

Applications of tree-rings for natural resource management

- In, general tree-rings can provide a point of references to pre-fire exclusion/pre-logged forests and fire regimes



Should we manage to try to prevent large crown fire patches in some forest types?



Cerro Grande Fire, Los Alamos, NM 2000

What are the effects of fire suppression?



Do we need to thin and/or burn and where?



What burn severities and fire intervals should we prescribe?



How soon could this re-burn?



What type of fire regime and forest structure did T&E species evolve with?



Jemez Mountain Salamander

Photo credit Chris Newsome

Specific applications of tree-rings for natural resource management

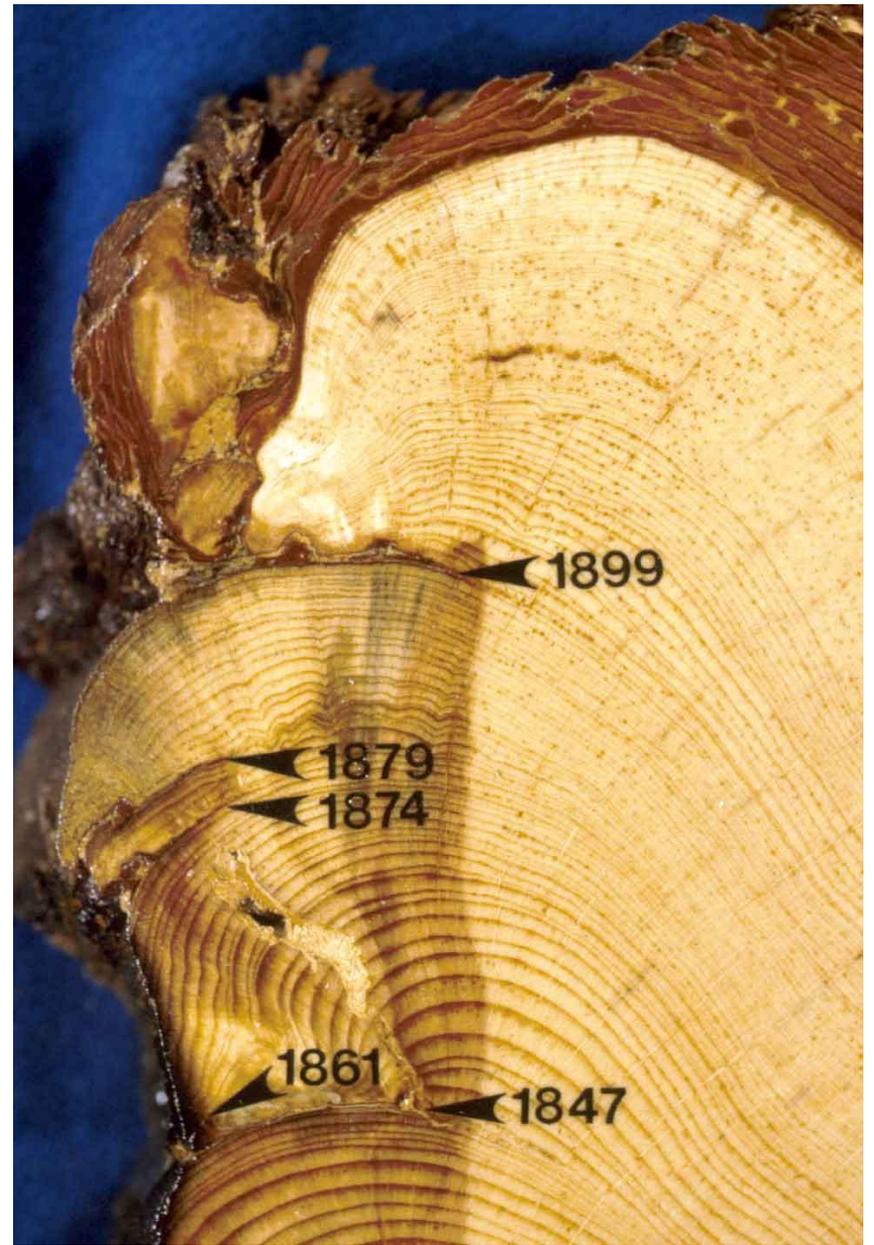
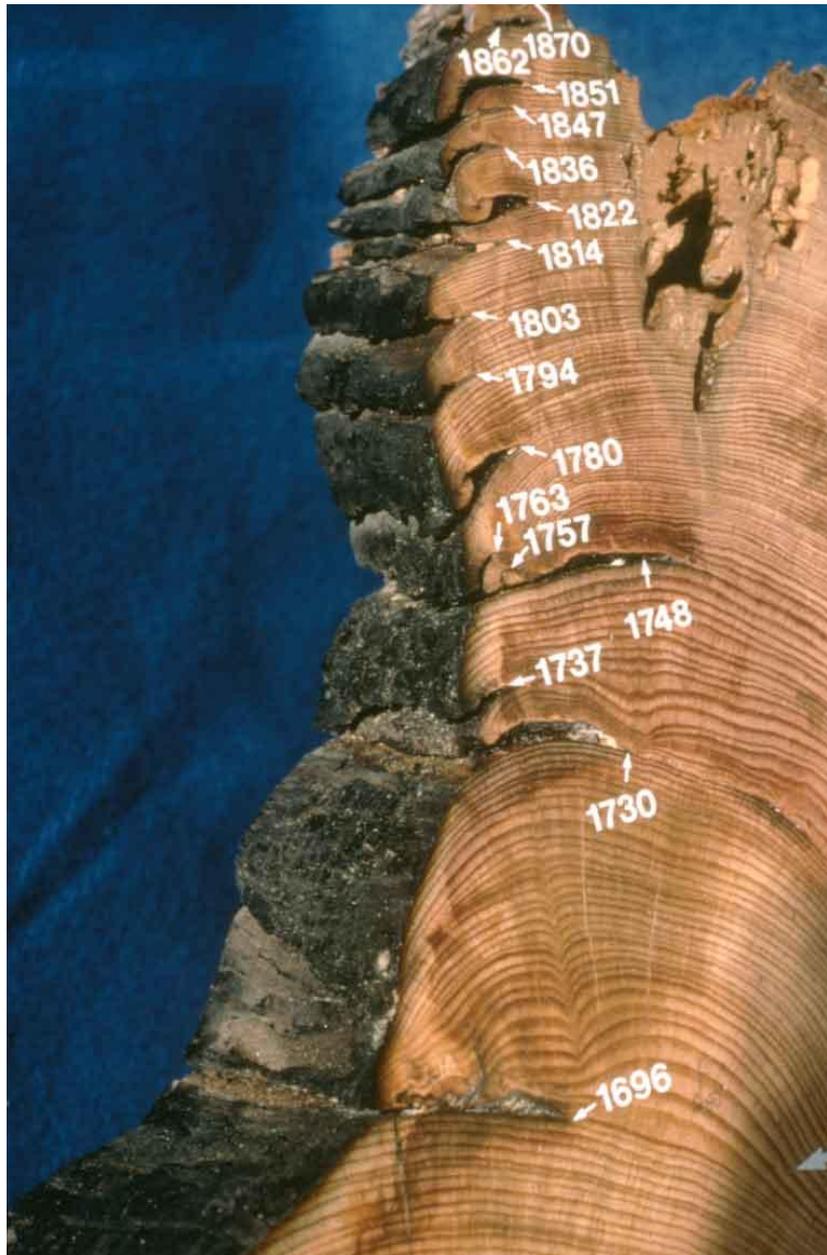
- Guide fire management
 - Is the fire regime outside of the historical range of variability?
 - Should we use prescribed fire? How often, how big, how hot, what season?
- Guide forest restoration
 - Should we thin? And to what density and composition?
- Reconstruct habitat of the Jemez Mtn Salamander
 - Has it changed due to fire exclusion?
- Set diameter cap on fuel wood harvesting (< 120 yrs old, cm drc)

Tree-ring reconstruction of past fires

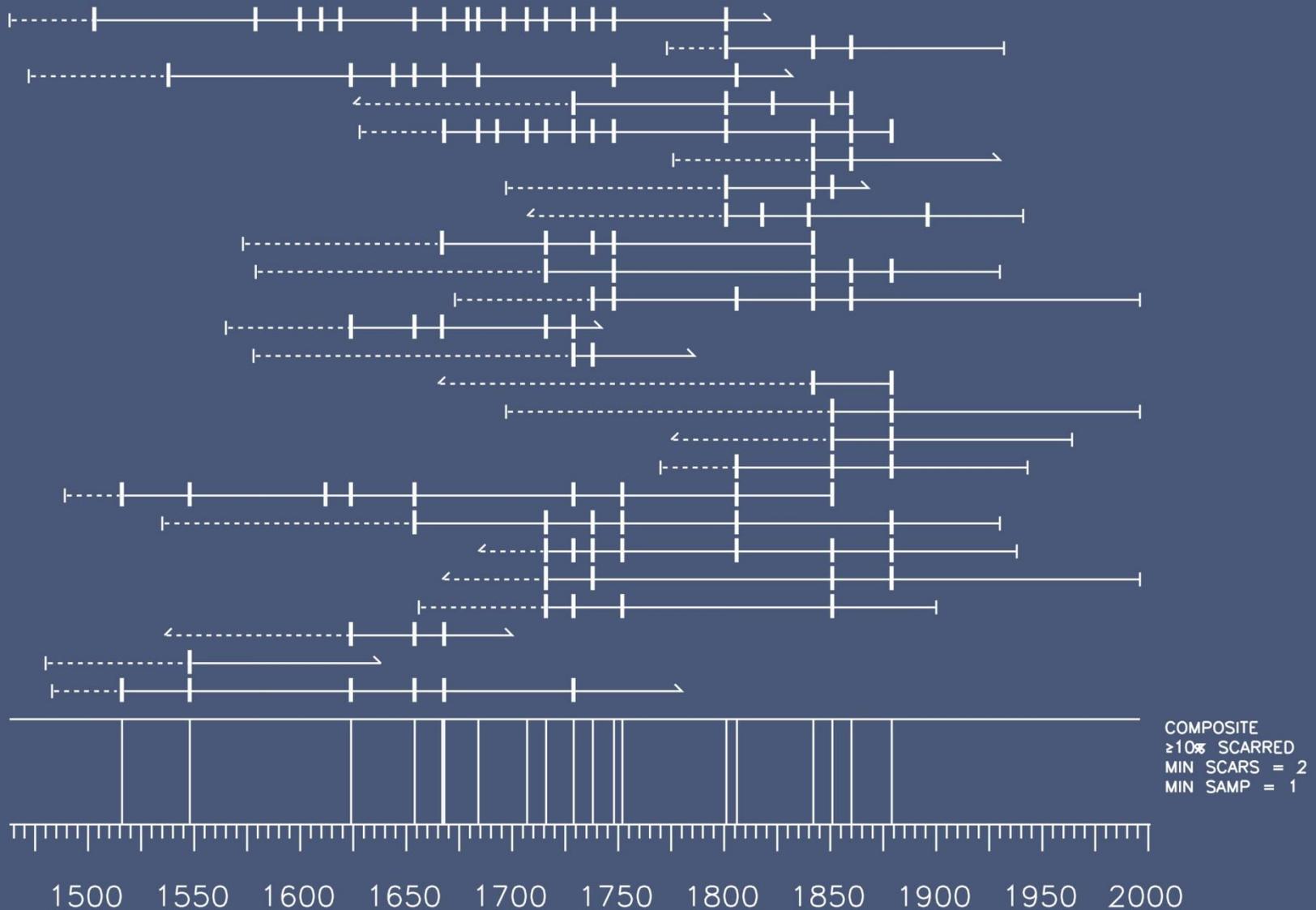
- Fire scars







Alamo Bog Fire History



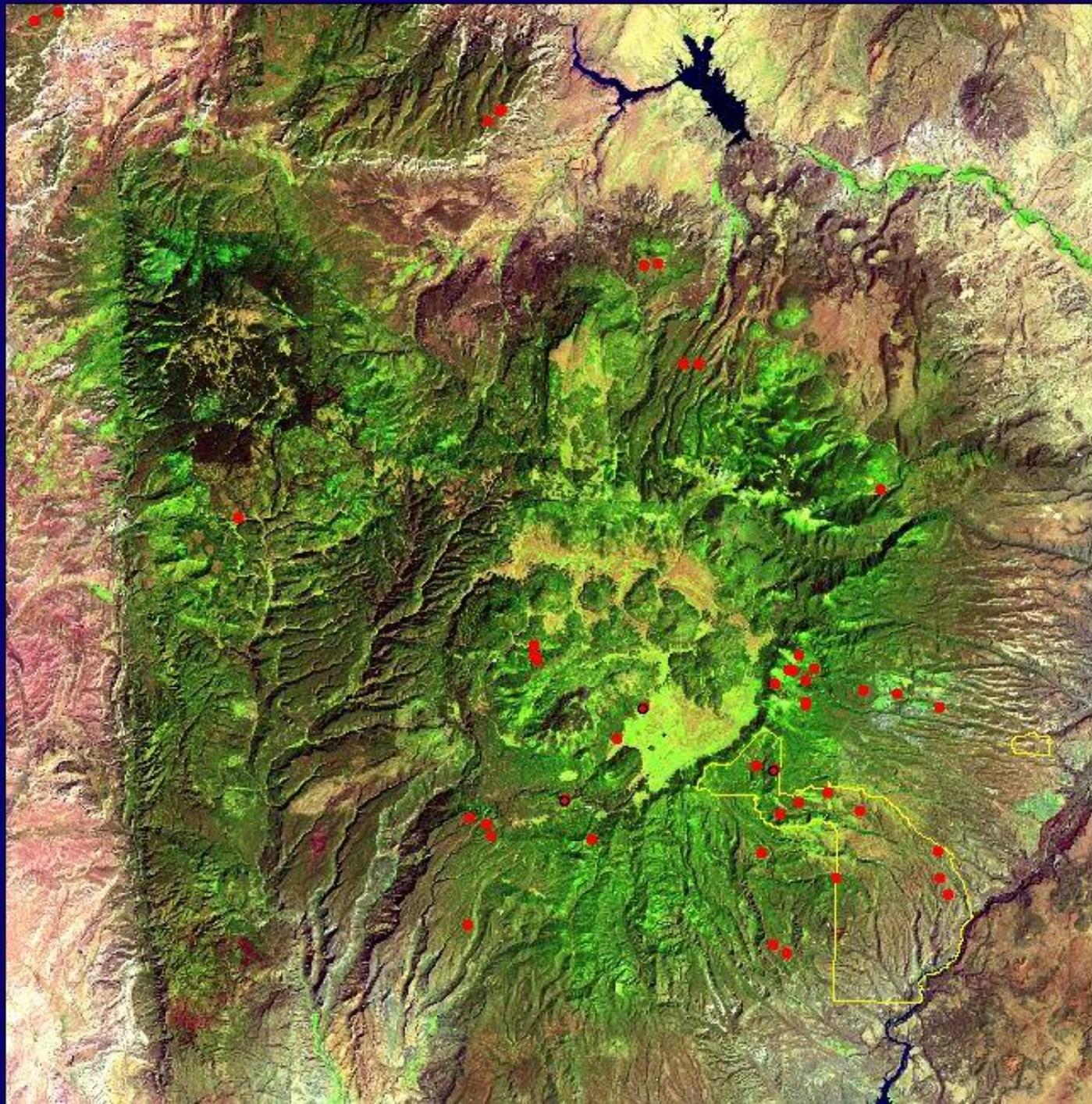
Can determine fire frequency and even seasonality

What time of year did historical fires occur?

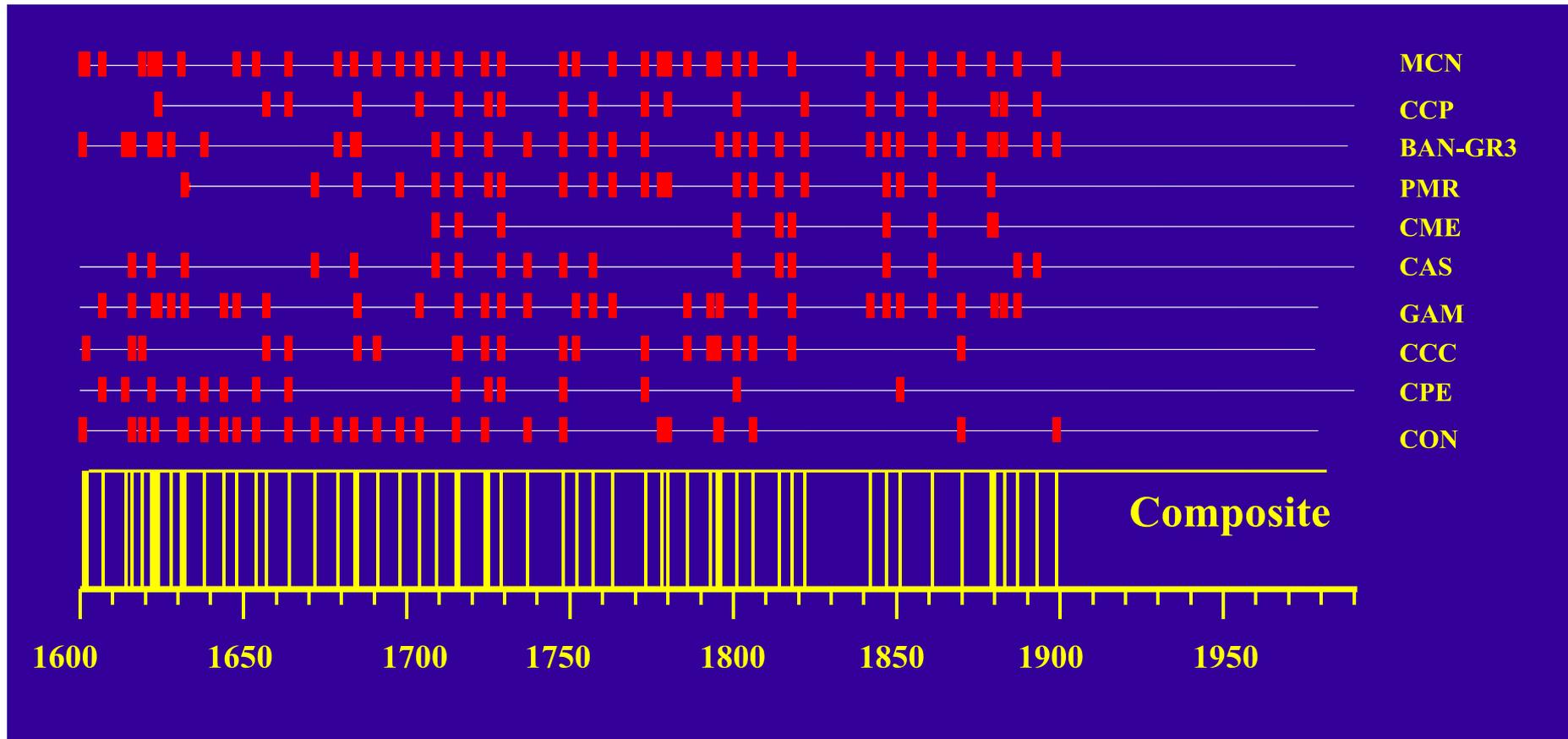


More fire history sites in the Jemez Mtns than any mountain range in the U.S. (World?)

RED DOTS =
FIRE-SCAR
SAMPLE
SITES



Composite fire scar chronologies from 10 forest stands In the Jemez Mountains, New Mexico



Fires historically burned across the Jemez
All fires stopped by 1900 – overgrazing

There were more than 6 million sheep in Arizona & New Mexico in 1900.



B. BAND OF 2,200 SHEEP.



1990

Biondi, F. 1999. Ecological Applications 9: 216-227



Aspen Fire, June 2003



Rodeo-Chedeski Fire
June 2002

So what do the tree-rings tell us about Jemez fire regimes?

- SW ponderosa pine forests historically burned in spring/early summer with frequent low severity fires that kept the forest open
- Fire exclusion, first by grazing, then by active suppression has altered this important process
- Result: no fire, lots of small trees and then it all blows up!!!
- Possible management action: restore frequent, low severity fire regime, which will reduce and maintain tree densities

How does any of this relate to the Jemez Mountain Salamander????

- Jemez Mtn Salamanders don't all live in ponderosa pine, so what was the fire regime in the wetter mixed-conifer forests where they are often found?
- Have mixed-conifer fire regimes and forests changed like ponderosa pine?

We're using tree-rings to try to answer these questions

Los Griegos
Wet Mixed-
conifer forest:

Giant Doug-fir and
young aspen and
mixed-conifer
species – fire scars
rare



Oat Canyon -
Wet Mixed-
conifer
forest:



It's likely that some of these sites were naturally more dense and had some high severity fire, which suggests that they may not need restoration

Twin Cabins Dry Mixed- conifer forest:

White pine on
ridgetop with multiple
fire scars - possibly
burning less
frequently than
ponderosa pine with
mixed-severity on
steeper slopes



Summary - tree rings provide valuable information to guide management

- Fire management
 - Identify departure from historical fire regime (or not)
 - Define historical fire regime: frequency, size, severity, seasonality – use to guide burning
- Forest restoration
 - Determine thinning density and composition prescriptions
- Reconstruct structure and composition, and fire regime of historical Jemez Mtn Salamander habitat
 - Has it changed due to fire exclusion?
- Set diameter cap on fuel wood harvesting (< 120 yrs old, cm drc)