Fire Ecology 101

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Wildfire trends in California

Data from CAL FIRE Fire and Resource Assessment Program (FRAP)

Wildfire trends in California

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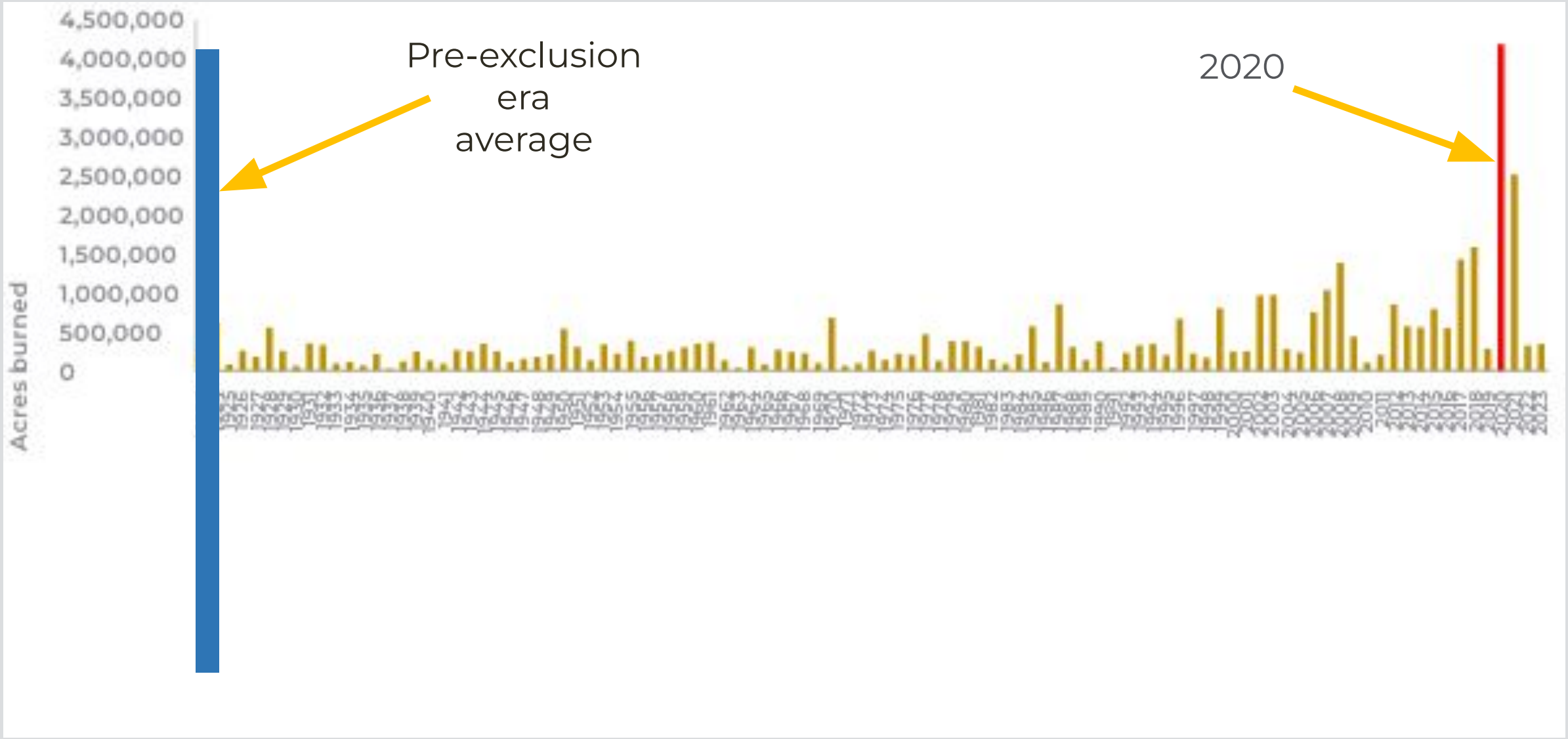
Wildfire trends in California



From CalFire Resource Assessment Program and Stephens et al. 2007

What's changed?

- More people and infrastructure in wildland areas
- Changing climate
- Legacy of past land use
- Fire severity

Outline

Fire ecology basics

How do we know what we know?

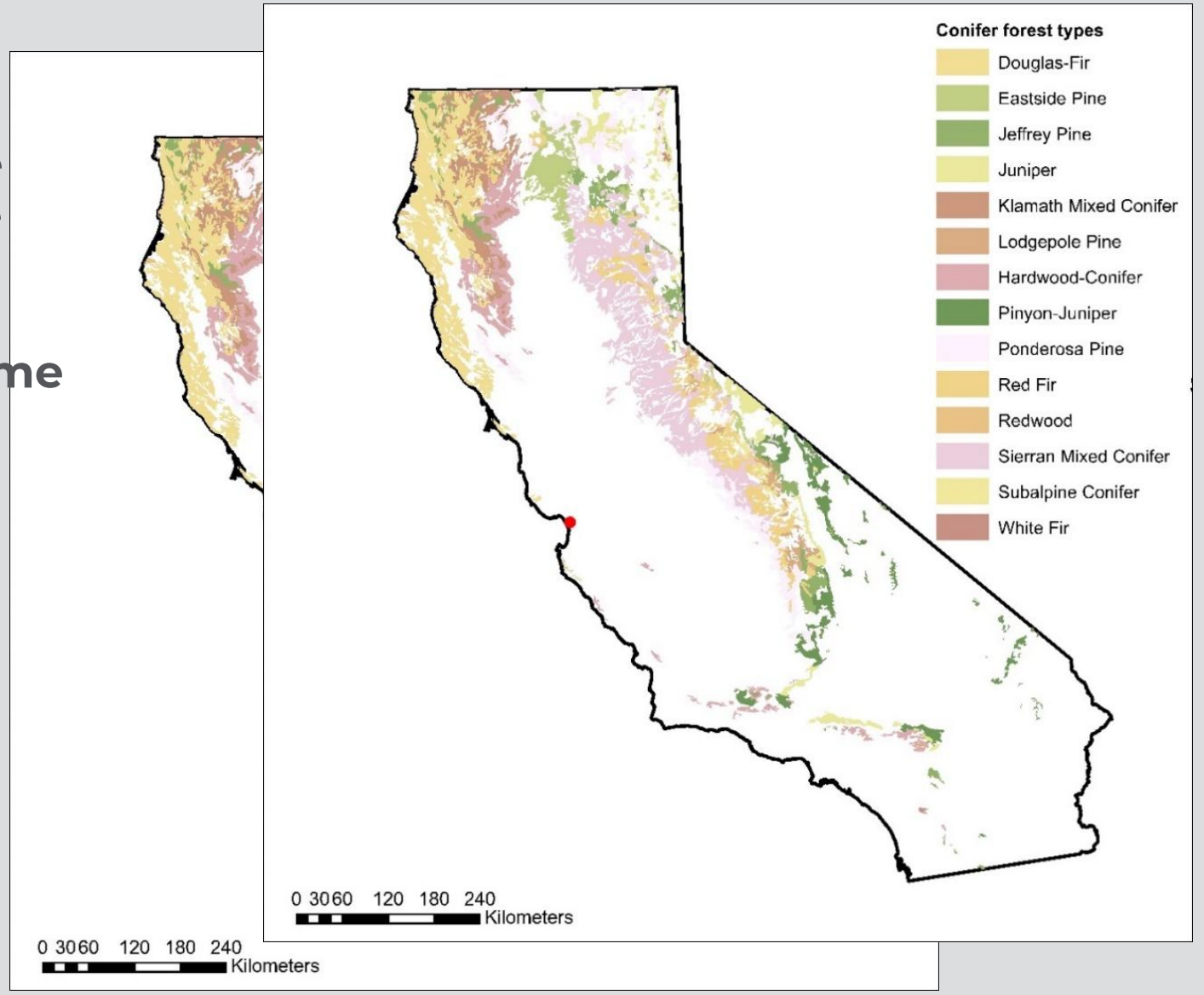
Modern wildfires

Stewarding forests into the future

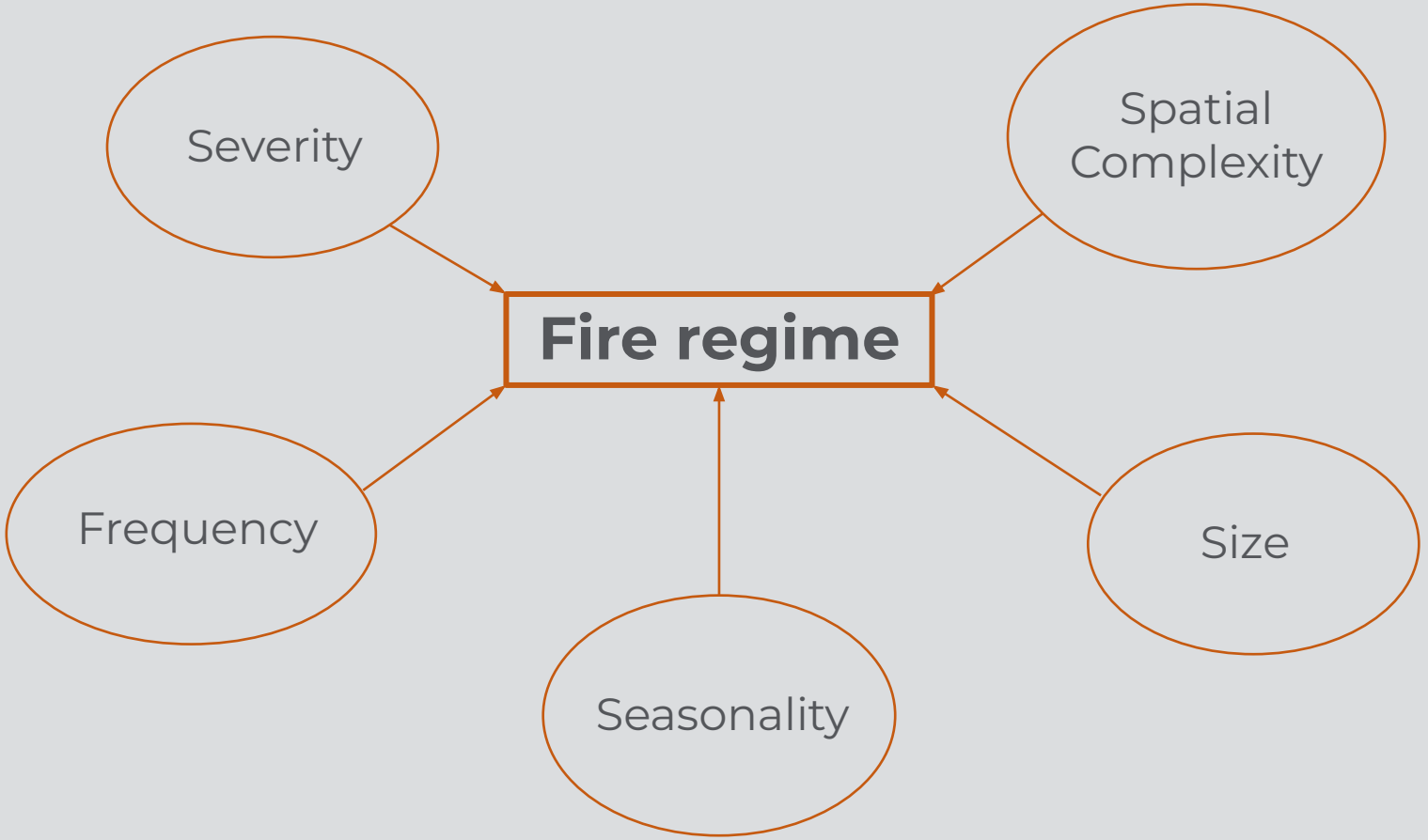
Fire ecology basics

Forests of California

- Each forest type has unique historical relationship to fire
- Described by their **fire regime**



Historic fire regimes



Fire ecology basics

How do we know what we know?

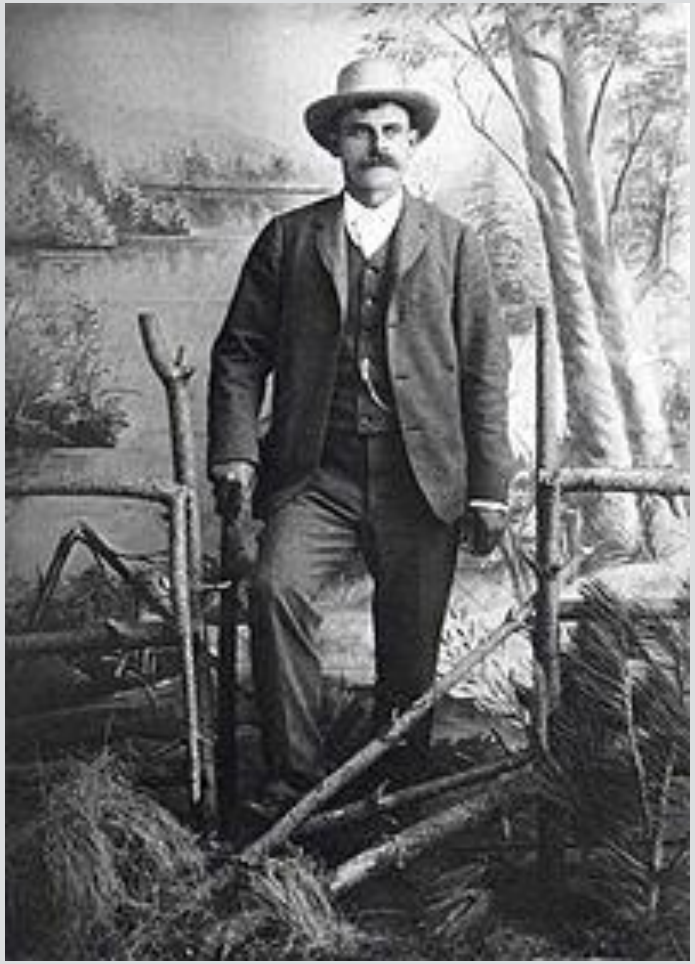
How do we know what we know?

“But the open character of the yellow-pine type of forest anywhere in the region examined is due to frequently repeated forest fires more than to any other cause.“

- *Lieberg (1900)*

“In the virgin timber fires do comparatively little damage and are easily controlled. It is seldom that the flames reach up into the foliage, even in stands of fir, but usually run along through the litter as a ground fire, often burning deep into the humus and smouldering for days”

- *Sterling (1904)*



Fire ecology basics

How do we know what we know?

Fire ecology basics

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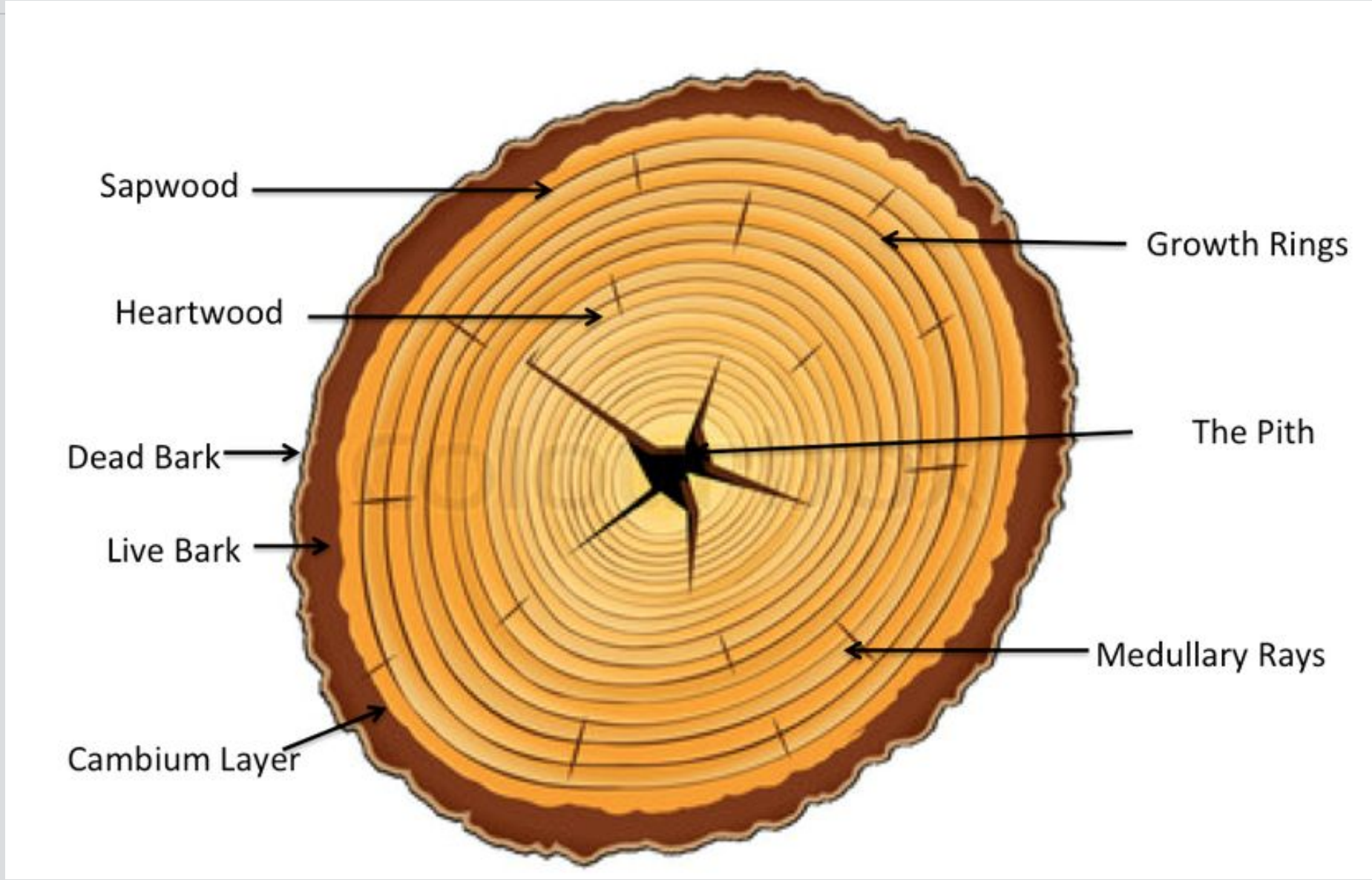
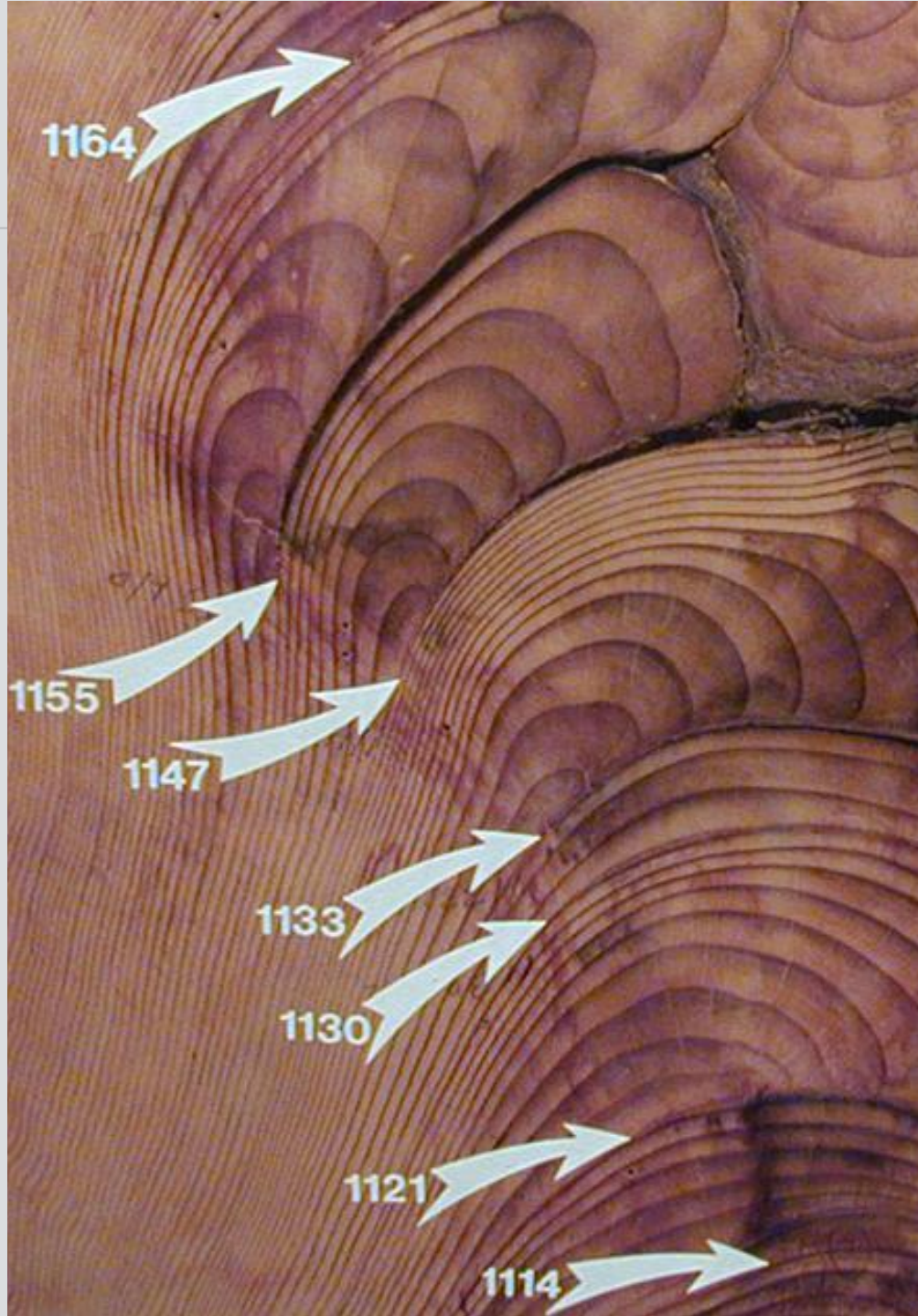
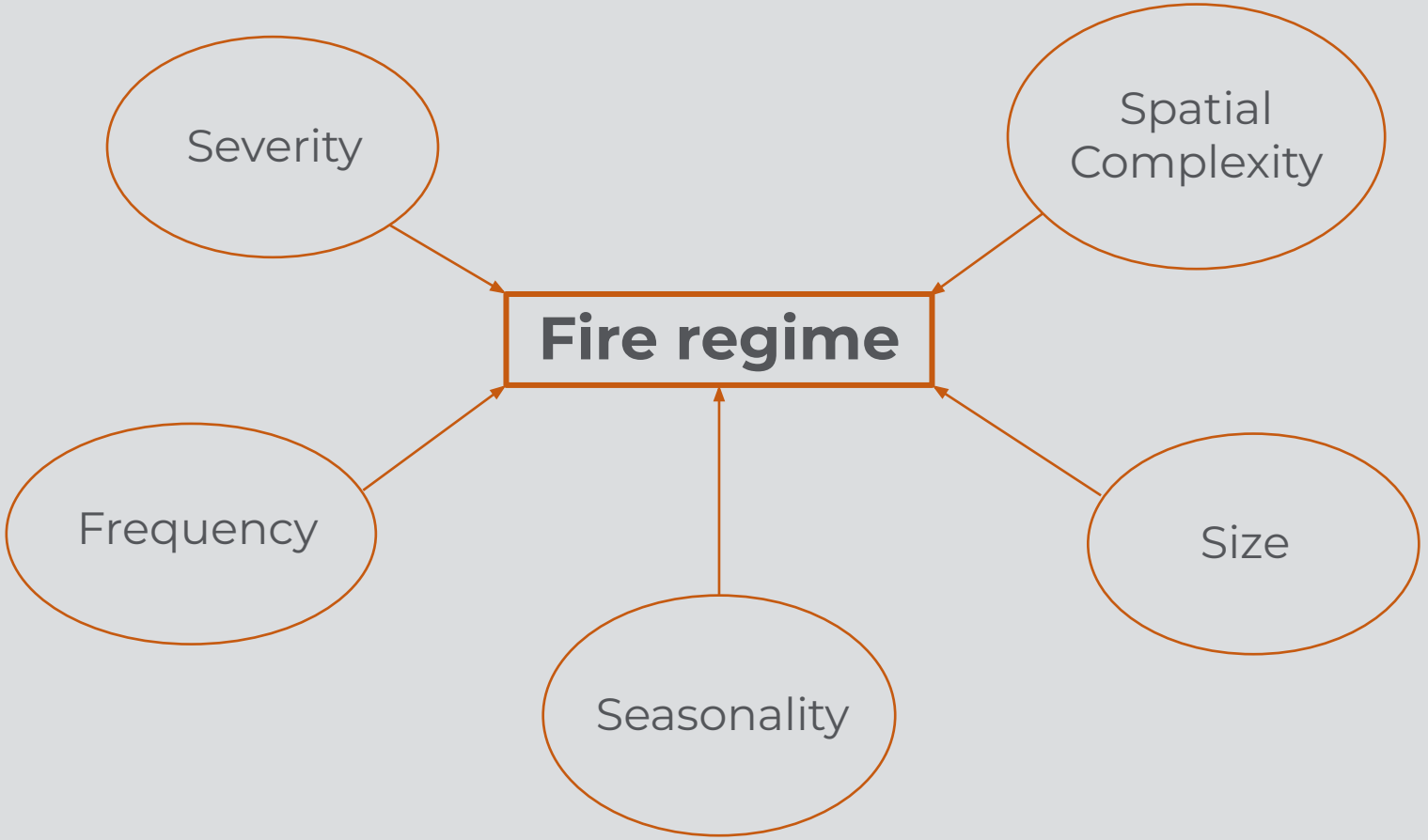


Fire ecology basics

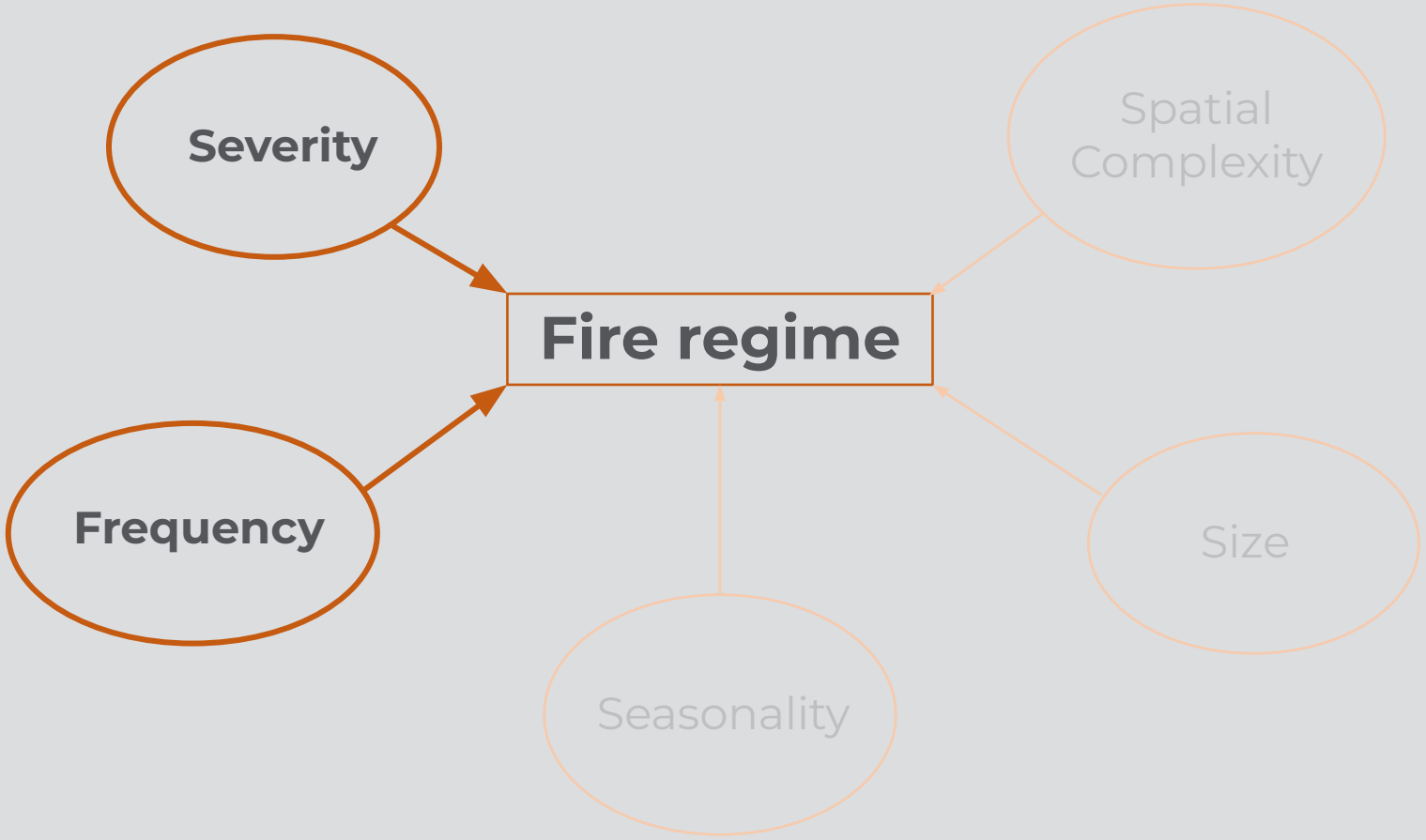
How do we know what we know?



Historic fire regimes



Historic fire regimes

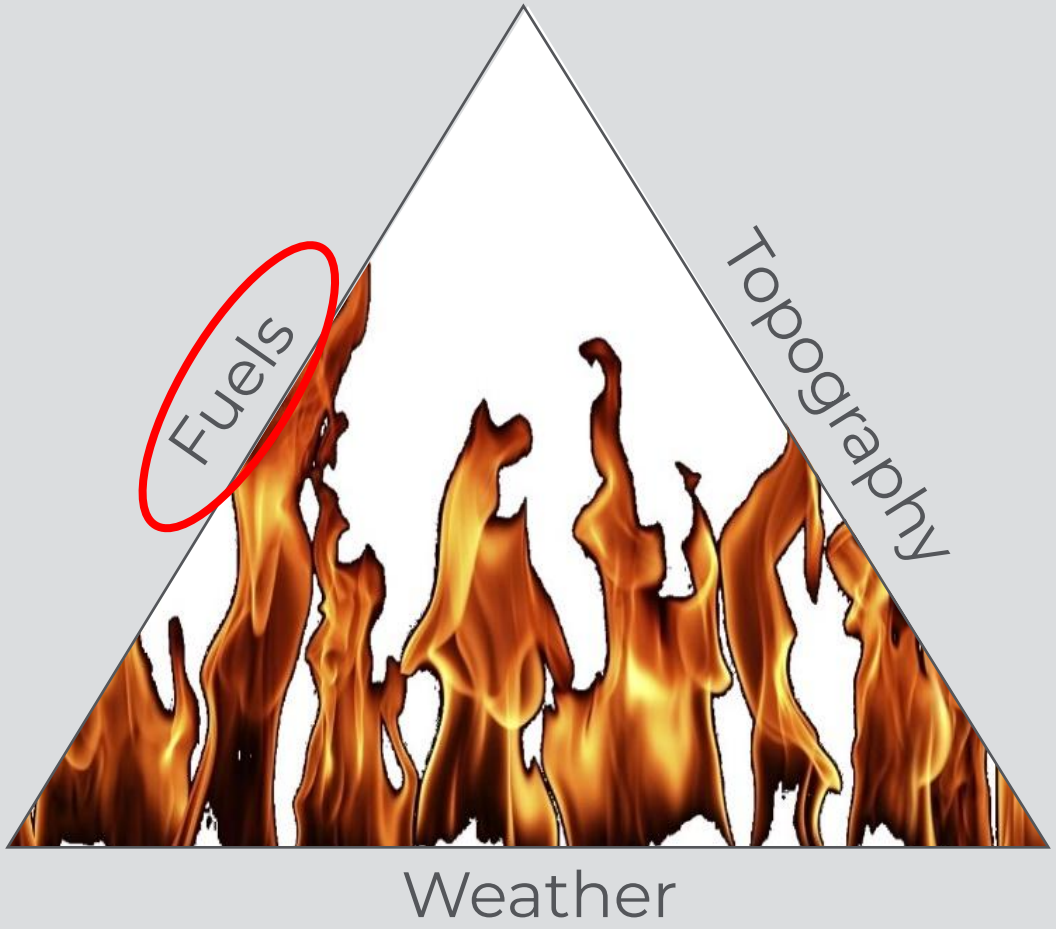


Fire ecology basics

Fire severity

- Severity classes
  - Low: <25% mortality
  - Moderate: 25-90% mortality
  - High: >90% mortality

Controls on fire severity

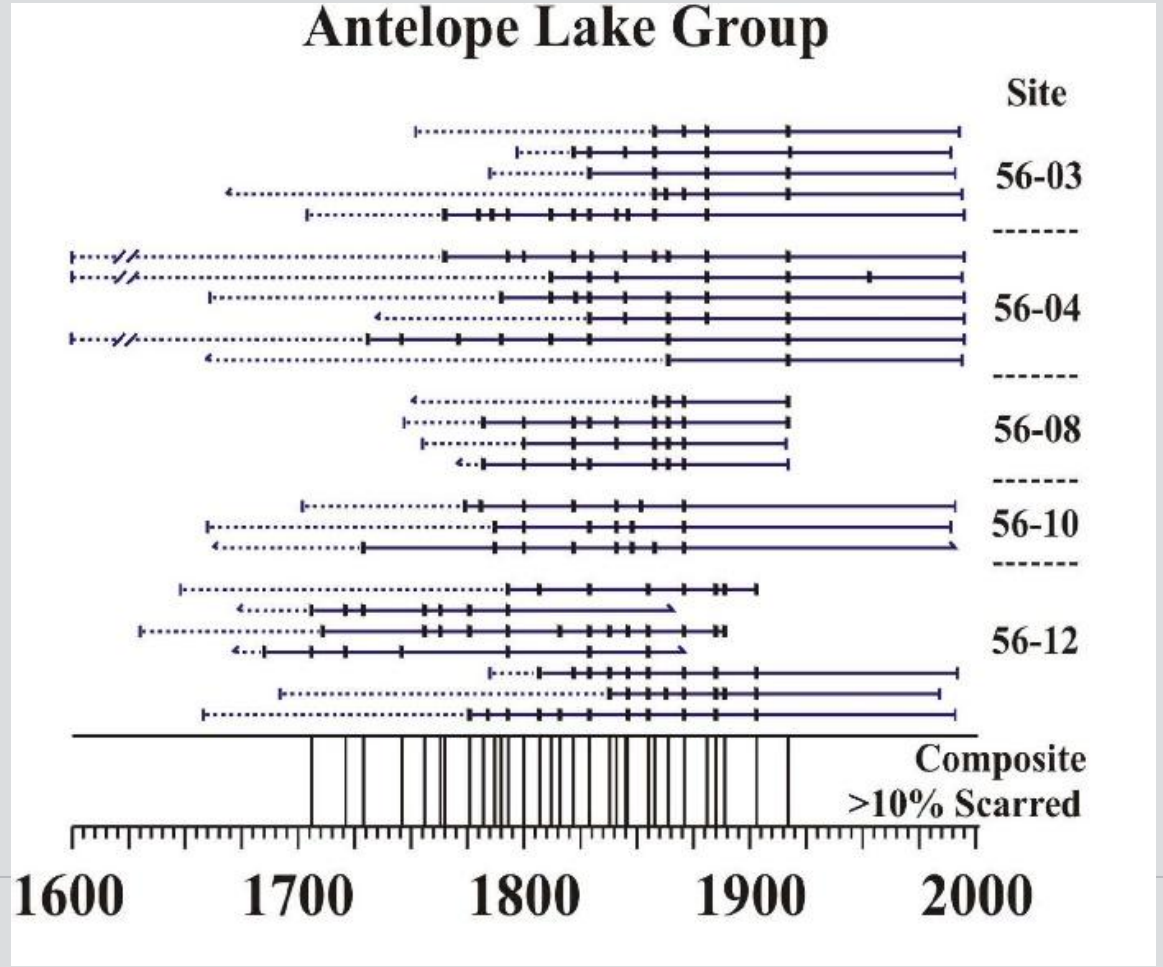


Fire ecology basics

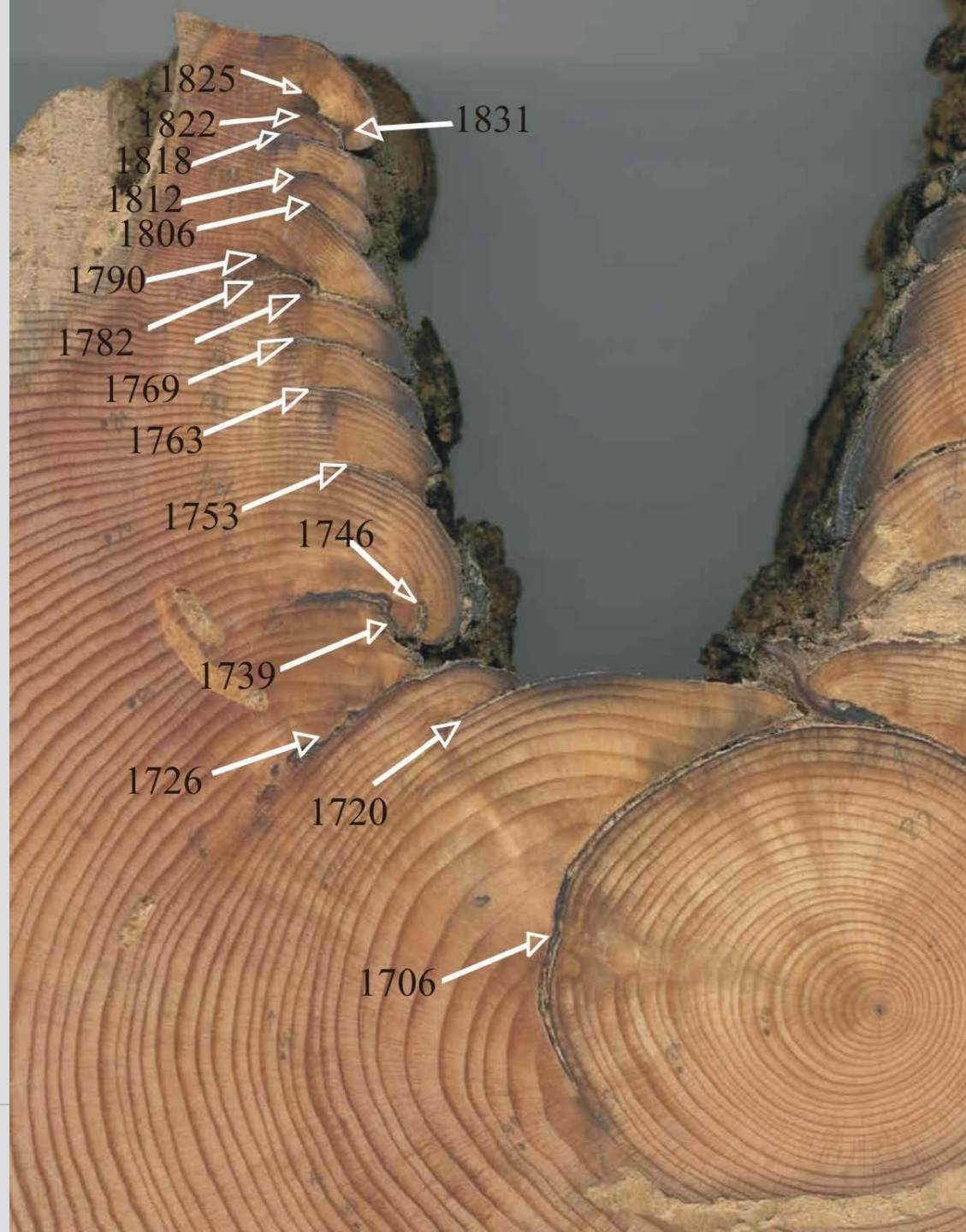
Fuels

Fire frequency and severity

Mixed conifer forests: Historic fire regime



Moody et al. 2006

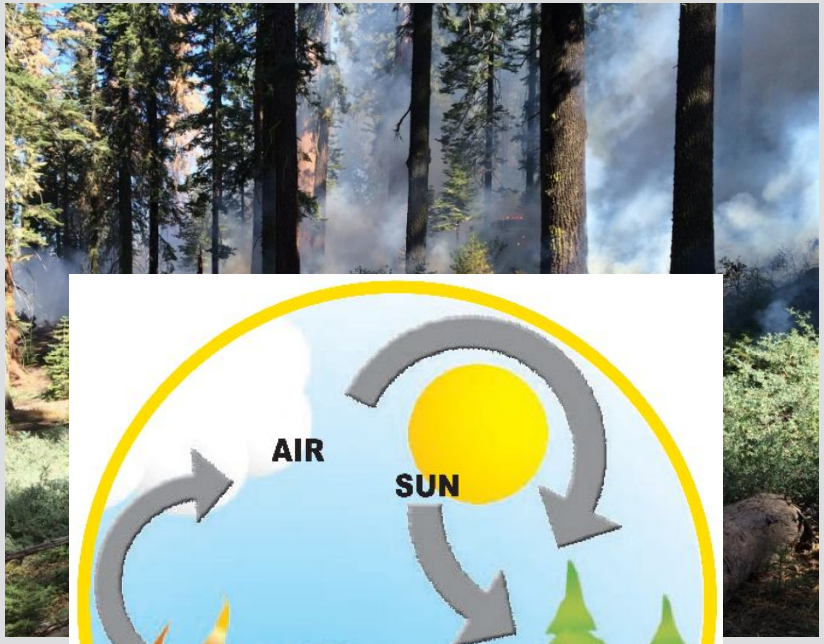


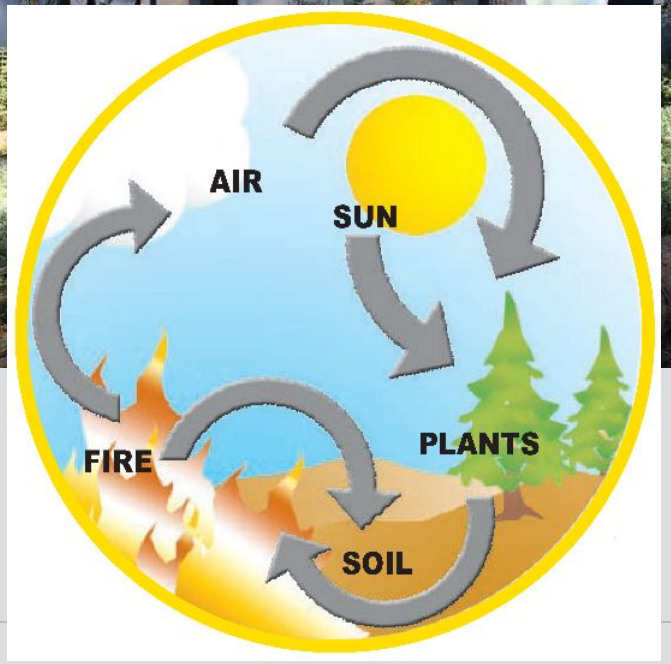
Mixed conifer forests of the Sierra Nevada

Predominantly low-moderate severity fire regime

With small patches of high severity – spatial pattern matters!

How did this shape our mixed conifer forests?





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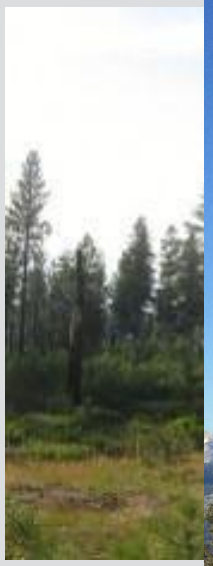
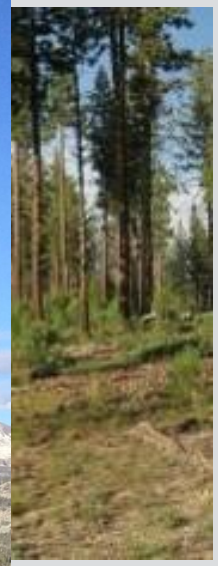
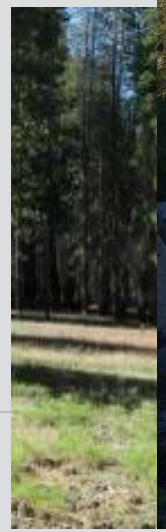
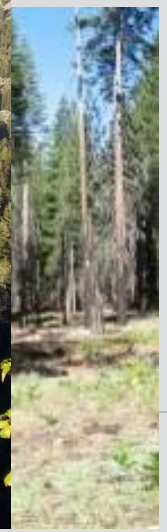


Predominantly high severity fire regime: coastal chaparral

Chaparral

Historic fire regime

- Infrequent fire
  - ~30-100 years
  - Lack of lightning ignitions
- Accumulating dense vegetation
  - High severity crown fire
  - Seed bank that relies on high severity

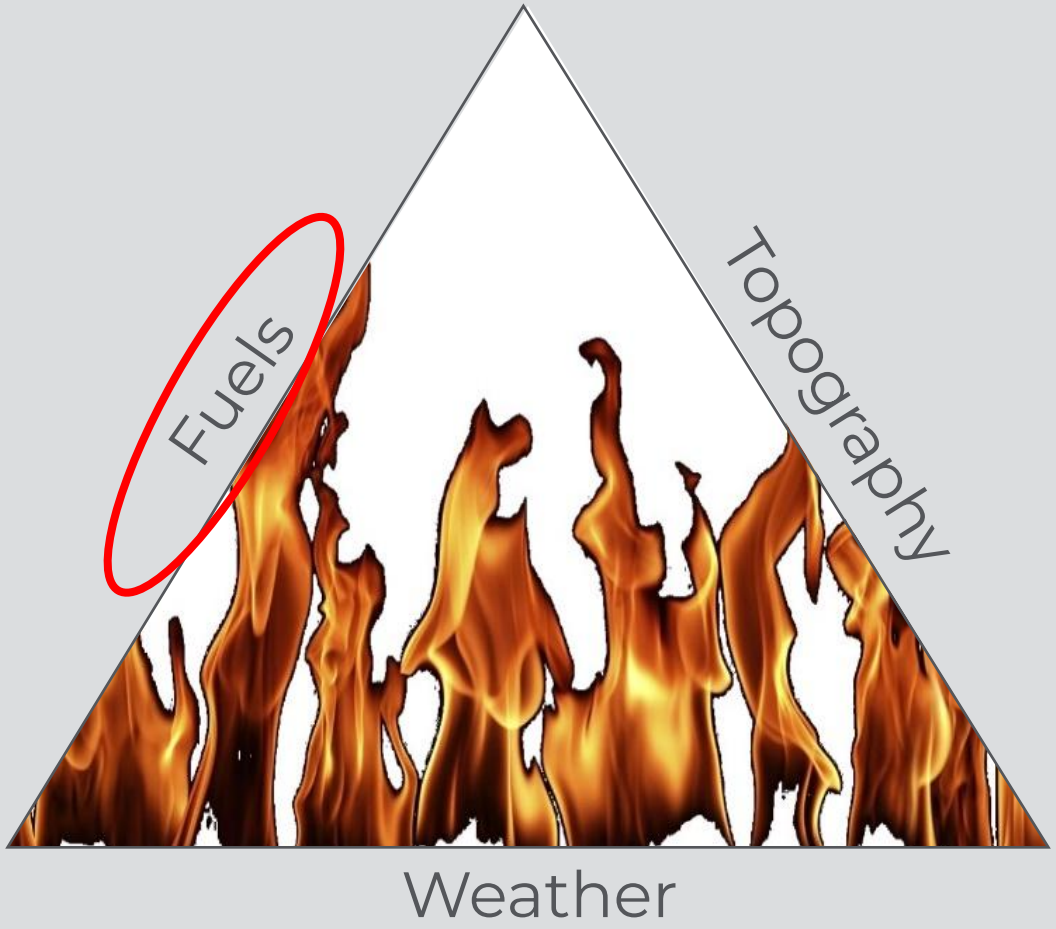
Chaparral

Historic fire regime

- Now they are getting too frequent fire
    - Fueled by nonnative grass invasions, increased ignitions
    - Limits seed production for future recolonization

Modern wildfires in Sierran forests

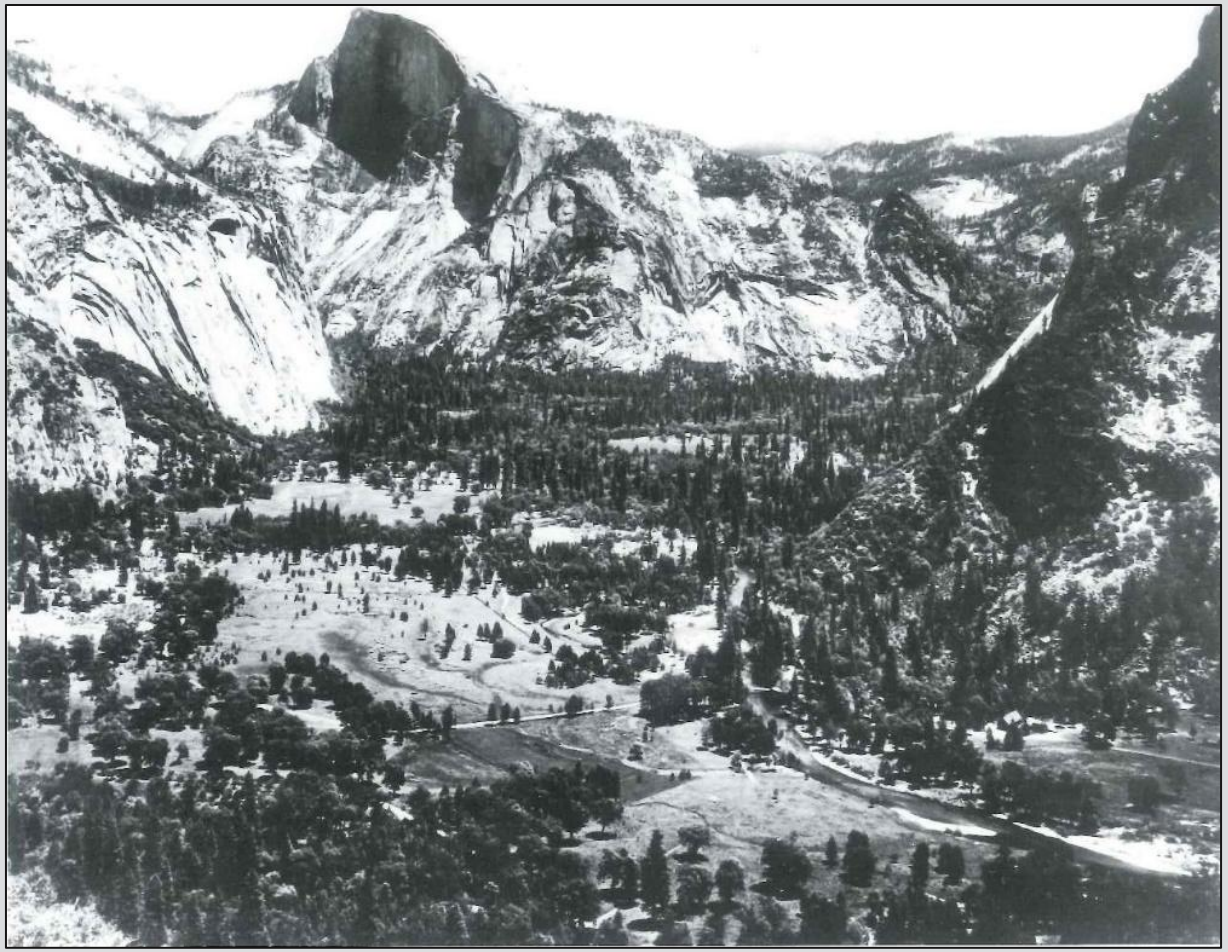
What's changed?

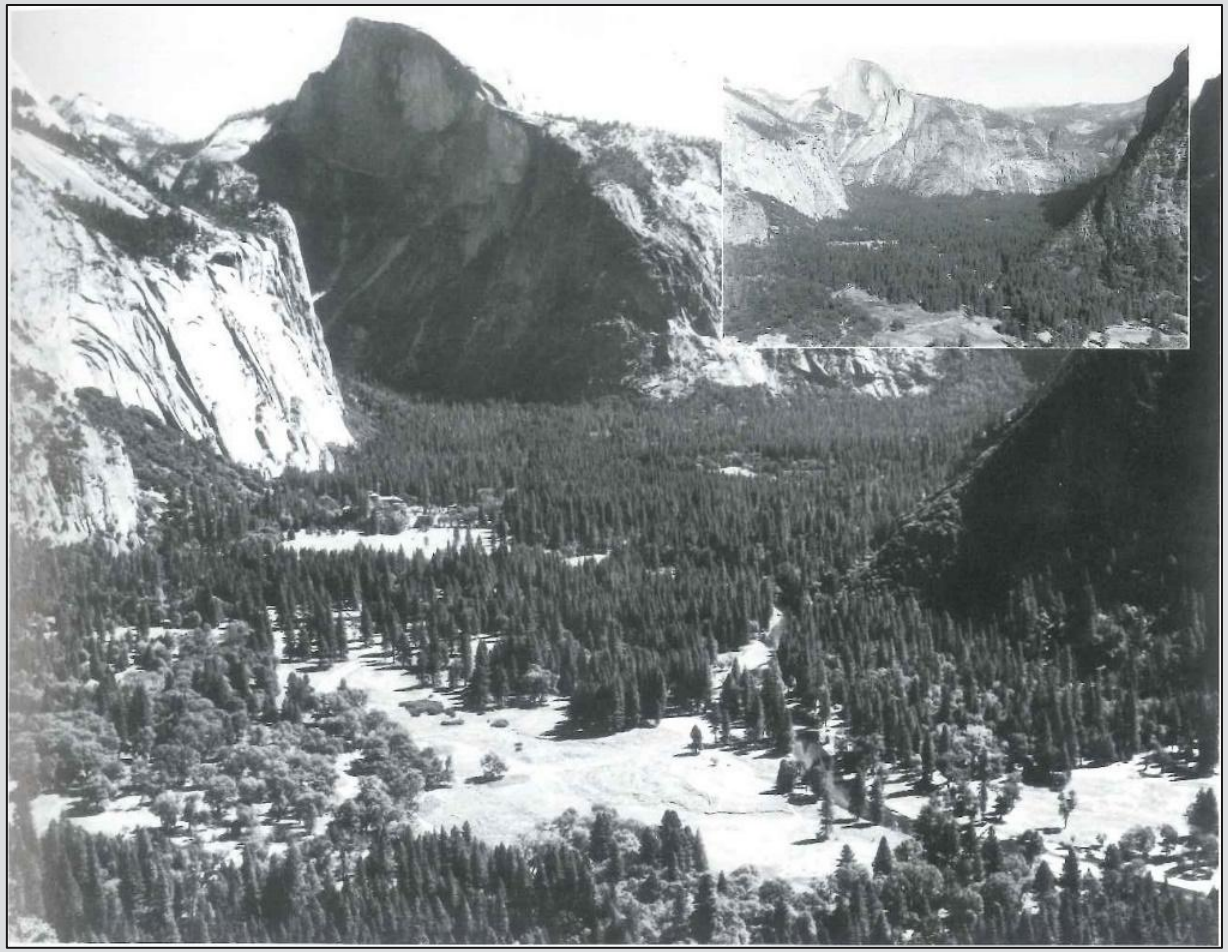


Euro-Americans came to “save” the forest

Modern wildfires

Suppressing indigenous burning





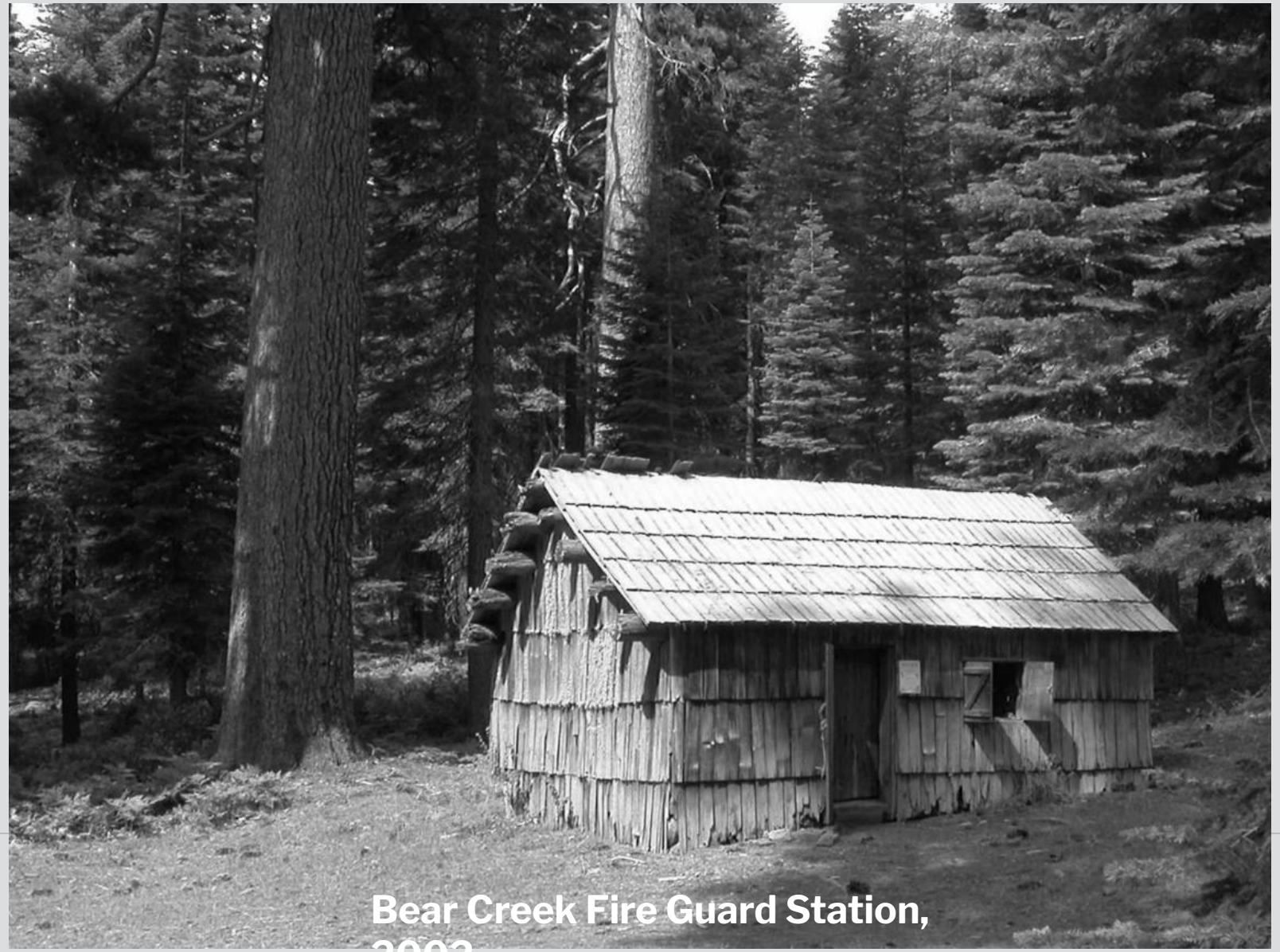
And then came this guy…

Our forests have changed from this:

Bear Creek Fire Guard Station, 1915

Modern wildfires

Our forests have changed from this:

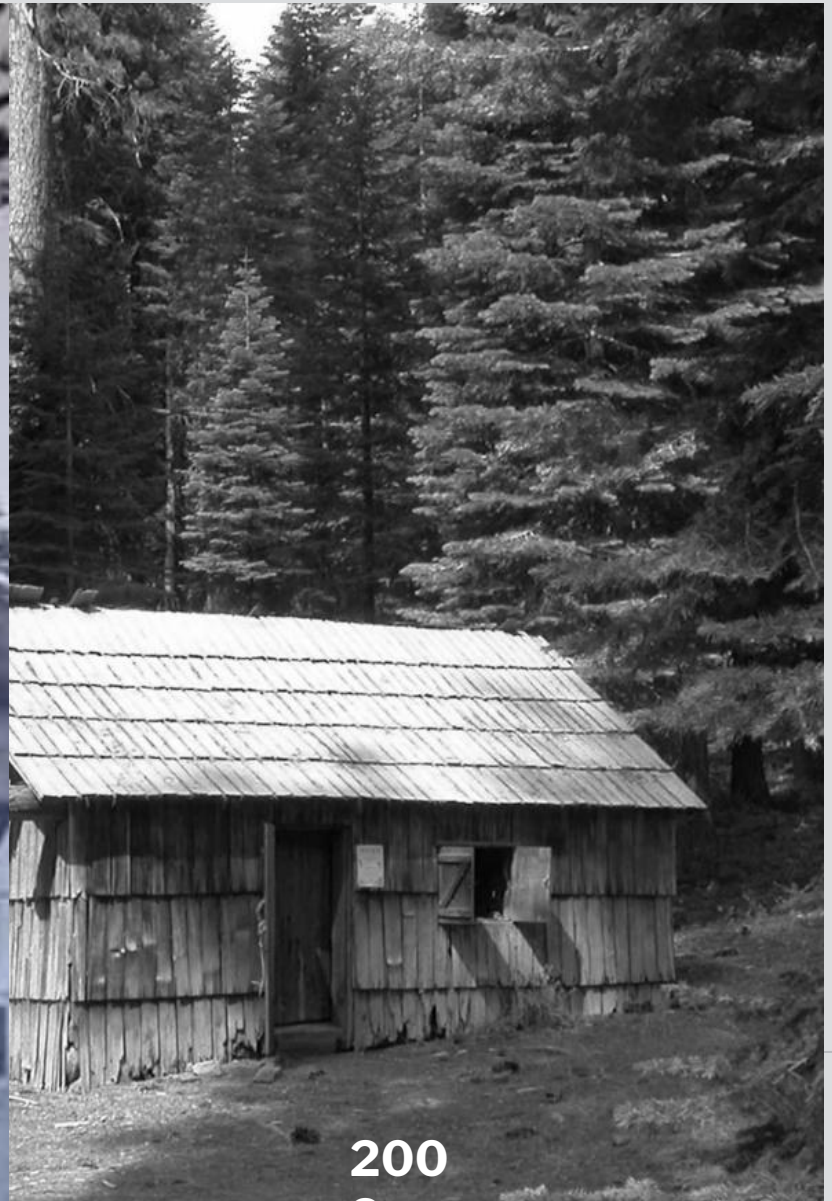


Bear Creek Fire Guard Station,

Modern wildfires

To this:

191

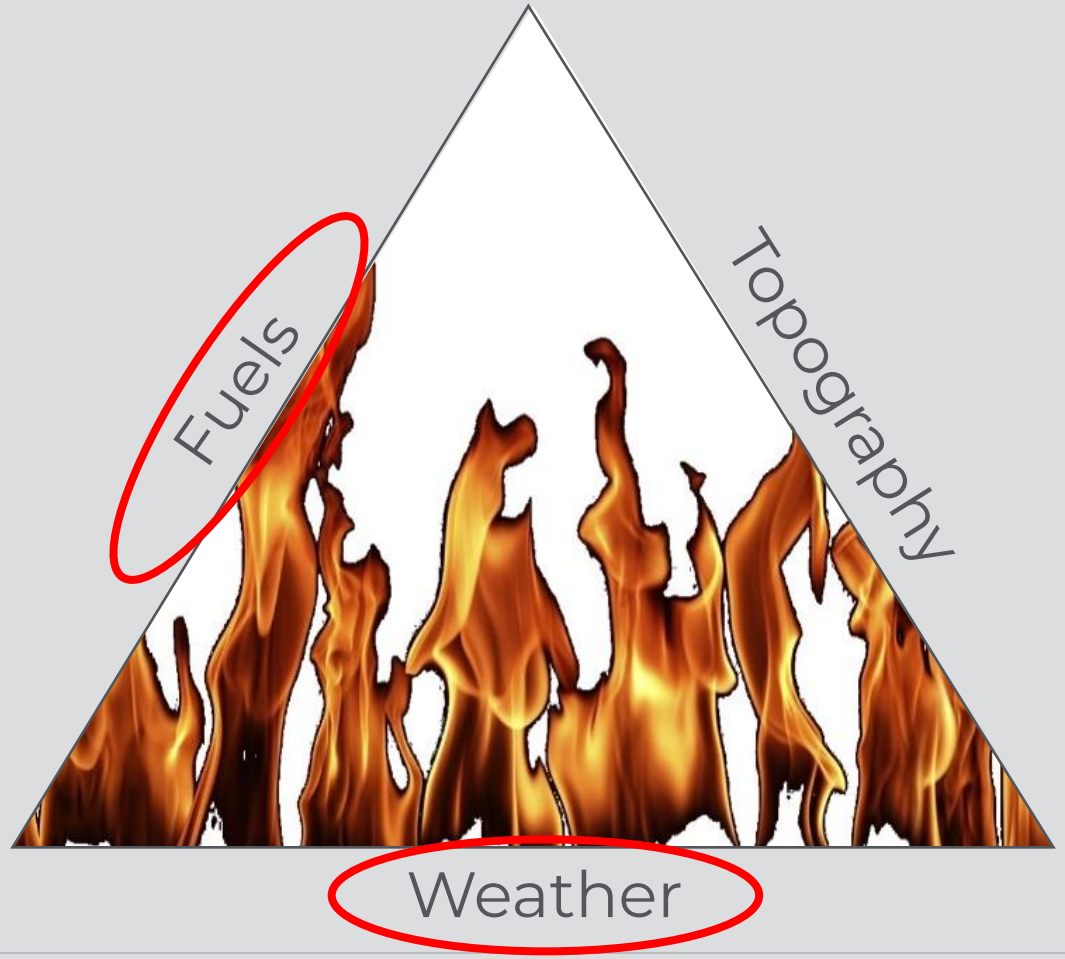


200

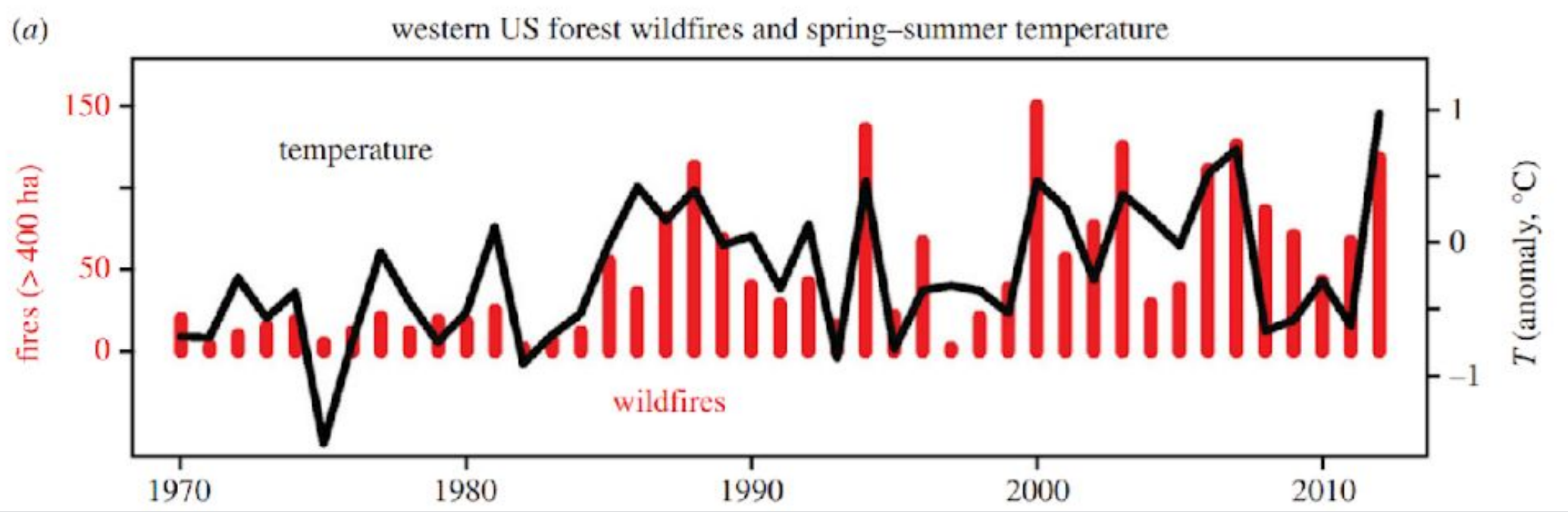
What does this lack of fire mean for forest health?

- Decreased resilience to drought, insects and disease
  - Competition stresses the trees
- Shift to less fire tolerant species
- Loss of biodiversity in the understory
- Loss of habitat diversity across the landscape

What's changed?



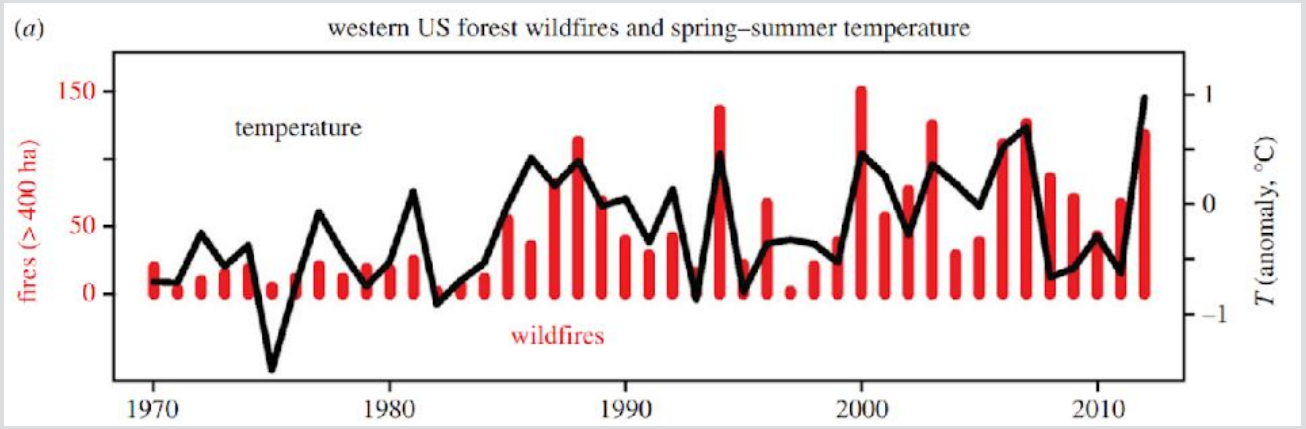
Climate change



From: Westerling et al. 2016

Modern wildfires

Interacting stressors



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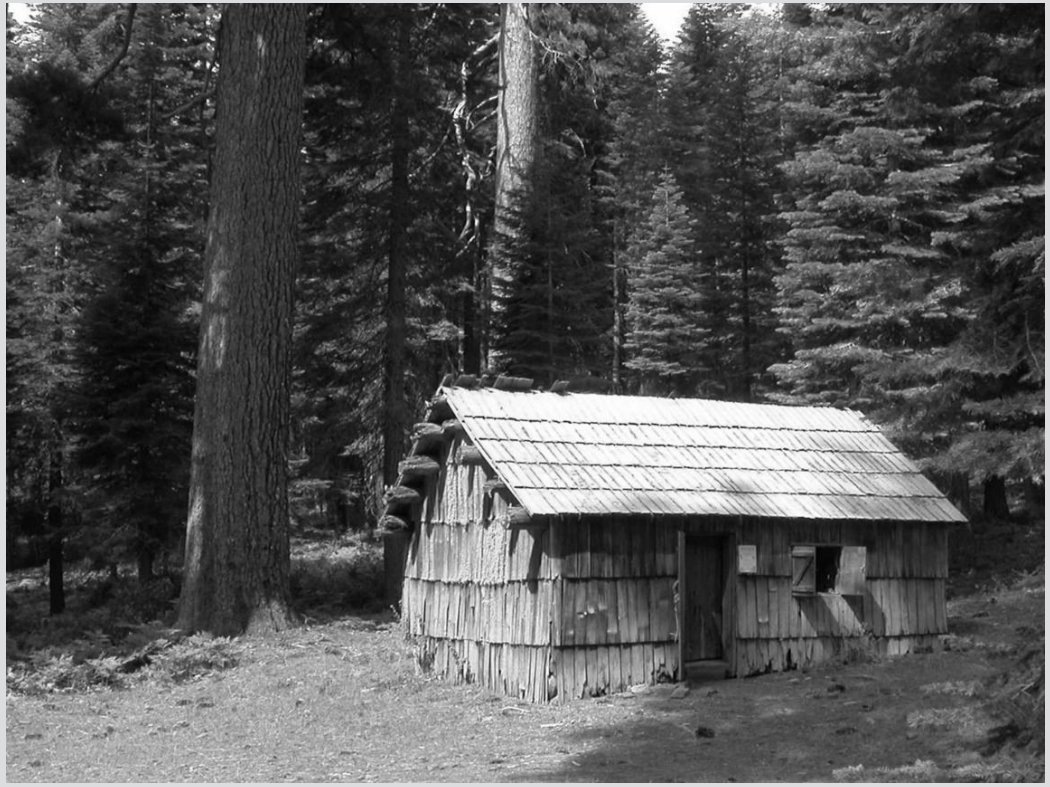


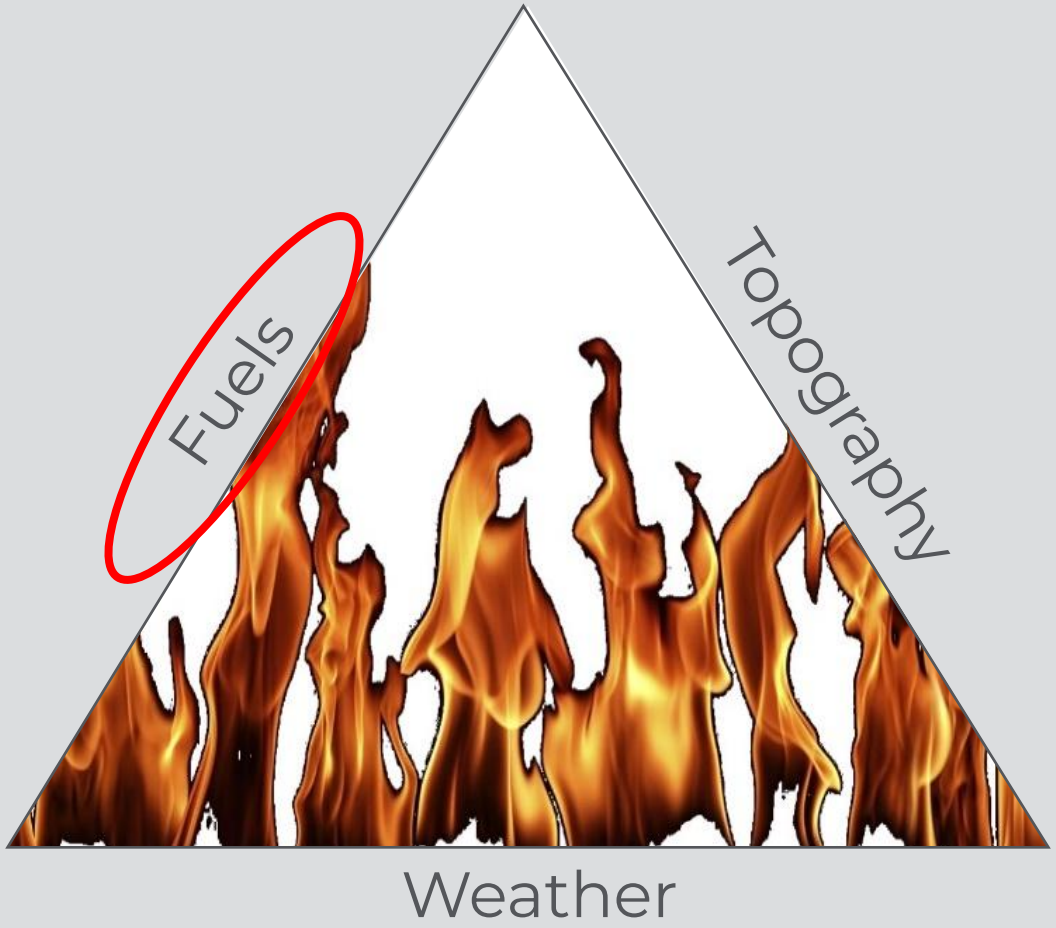
Interacting stressors

Modern wildfires

Increases in high severity fire

Stewarding forests in a time of global change

How can we improve forest health and reduce fire severity?



Stewarding forests for the future

How can we increase resilience and reduce fire severity?

Stewarding forests for the future

Fuels reduction via fire and fire “surrogates”

Stewarding forests for the future

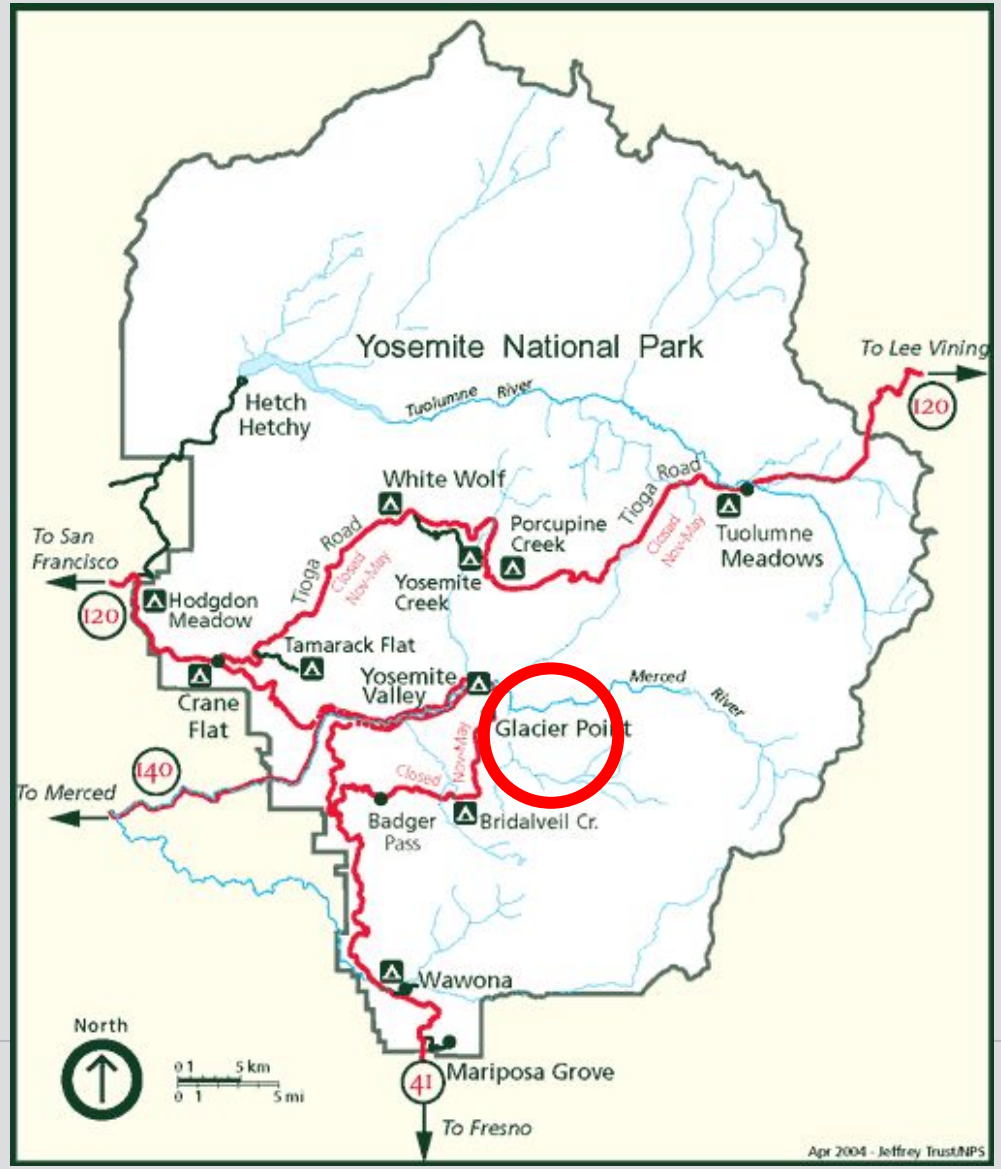
Fuels reduction via fire and fire “surrogates”

Allowing lightning ignitions to burn – at the right time

- Still heavily managed
  - *Need to consider likely effects based on weather and location*
- Generally in remote areas
- Cheapest way to treat a landscape
- Fires can be managed for multiple objectives

Stewarding forests for the future

Illilouette Basin in Yosemite National Park



Stewarding forests for the future

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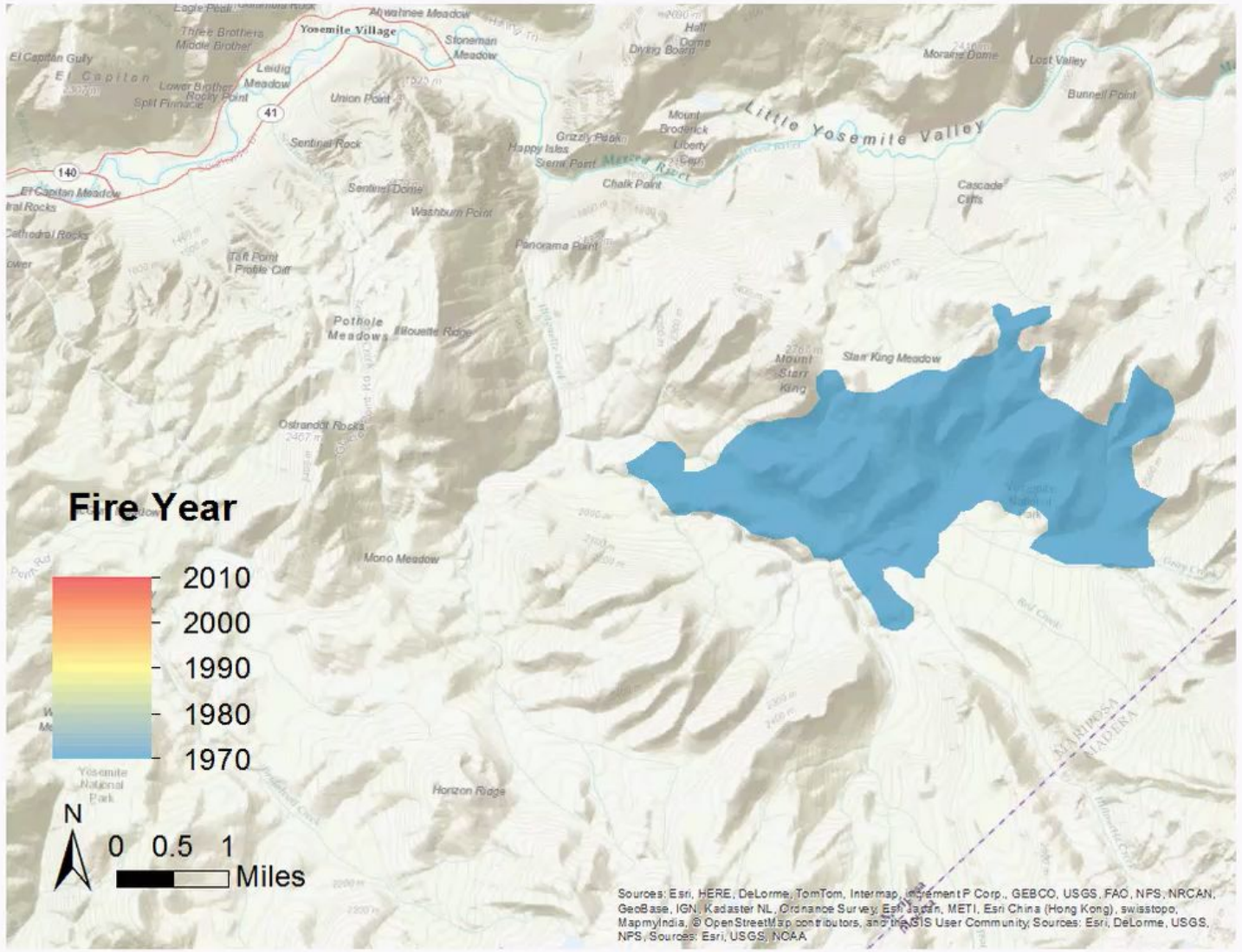
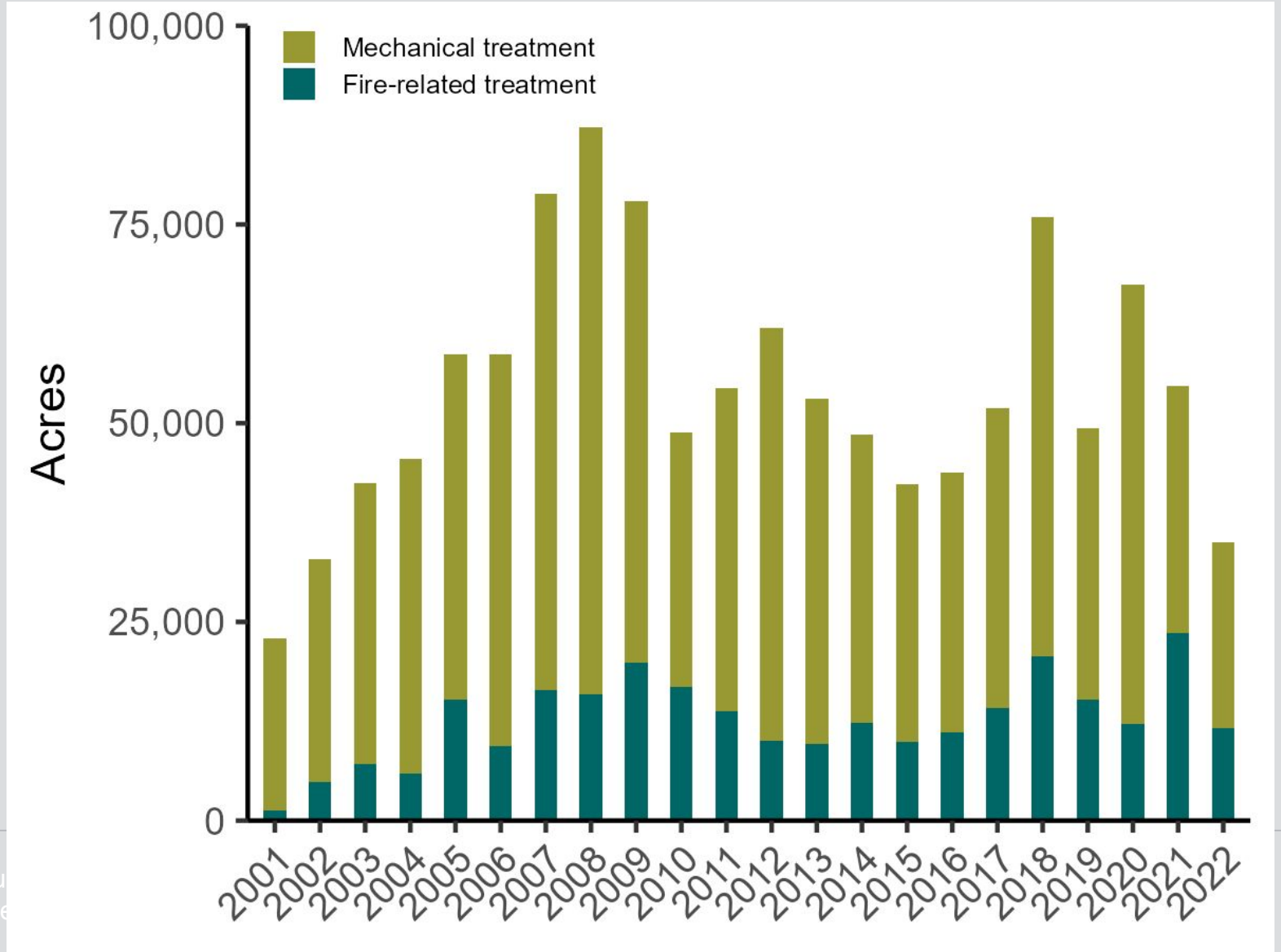


Stewarding forests for the future

Illilouette Basin in Yosemite National Park

Fuels reduction treatments work!

But active fuels management is hard…



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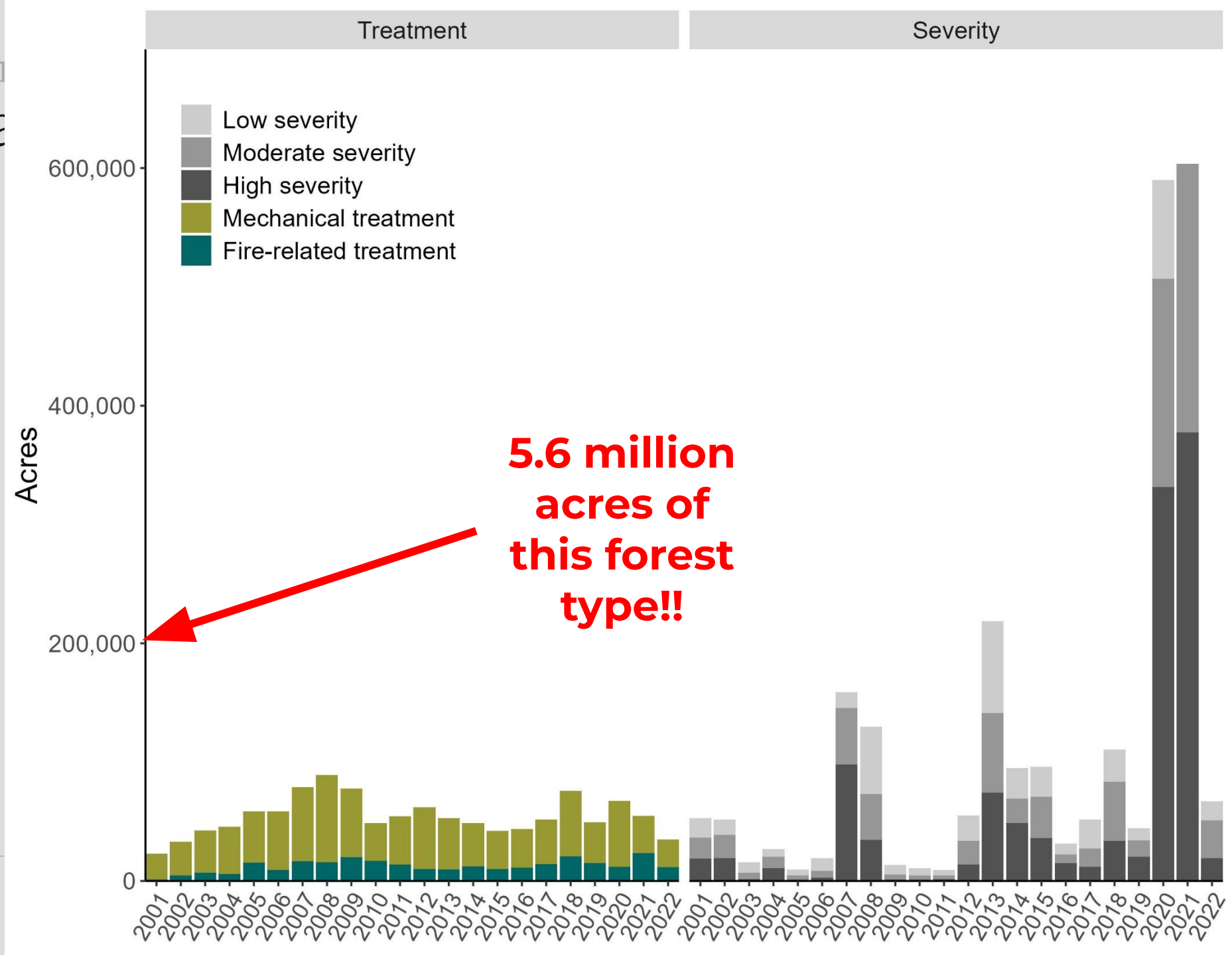
Treatment
Severity
Low severity
Moderate severity
High severity
Mechanical treatment
Fire-related treatment
Acres
600,000
400,000
200,000
0
5.6 million acres of this forest type!!
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

How can we increase the pace and scale of treatments, and allow for more good fire?

- Increase staffing
- Increase funding
- Adjusting regulation to account for natural processes and cultural burning

Clark *et al. Fire Ecology* (2024) 20:74
https://doi.org/10.1186/s42408-024-00301-y
Fire Ecology
Association for Fire Ecology
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Realignment of federal environmental policies to recognize fire's role

Sara A. Clark[1*], Jenna N. Archer[1], Scott L. Stephens[2], Brandon M. Collins[2,3] and Don L. Hankins[4]

Abstract

Background Enactment of the Clean Air Act (CAA), Endangered Species Act (ESA), and National Environmental Policy Act (NEPA), three of the primary federal environmental laws, all coincided with the height of fire suppression and exclusion in the United States. These laws fail to acknowledge or account for the importance of fire in many fire-adapted and fire-dependent ecosystems, particularly in the American west, or the imperative for fire restoration to improve resiliency and reduce wildfire risk as identified by western science and Indigenous knowledge. We review

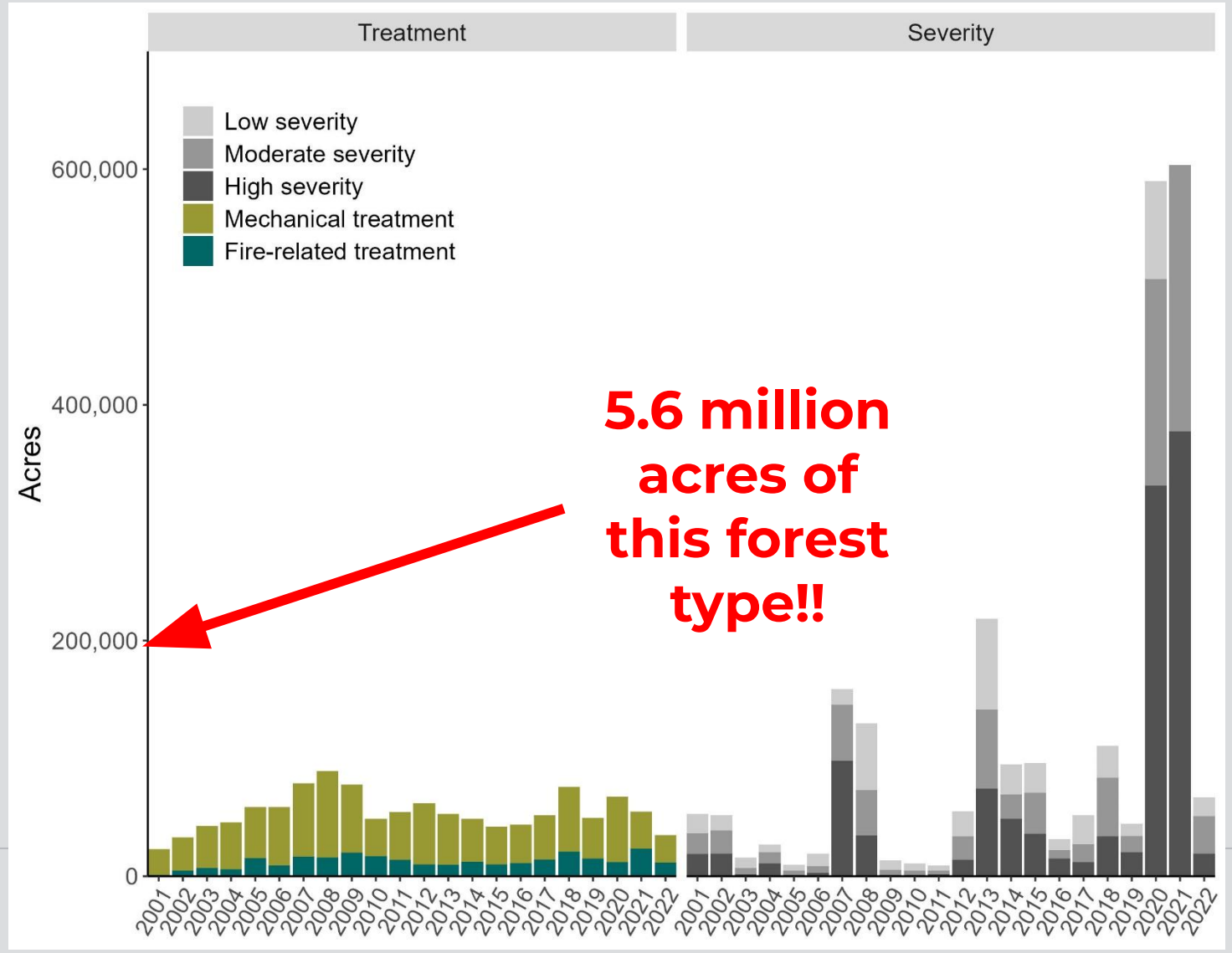
Change the narrative

Change the narrative

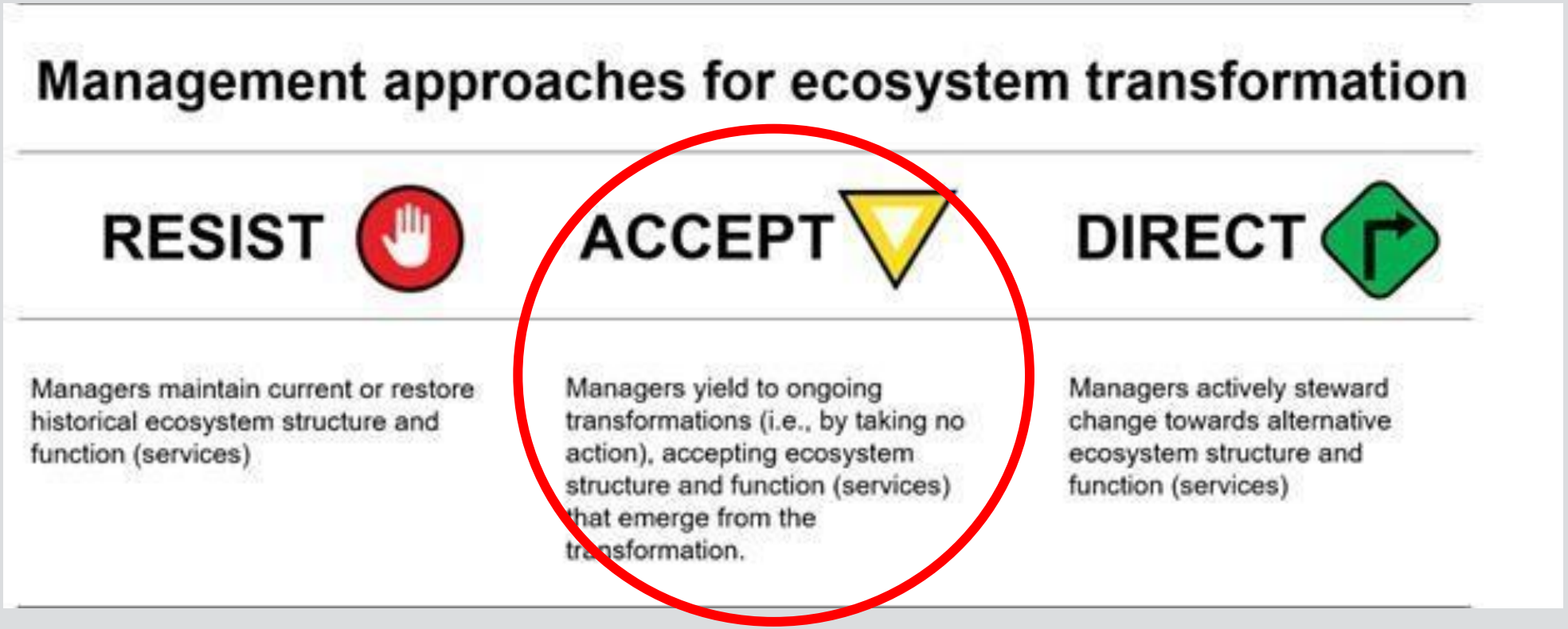
Change the narrative

Change the narrative

Double down on critical resources and get ready for big changes



Double down on critical resources and get ready for big changes



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