Overview of Dendroecology

THE UNIVERSITY OF ARIZONA

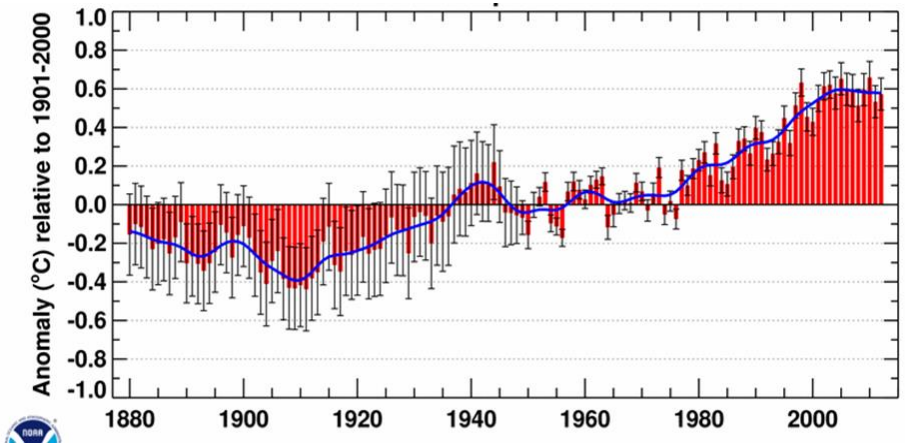
DISC 2018
Tuesday, May 15th
9:30 – 10 am

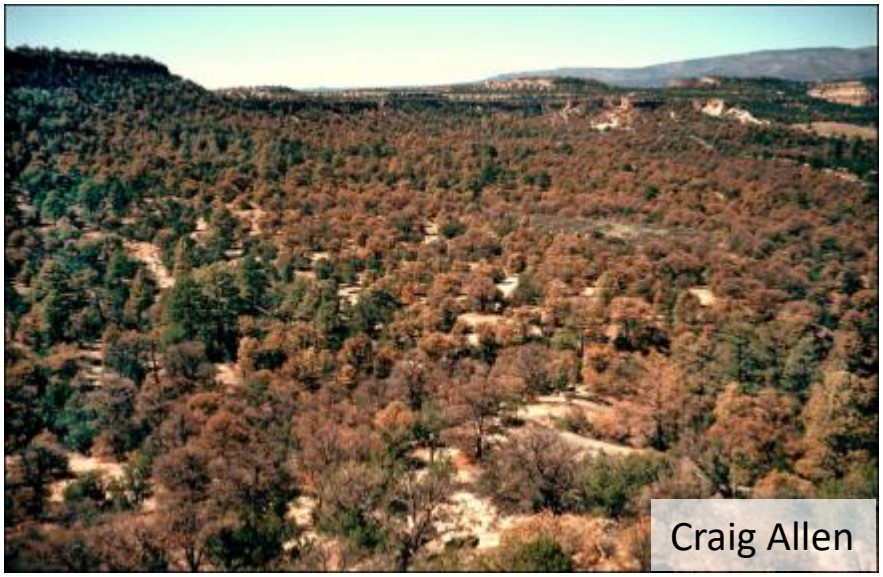
THE LABORATORY OF TREE-RING RESEARCH
UASCIENCE

Sequoia-Kings Canyon

Increasing pressure on forests

Global Mean Temperature

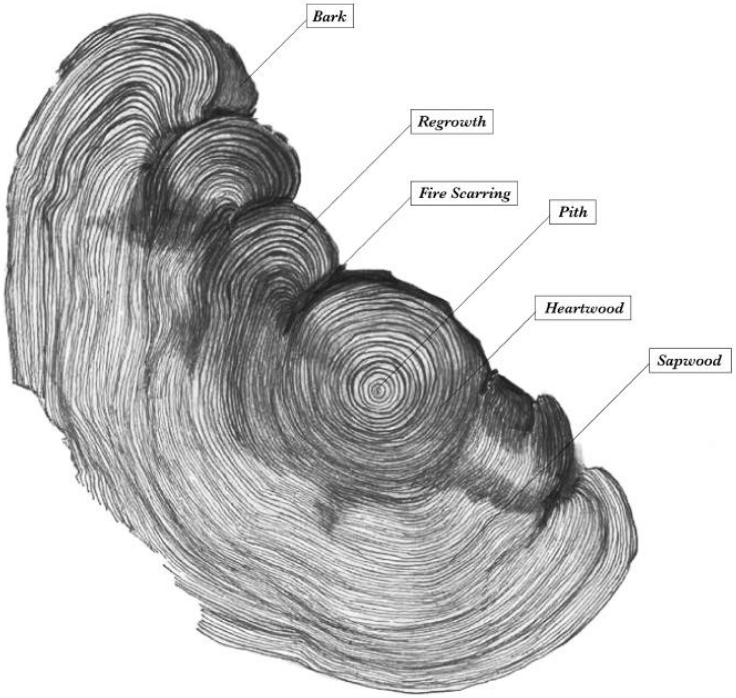




Ecology – study of how organisms interact with one another and their physical environment

Amoroso et al., 2017

Dendroecology



Tree-rings are method for evaluating historical *forest disturbances*:

→Forest fires

→Insect outbreaks

→Drought-related mortality

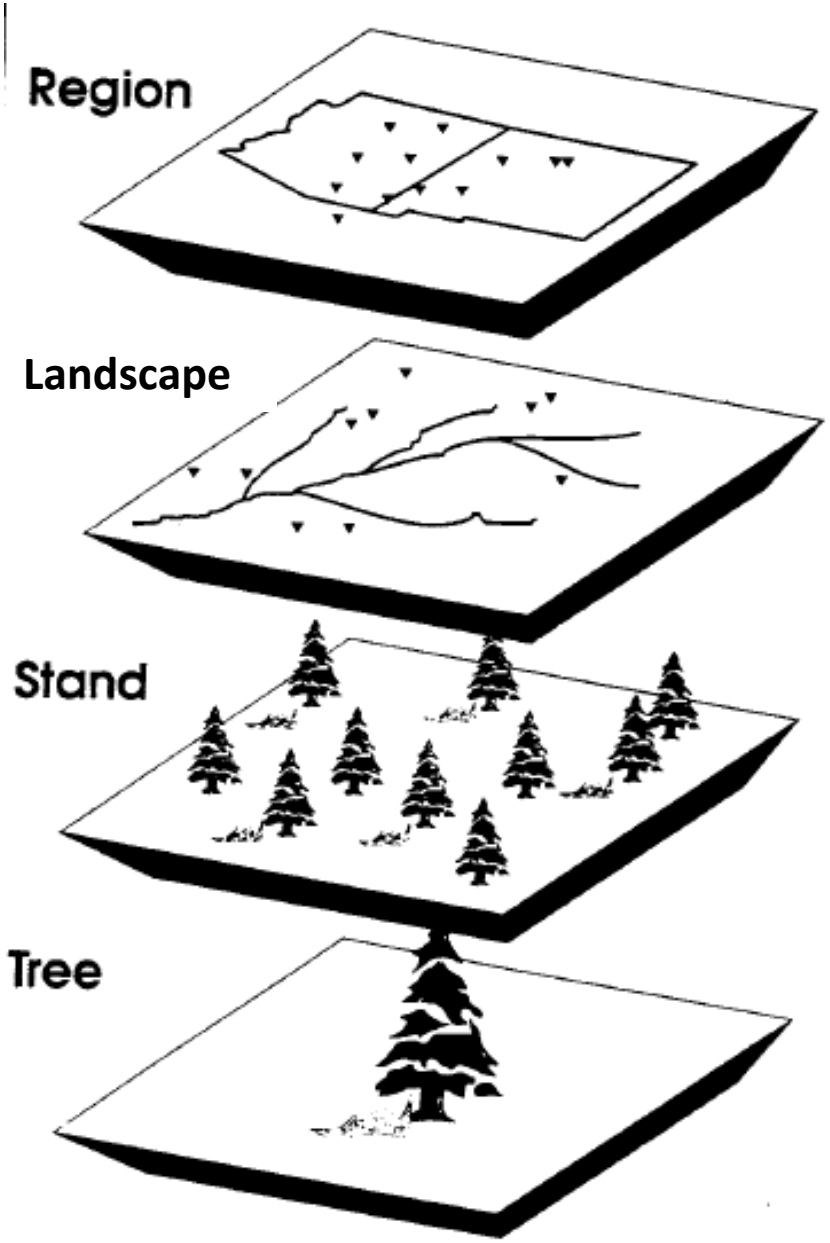
→ Avalanches/floods/storms

Forest dynamics and demography:

→ even-aged forest? Continuous recruitment?
→ transitions in demography (species composition, age)
→ relate to disturbance regimes
(including climatic and human influences)

Scale of Inference:

Scaling up from the tree . . .



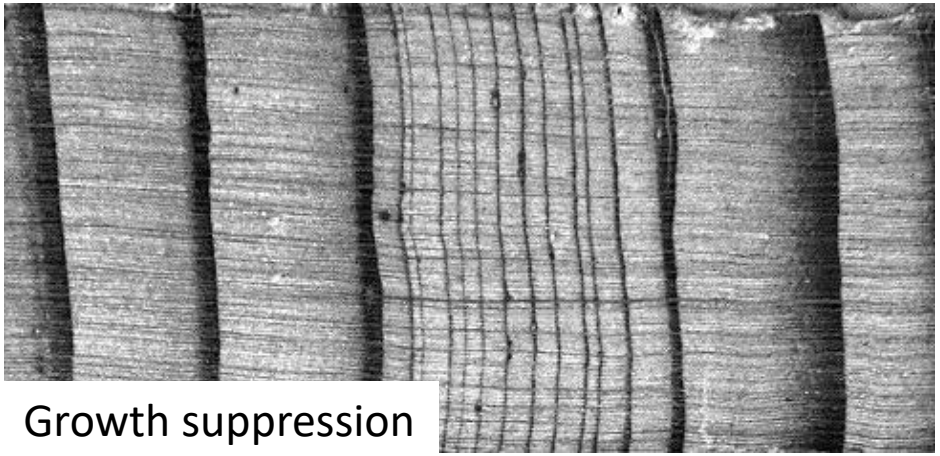
Top-down influences (climate)

Annual precision allows for compositing data from stands to landscapes

Bottom – up (local factors)

Swetnam and Baisan 1996, 2003

Scarring
Growth changes
Variability in growth

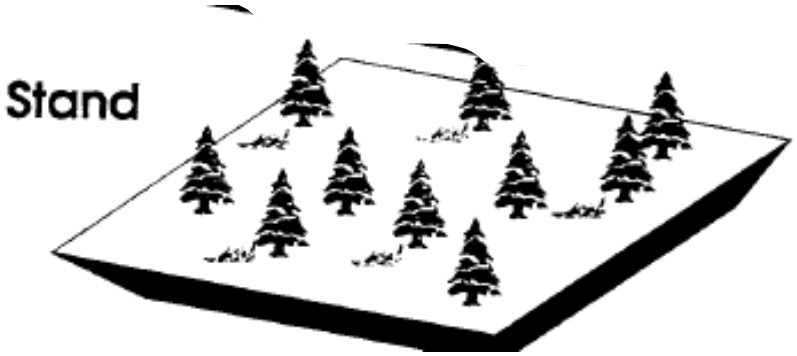


Growth suppression

Ring-width patterns

Fire-scarred tree

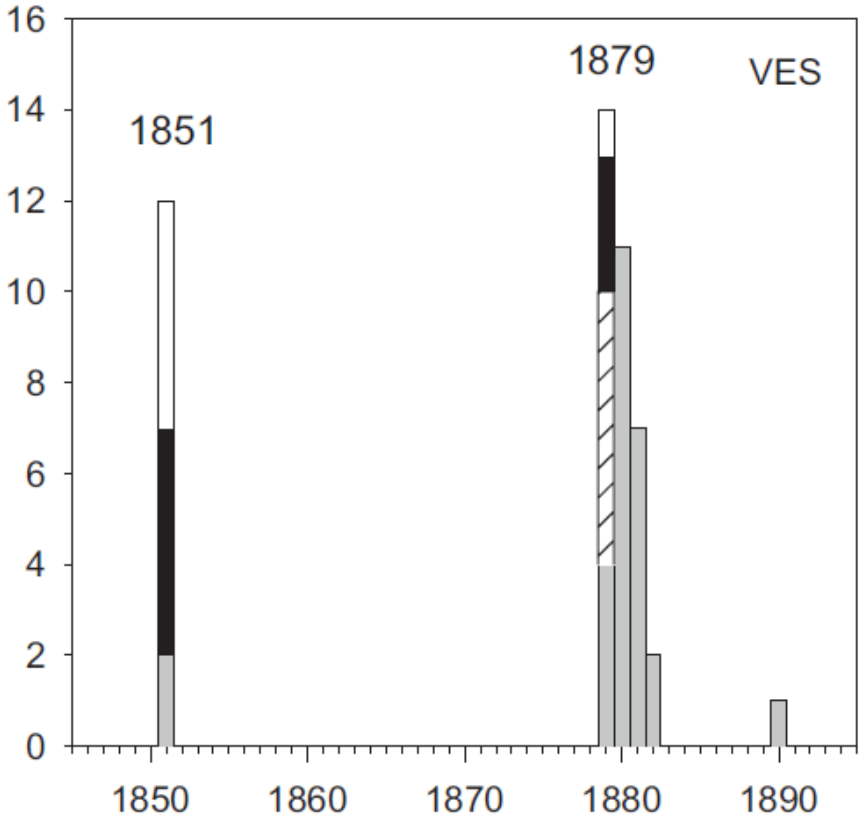
→ Consider context of tree on the landscape



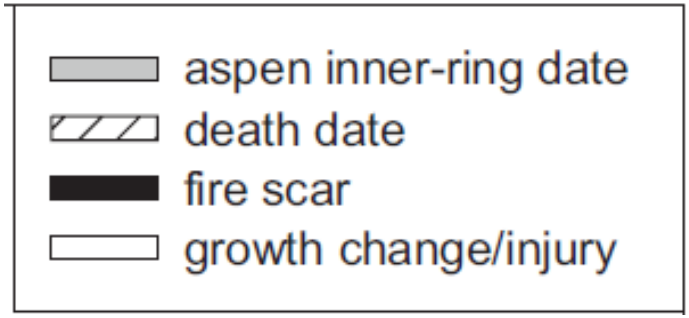
Demography questions

- species composition
- stand age
  - even-aged?
  - continuous recruitment over time

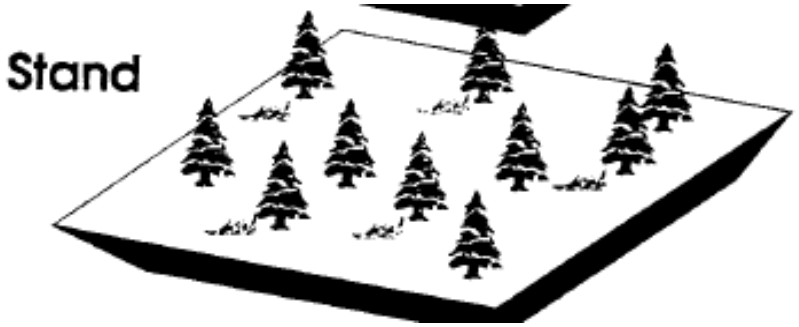
Multiple lines of evidence to reconstruct disturbance event

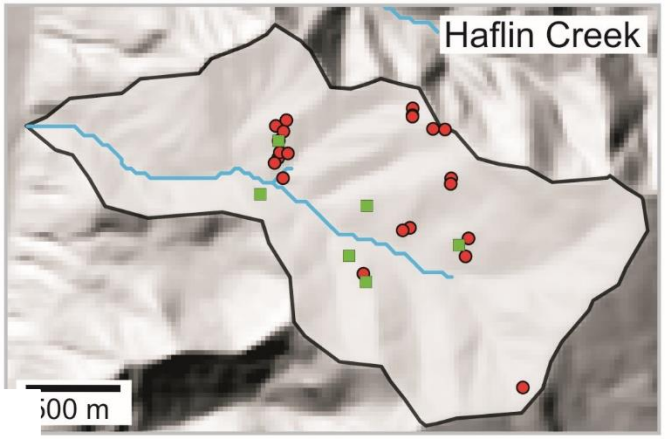


- Influences on stand structure and disturbance history?

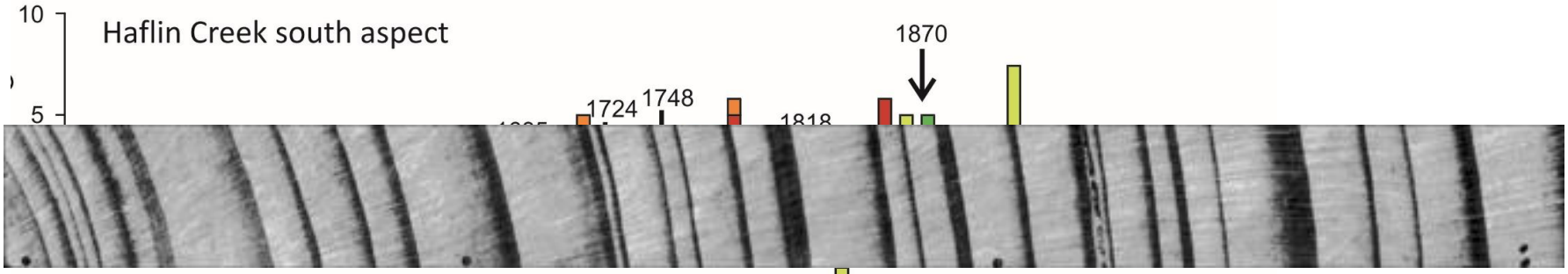


Margolis et al., 2007

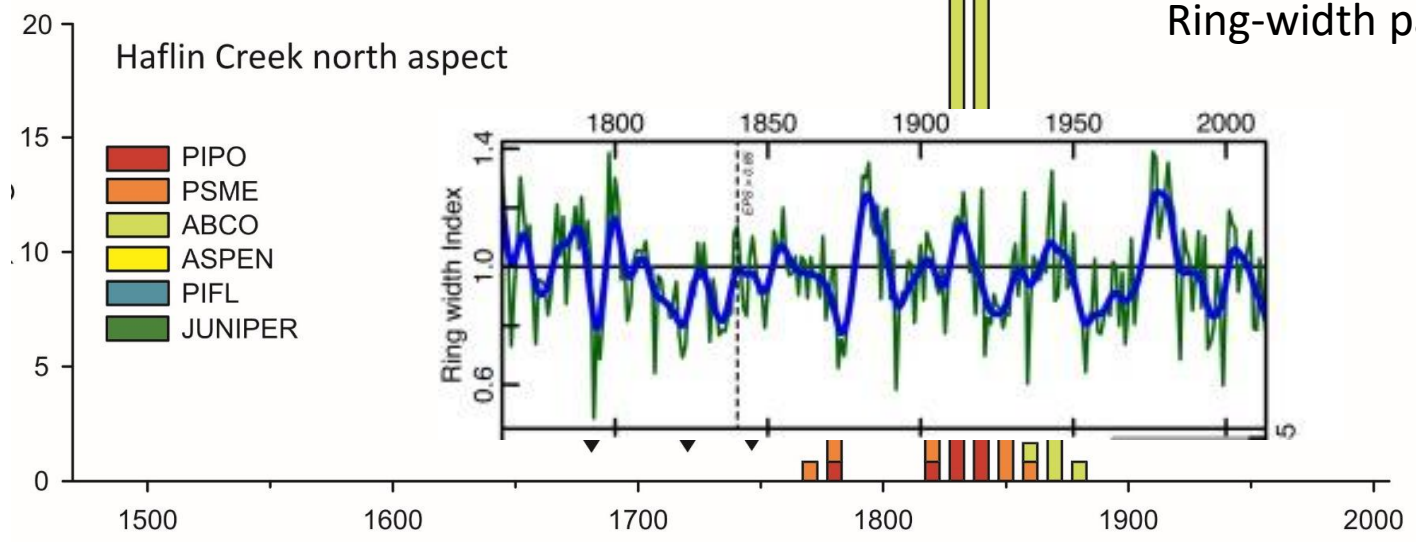




San Juans example: Tree regeneration by species and aspect

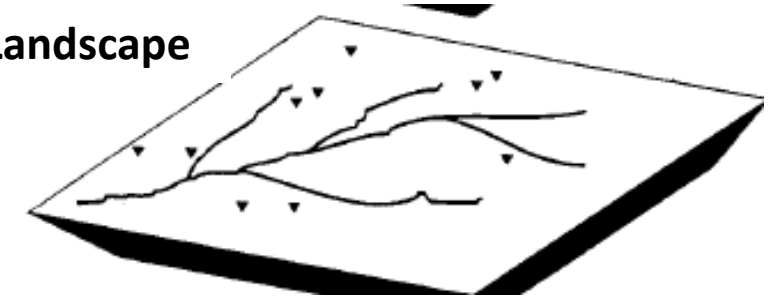


Ring-width patterns



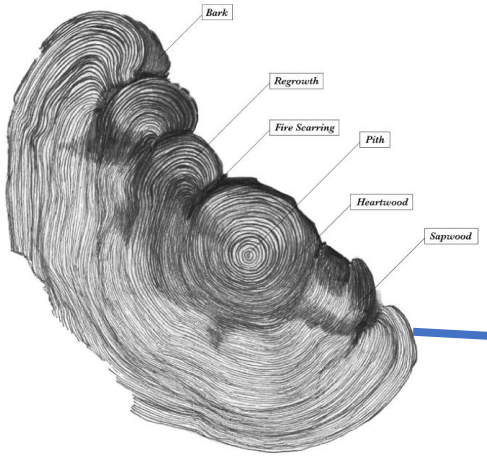
Bigio et al., 2016

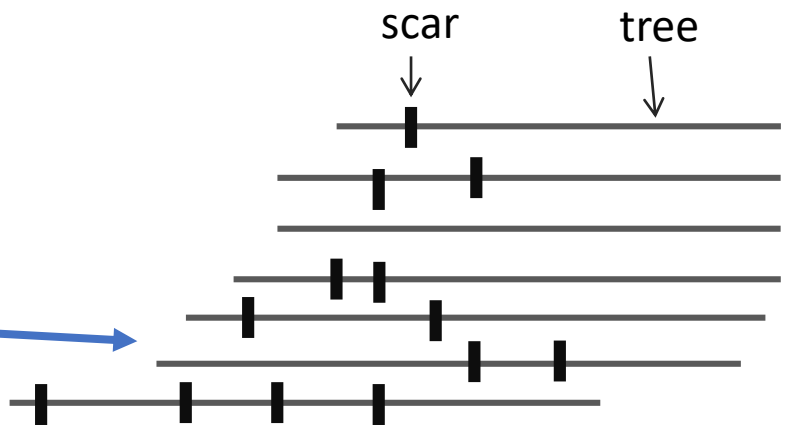
Landscape

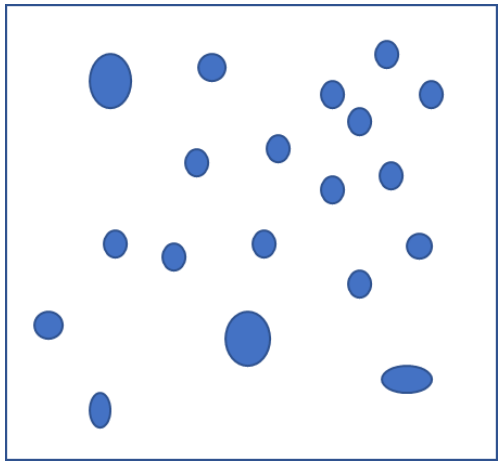


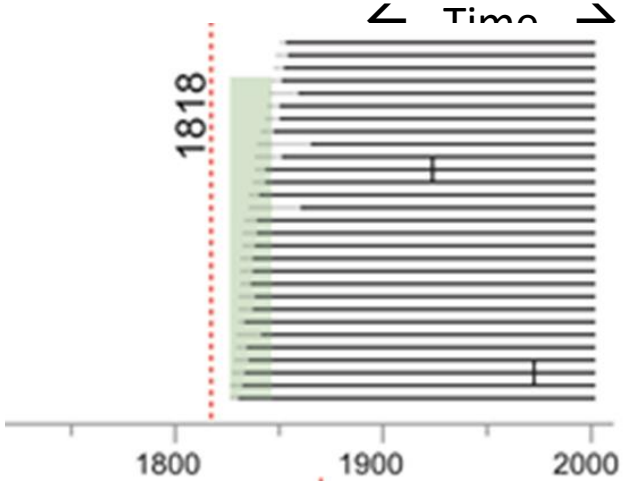
Strength of dendrochronology:

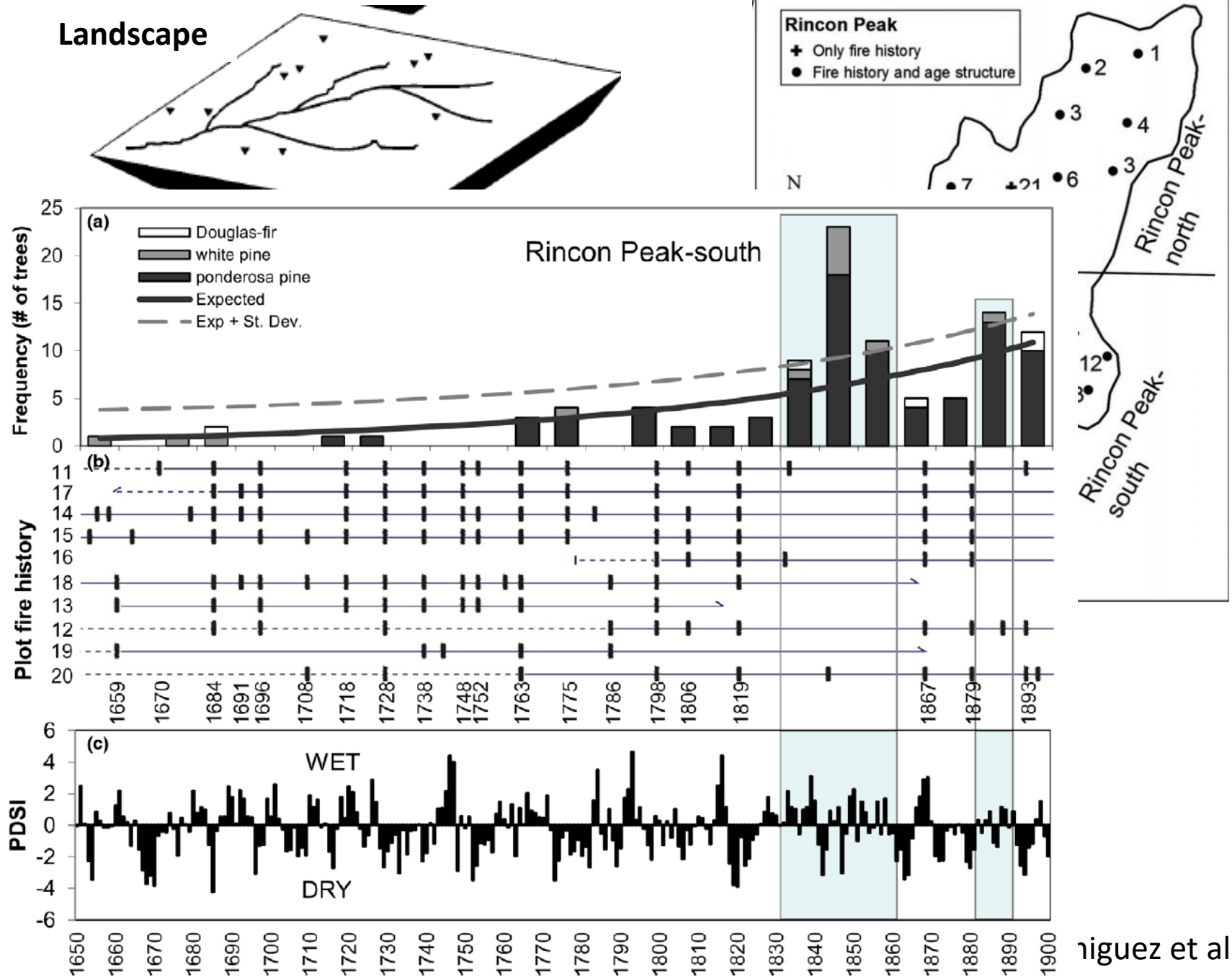
→ Combine multiple types of ecological data to infer relationships between disturbance regimes, demography and external influences (climate, human)





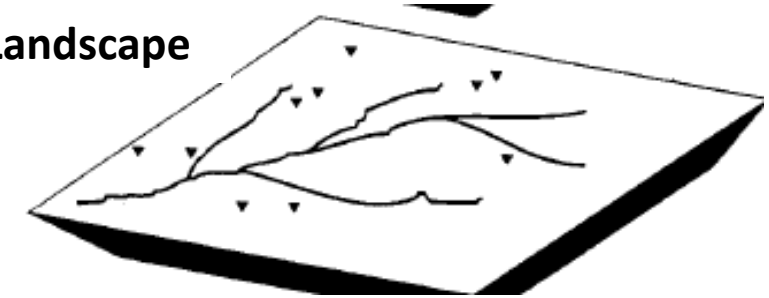






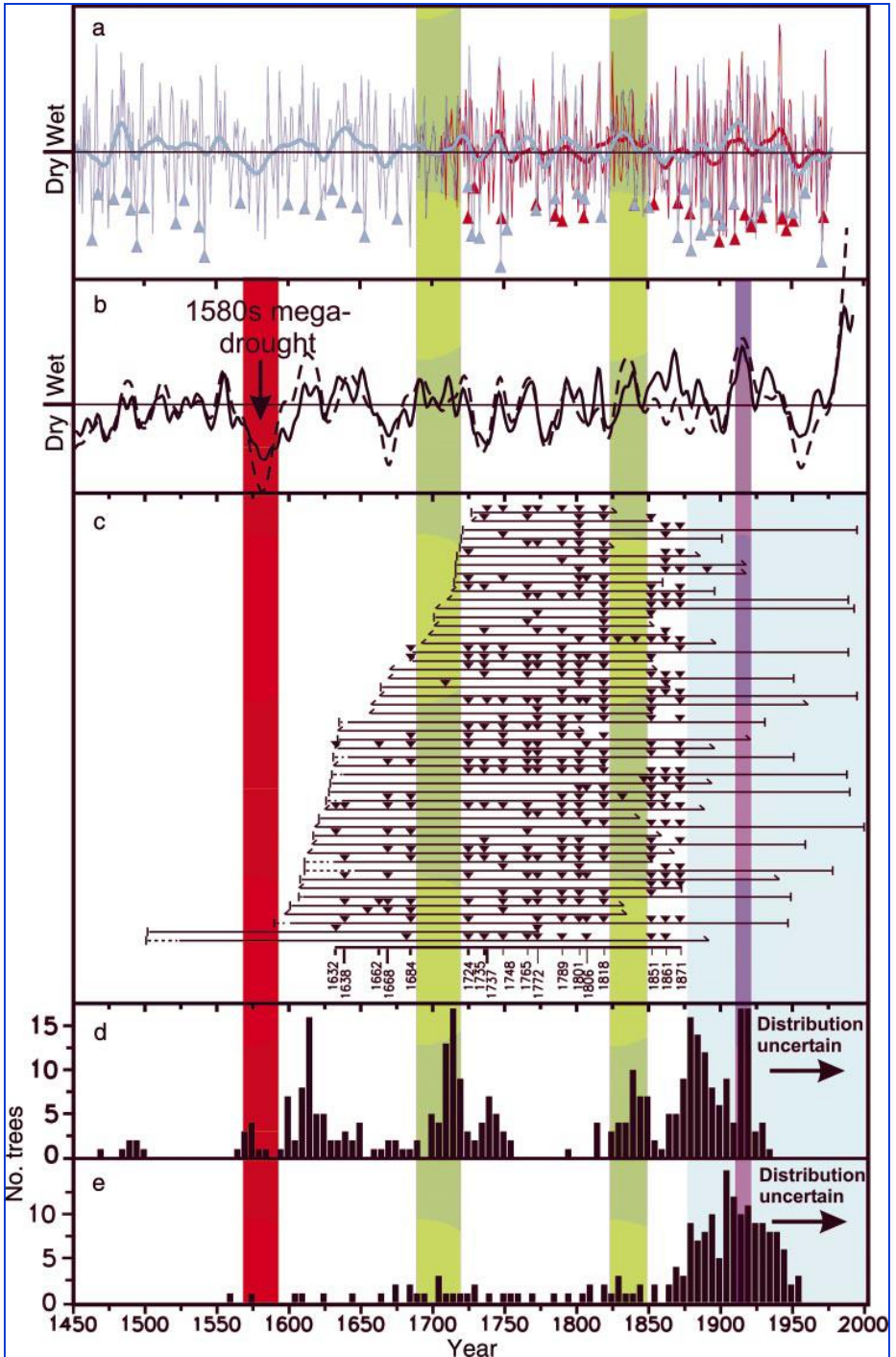
niguez et al., 2015

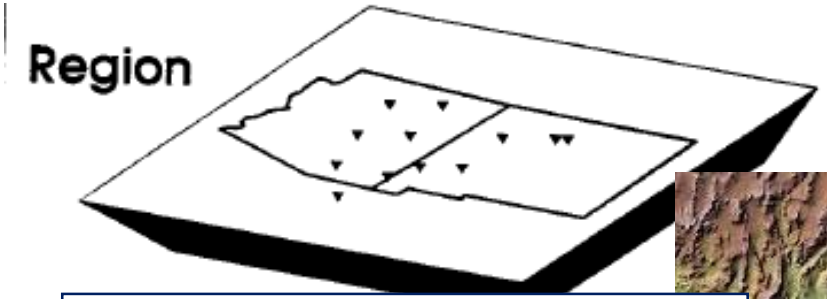
Landscape



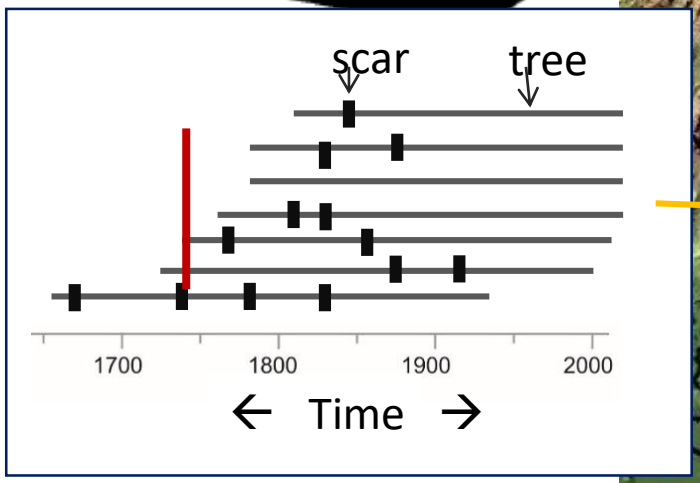
- Correspondence between more favorable climate conditions (reduced climate variability), reduced surface fire frequency and ponderosa pine establishment

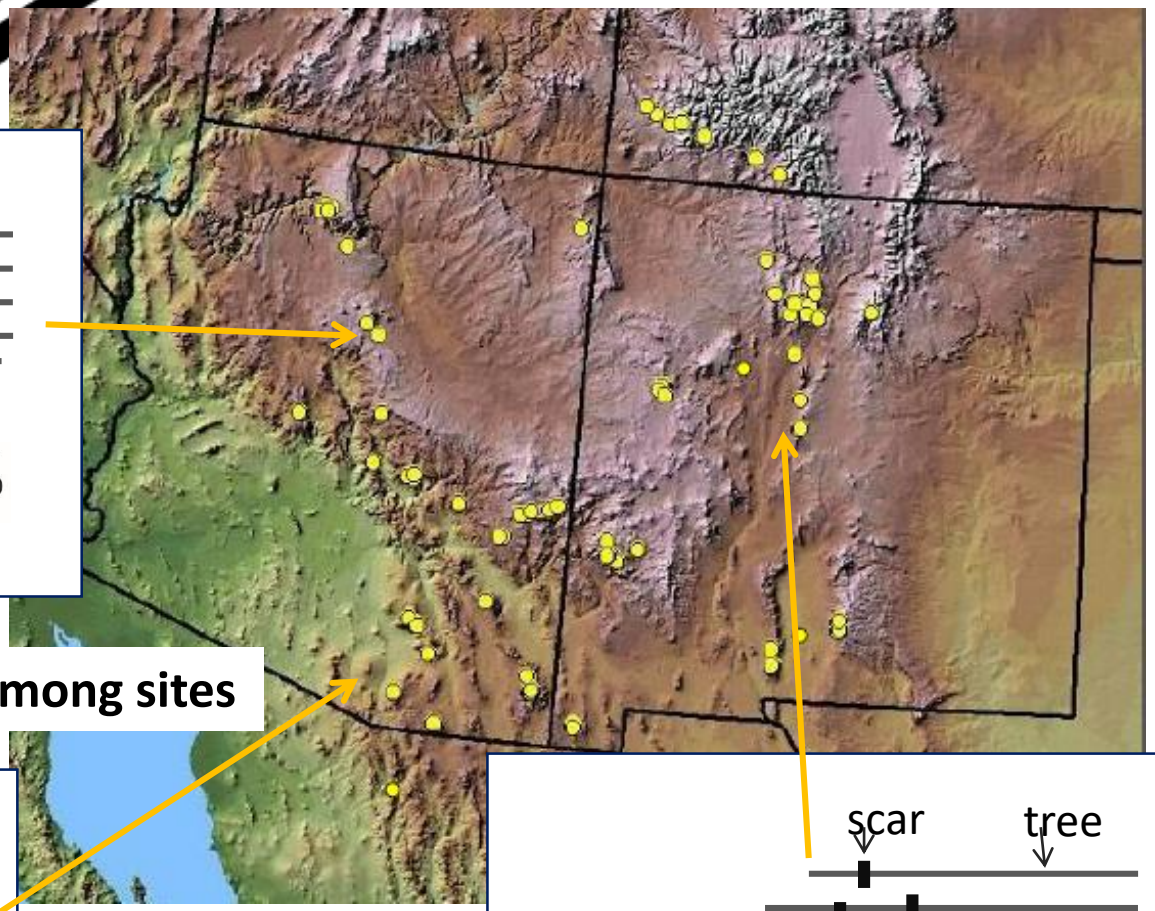
Brown & Wu 2005, *Ecology*



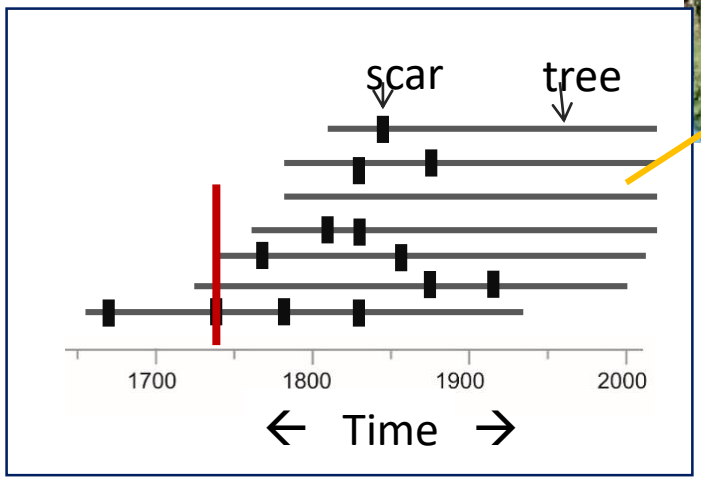


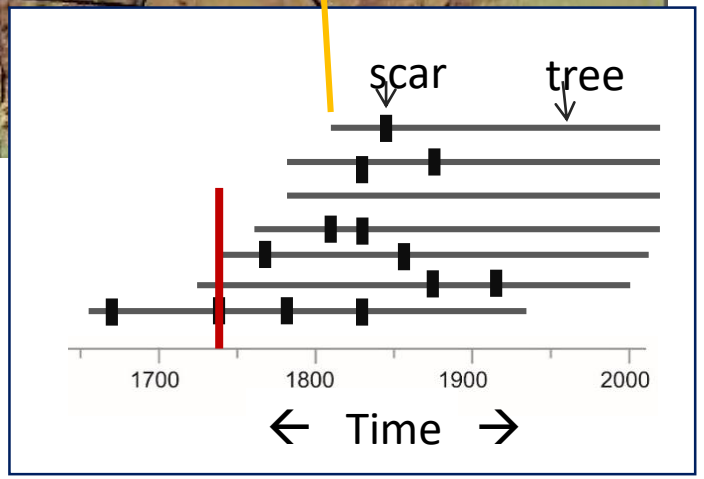
Fire history network for the SW:



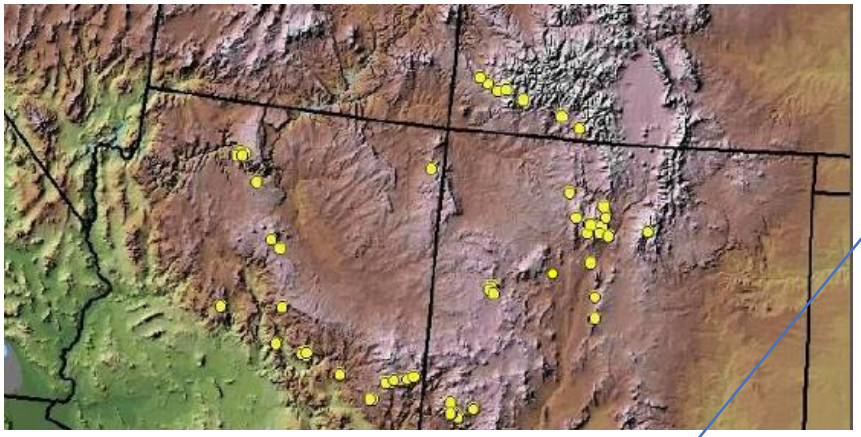


Identify years of synchrony among sites

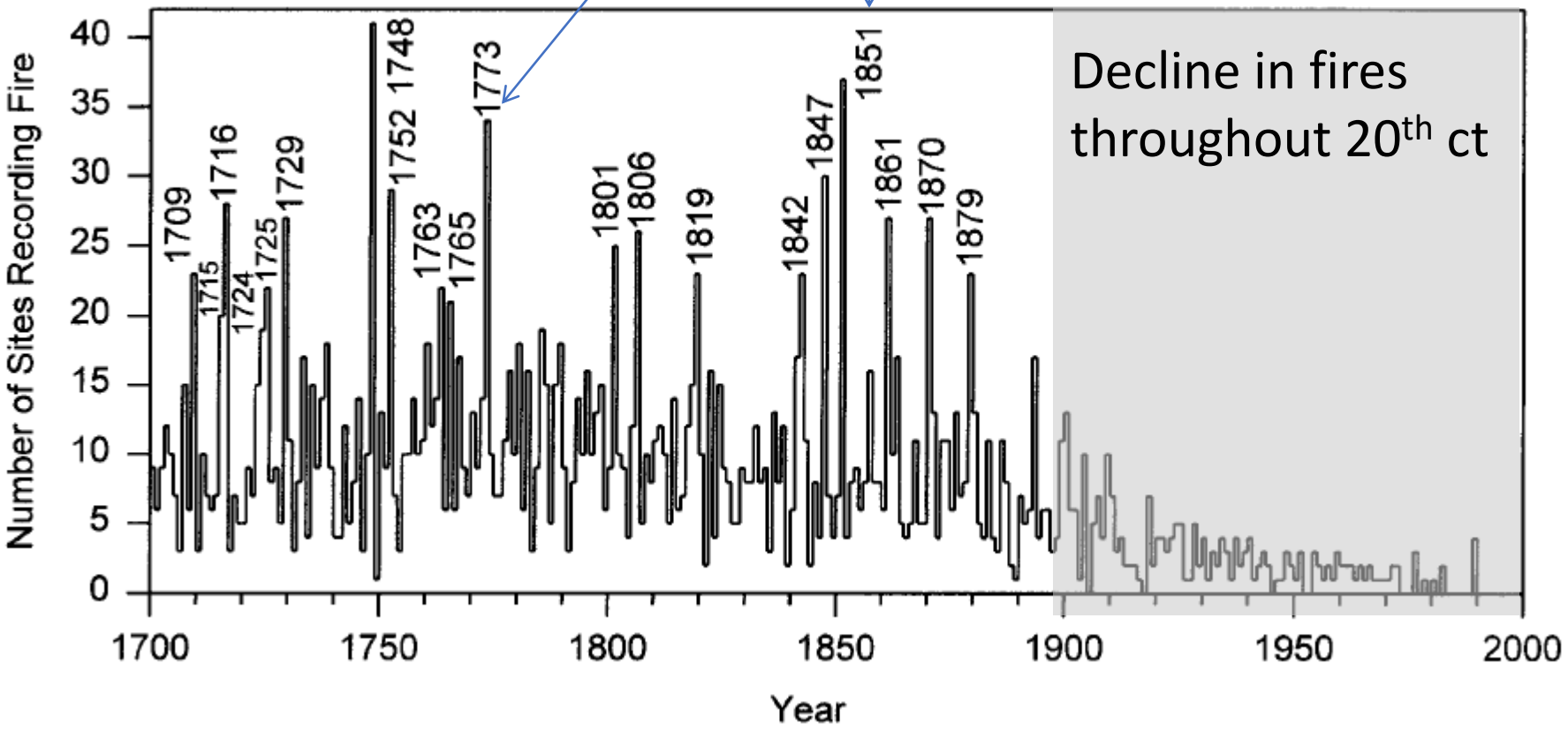




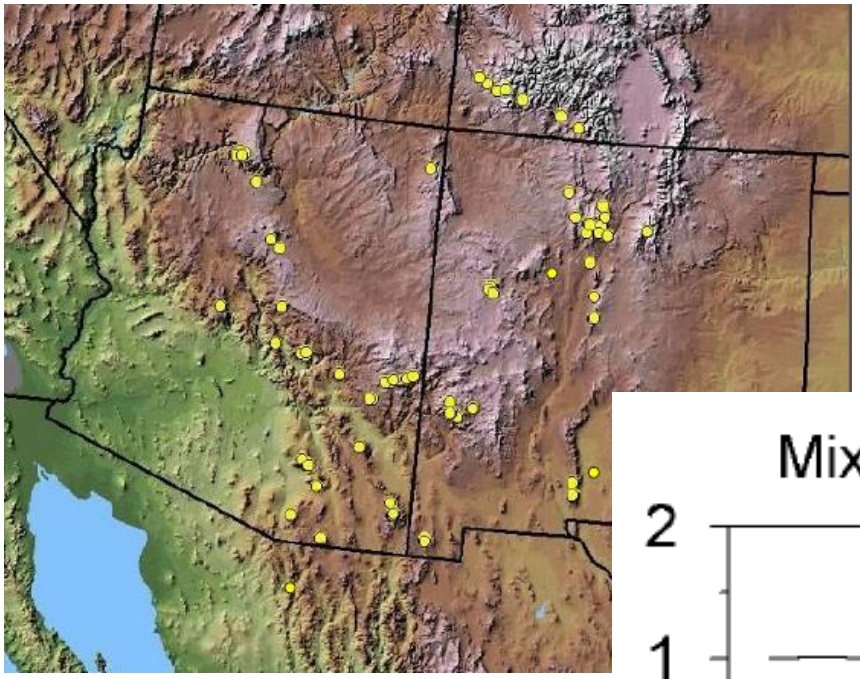
Fire-scar network for SW:



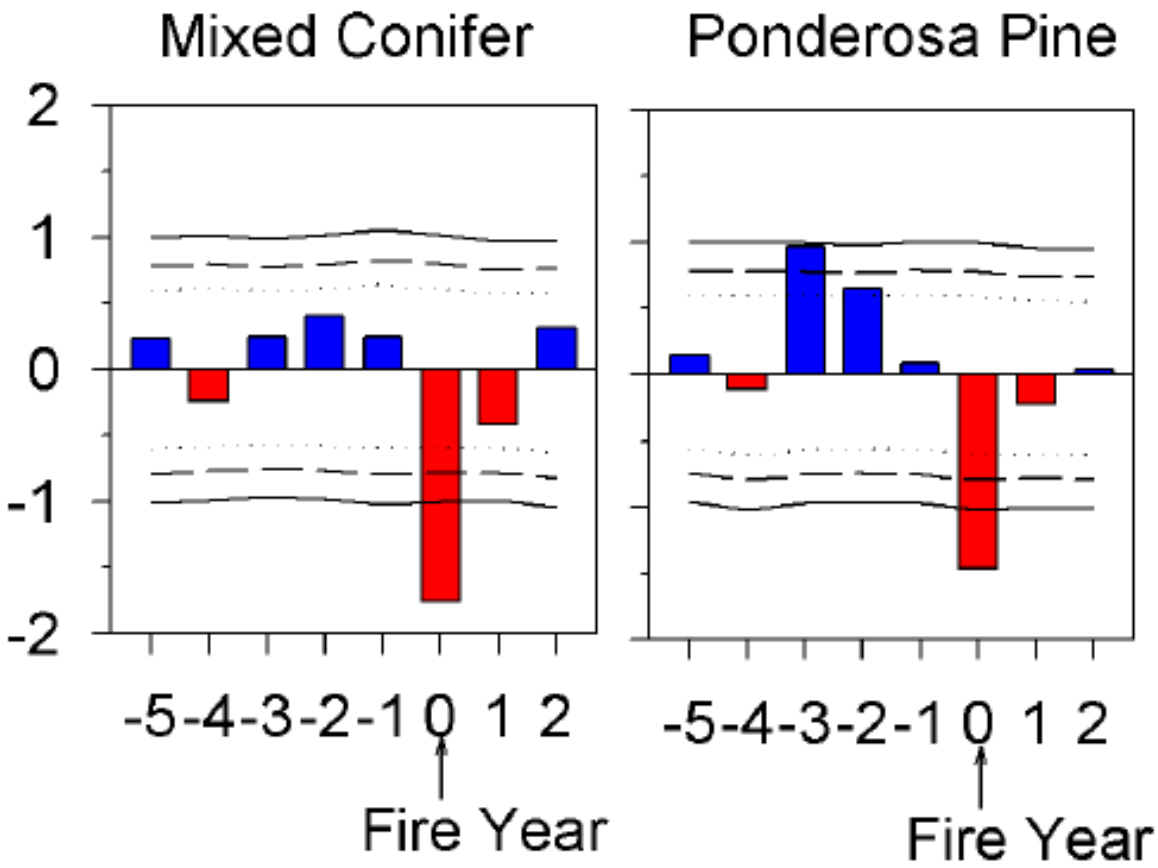
Years of high fire synchrony



Fire-scar network for SW:



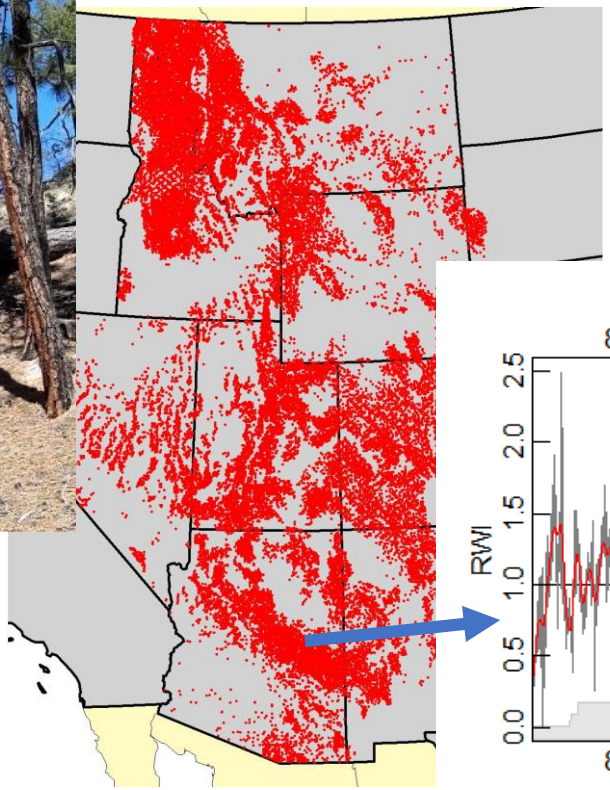
Fire-climate relationships:

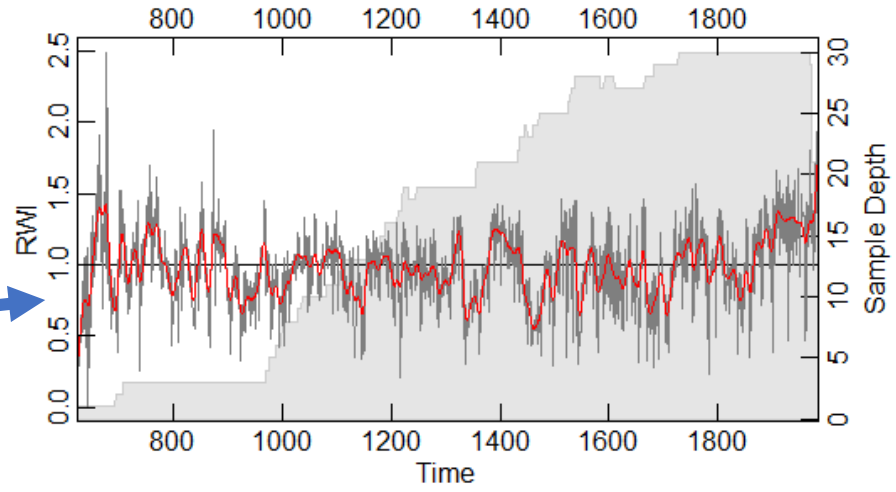


FIA data: merging of tree-ring data and ecological modeling

→ Estimate future growth and vulnerability to climate change

rich metadata
spatial replication





Questions?

Advantages of dendro methods

- Seasonal to annual resolution
- Can scale up to landscape and region
  → different patterns and influences emerge at different scales
- Long-term perspective