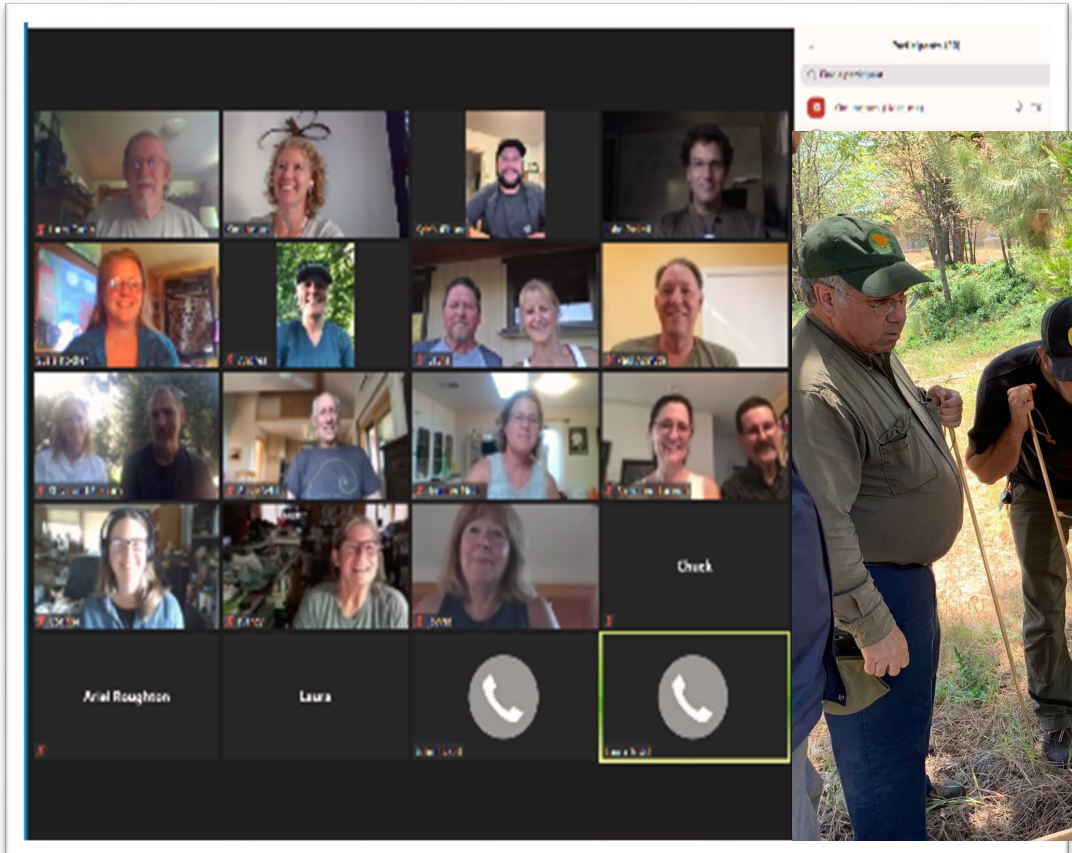
Expanding forest stewardship education

- UCCE Statewide Forest Stewardship Education Initiative 2019
  - Awarded National Woodland Owners Assoc. & National Assoc. of University Forest Resources Program best comprehensive family forest education program in nation 2022
- On our 21st cohort, over 450 people have participated
- Funded by CALFIRE
- Help people develop forest management plans and connect them to professionals & cost share programs



Workshop locations (2020 - 2022) and where participants reside.





After the workshop, they plan to :

88% Consult with a Registered Prof. Forester
83% Consult with their local RCD/NRCS office
81% Conduct forest inventory activities
74% Consult with their local Cal Fire office
71% Apply for cost-share funding

Expanding Post-fire Forest Resilience Education

- Many participants already affected by wildfire
- Next steps not always obvious
- Founded a Post-Fire Forest Resilience workshop series modeled on the Forest Stewardship series
- Funding from the US Forest Service thru 2026
- 7 weeks of weekly zoom sessions with an in-person field trip to the fires of focus
- Starting our 3rd cohort, almost 100 people have attended
- Completed Workshops:
  - N. & C. Sierra 2021 Dixie, Caldor and Tamarack fires (Plumas, El Dorado & Alpine Counties)
  - Southern Sierra on 2020 Creek fire (Fresno and Madera counties) and 2022 Oak fire (Mariposa County).
- Current and upcoming workshops:
  - Napa (2020 Glass fires & 2020 LNU fire)
  - Summer – Siskiyou (2021 Antelope Fire and 2022 McKinney
  - Fall –Trinity, Santa Cruz counties

Dixie fire field trip 10/12/2022 Plumas County

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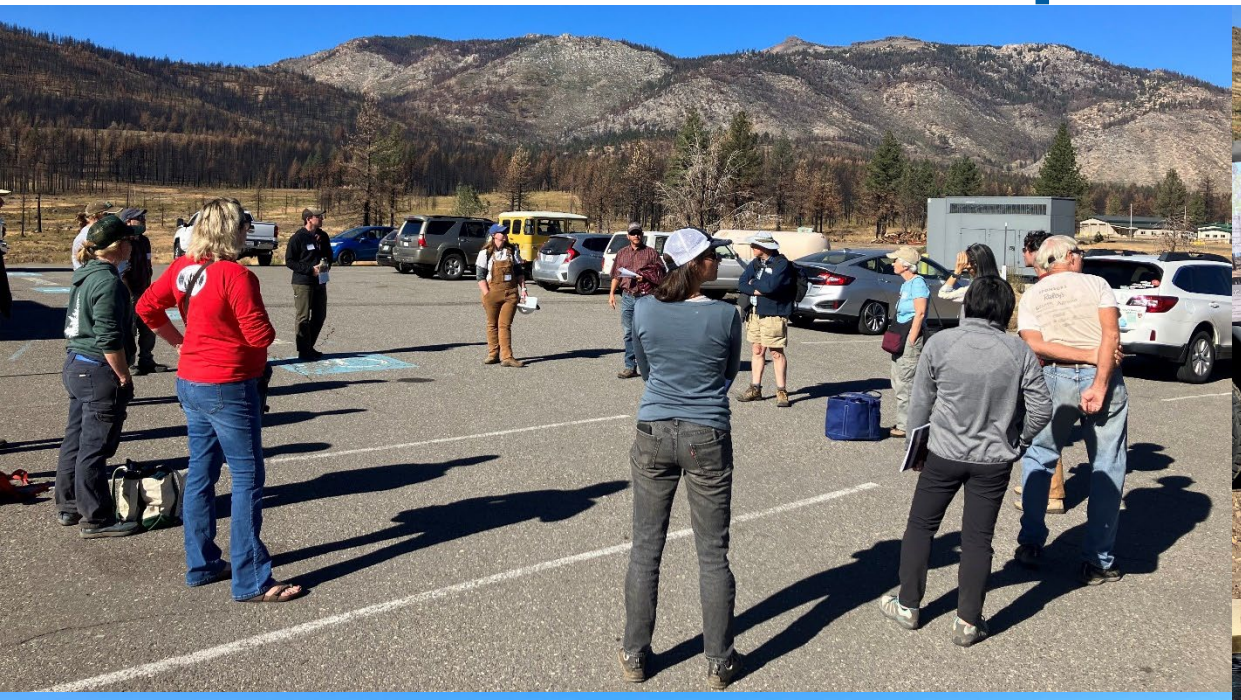
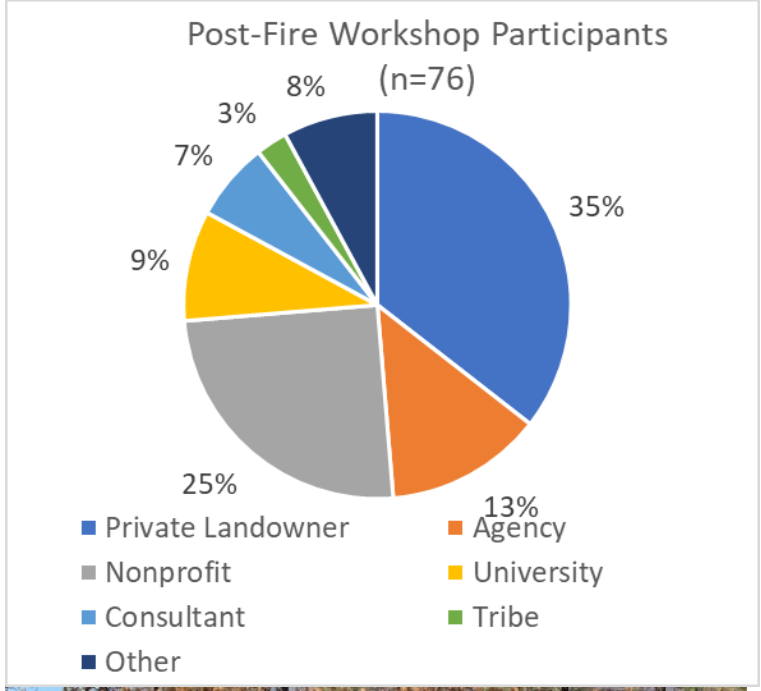
Caldor field trip 10/13/2022
El Dorado County

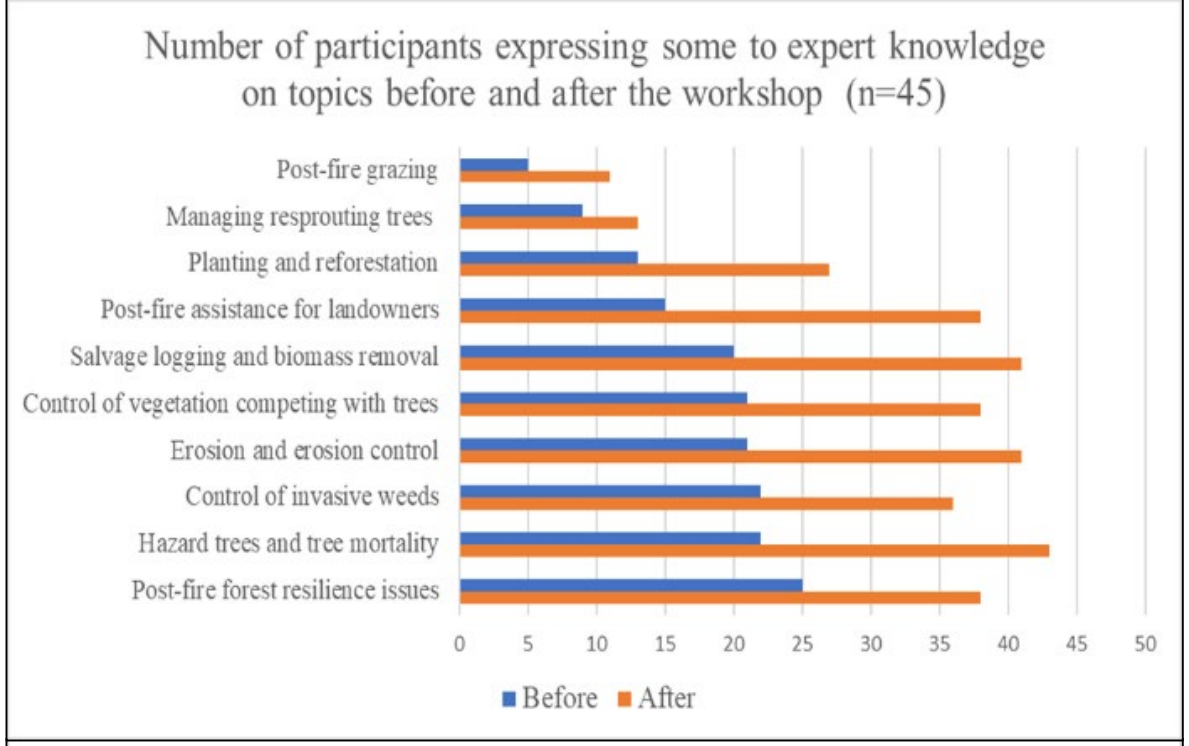
Tamarack Fire field trip 10/14/2022

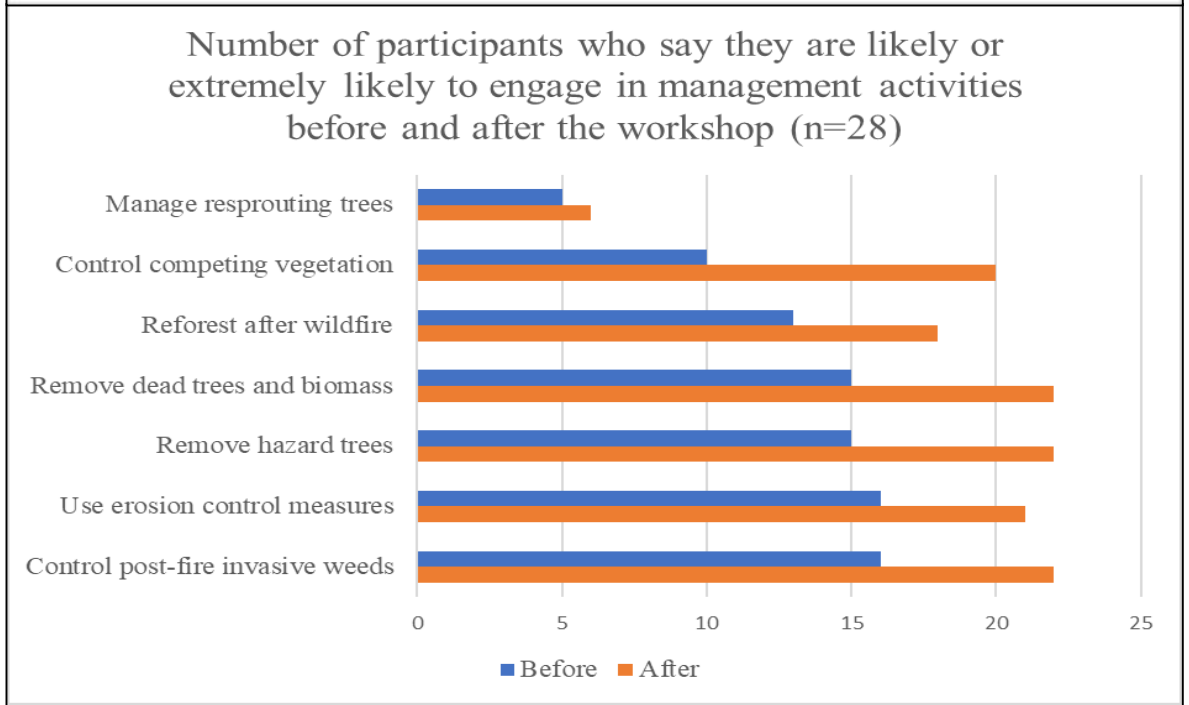


Post Fire Resilience Workshop Outcomes

- Increase in participant knowledge and intention to conduction reforestation steps







Emergency Forest Restoration Teams Established (EFRT)

Goal: The goal of EFRTs are to rapidly assess and implement post-wildfire restoration on private non-industrial private lands

- Collaborations of agencies and funding
- NRCS, RCDs, FSA, Calfire, USFS State and Private Forestry

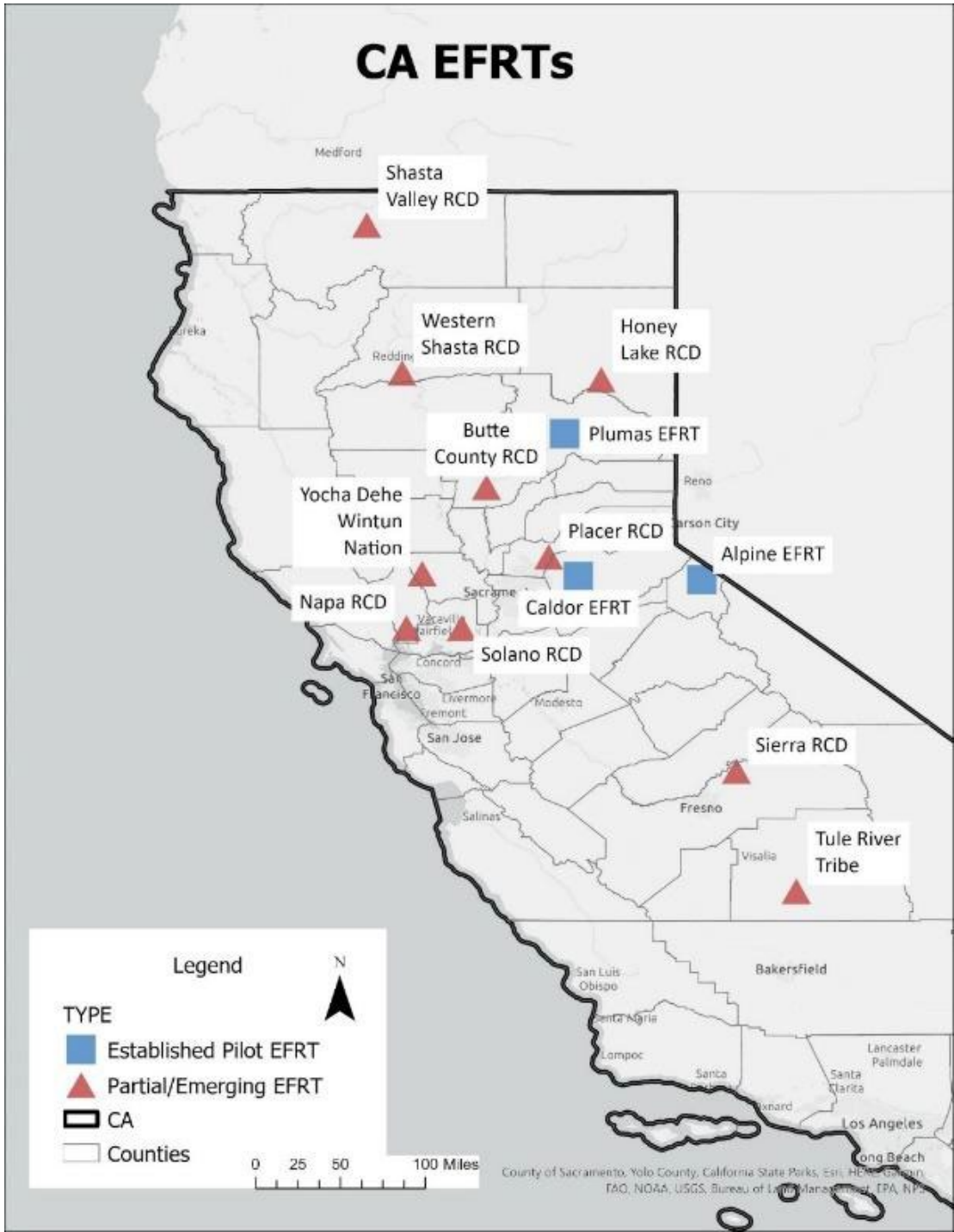
Current lead partners of existing EFRTs:

- Feather River RCD
- El Dorado RCD
- Alpine County
- Placer County RCD

Current locations of emerging EFRTs :

- Shasta Valley RCD (Siskiyou County)
- Western Shasta RCD (Shasta County)
- Honey Lake RCD (Lassen County)
- Butte County RCD
- Napa County RCD (currently limited to assisting in FSA EFRP)
- Solano County RCD
- Sierra RCD (Fresno County)
- Placer County RCD - Mosquito Fire

- **UCANR role**: monitoring of EFRTs to make policy recommendations
  - Key informant interviews
  - Landowner interviews
  - Ecological monitoring of reforestation success



Thank you!

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