
*Image courtesy of Henri Grissino-Mayer, UTN*

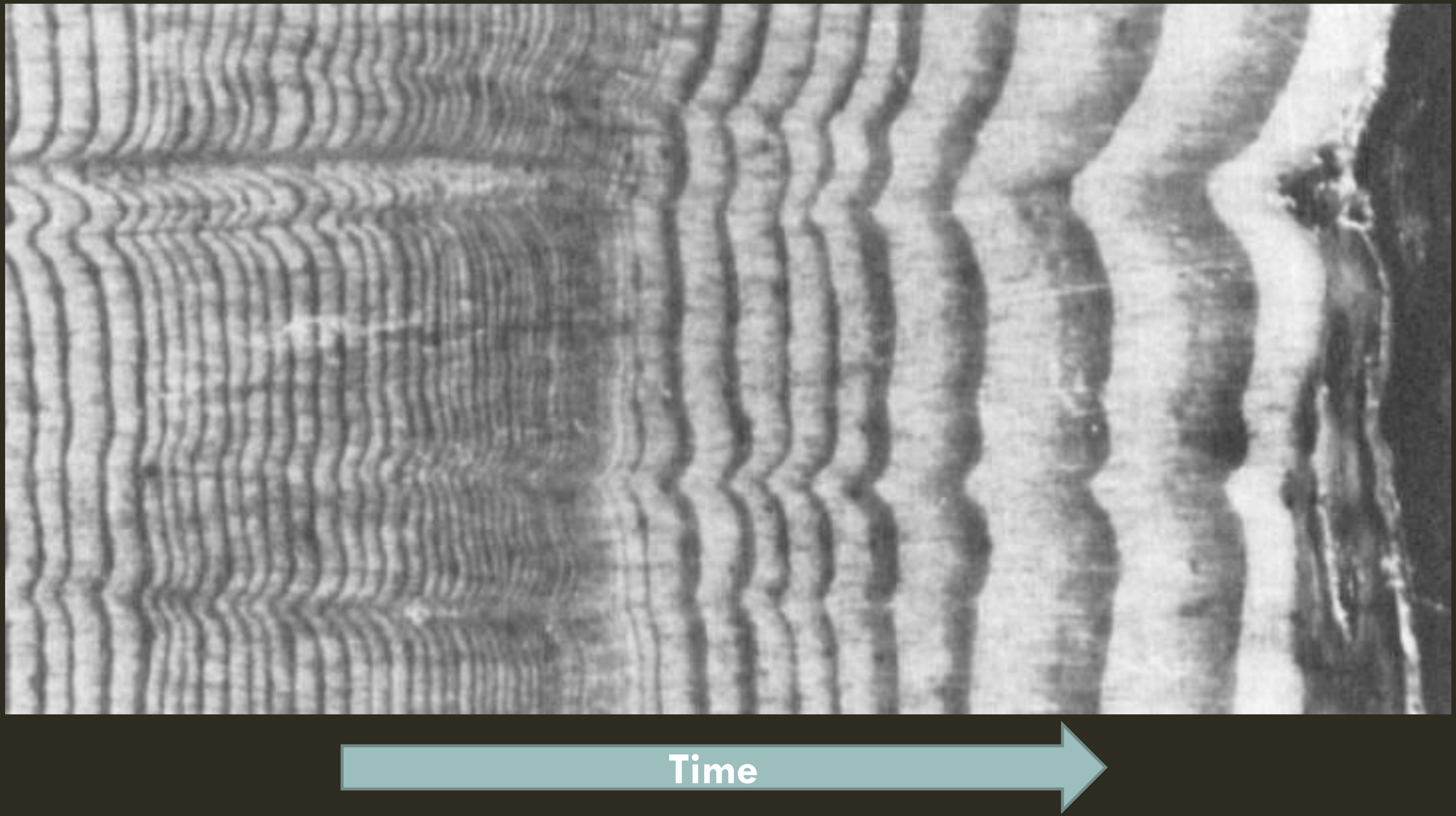



*Image courtesy of Scott St George, U. MN*

# DENDROECOLOGY

## STAND DYNAMICS

Large and small scale disturbance

Recruitment and declines

Changes in demography, composition and importance

February 1999 COMPARING TREE-RING AND INVENTORY DATA 223

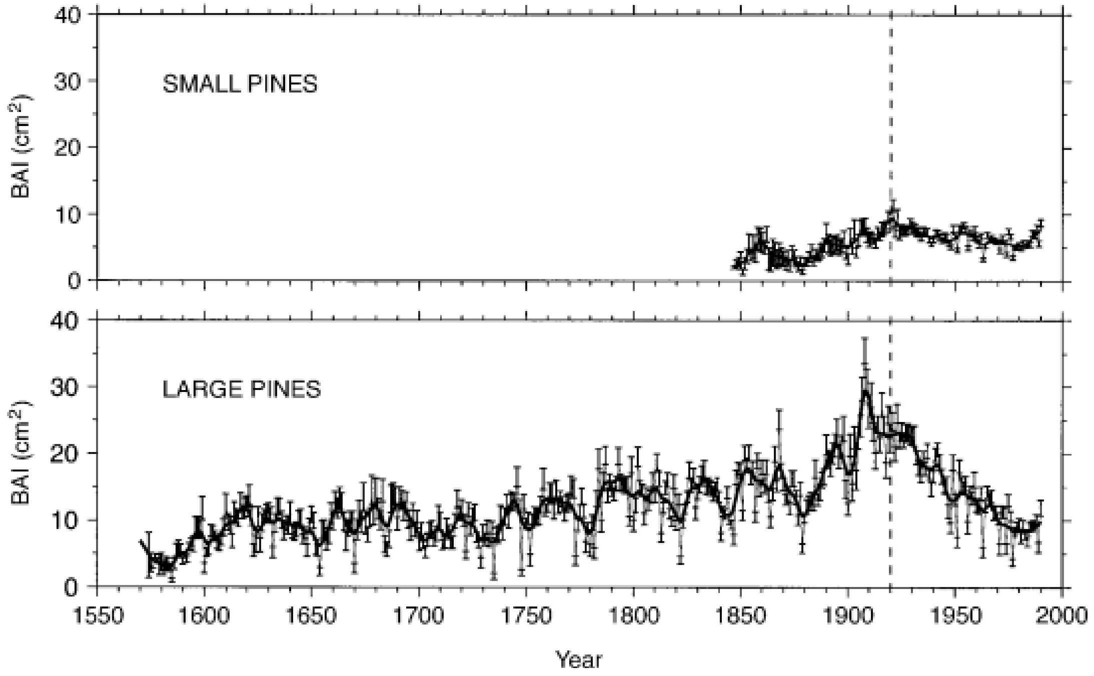



FIG. 6. Tree-ring chronologies for the whole period of available records, computed as the average of ring-area series. Standard error bars (±1 SE) are plotted to show variability of annual values. It is evident that pines with 1990 dbh >50 cm (LARGE PINES) were much older and experienced a greater growth decline in the last century than pines with 1990 dbh <50 cm (SMALL PINES). Tree-ring patterns over the last 400 yr reveal that the 20th century has been unique and suggest that the extreme growth decline experienced by large pines is partly a return to normal growth rates after the growth surge of the early 1900s.

*Biondi 1998. Comparing tree-ring chronologies and repeated forest inventories as forest monitoring tools. Ecological Applications*

*Images courtesy of Henri Grissino-Mayer, UTN*

# DENDROPYROLOGY

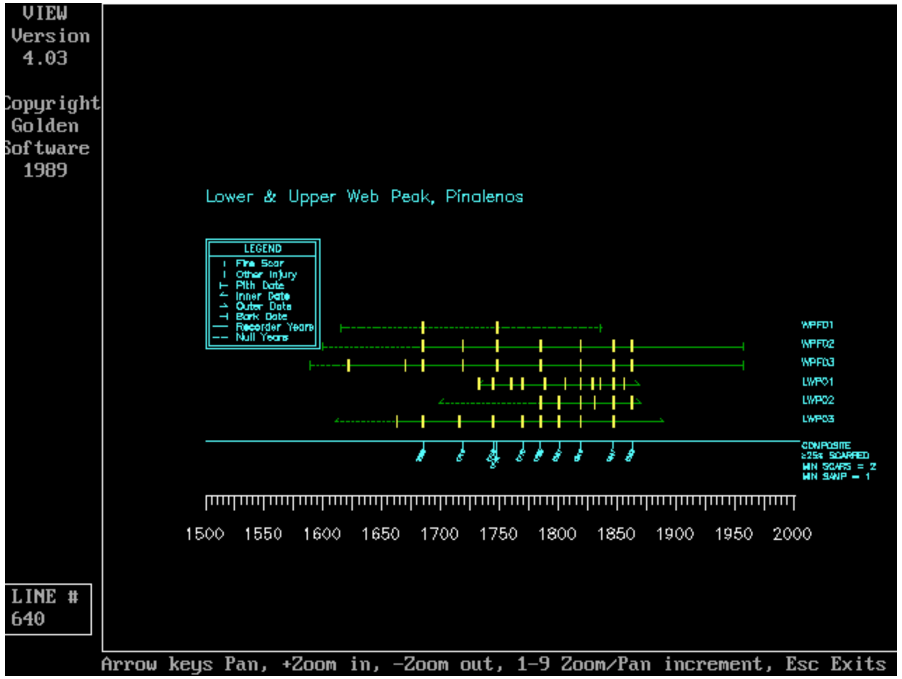
## FIRE SCARRED TREES

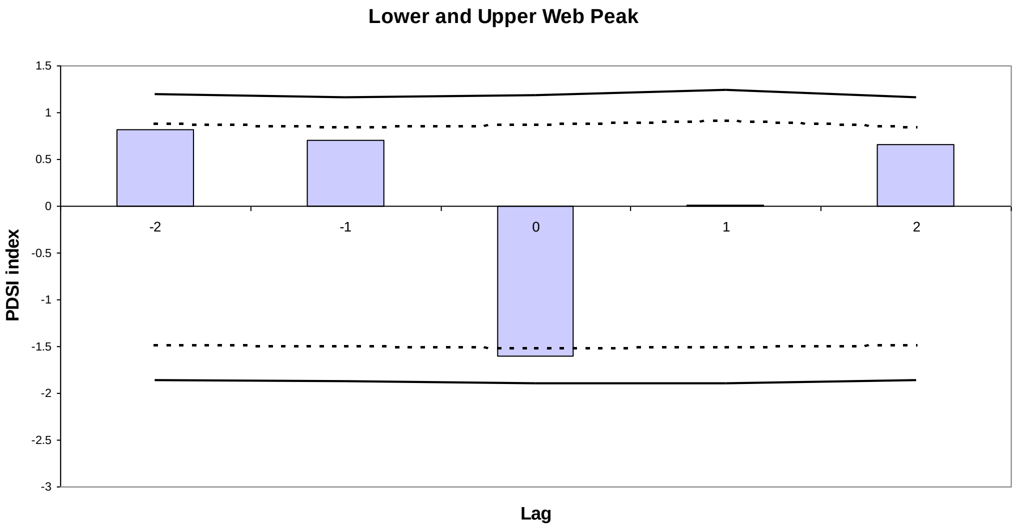
Scale (spatial and temporal)

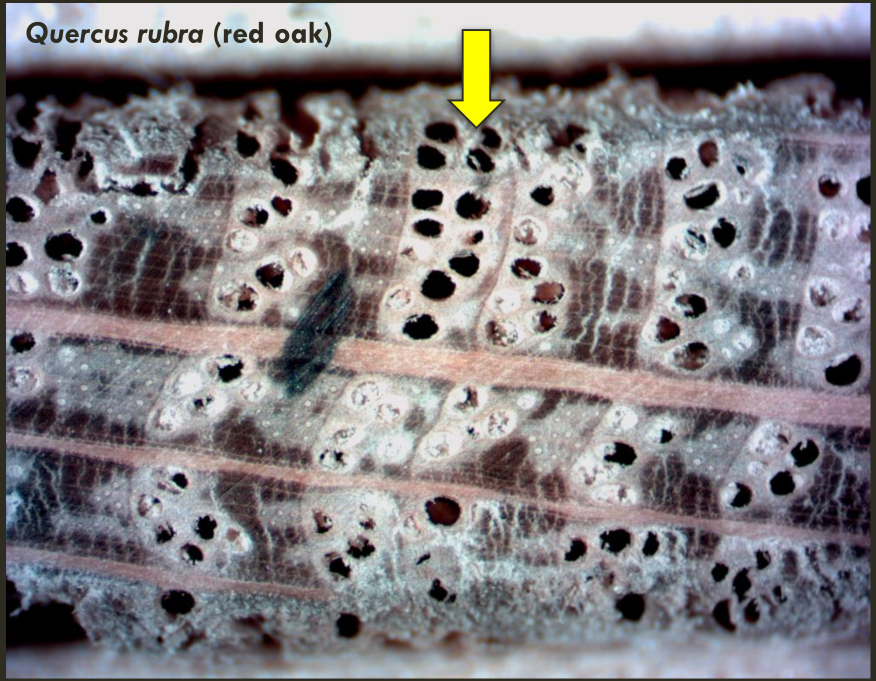
Frequency, Intensity, Seasonality

Drivers (climate, fuels)

Figures (top) fire history from Sky Islands (AZ), (bottom), superposed epoch analysis showing relationship between drought conditions and fire







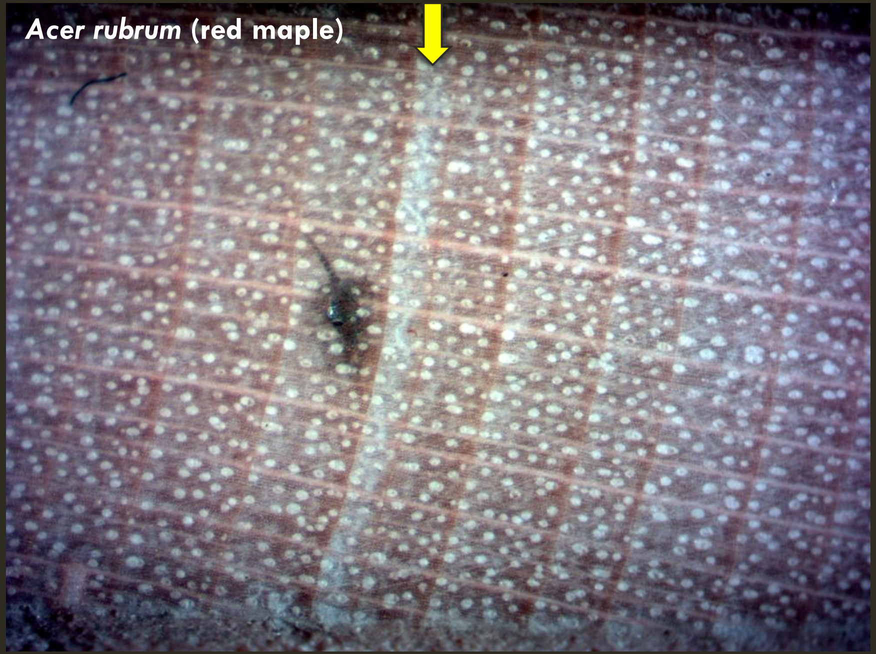




*Image courtesy of Daniel Bishop, Harvard Forest / Columbia University*

# DENDROENTOMOLOGY

## TREES LIMITED BY INSECTS

Defoliators (spruce budworm, forest tent caterpillar, gypsy moth)

Cambium feeder (spruce beetle, mountain pine beetle)

Root parasite (periodical cicadas)

408 THOMAS W. SWETNAM AND ANN M. LYNCH Ecological Monographs Vol. 63, No. 4

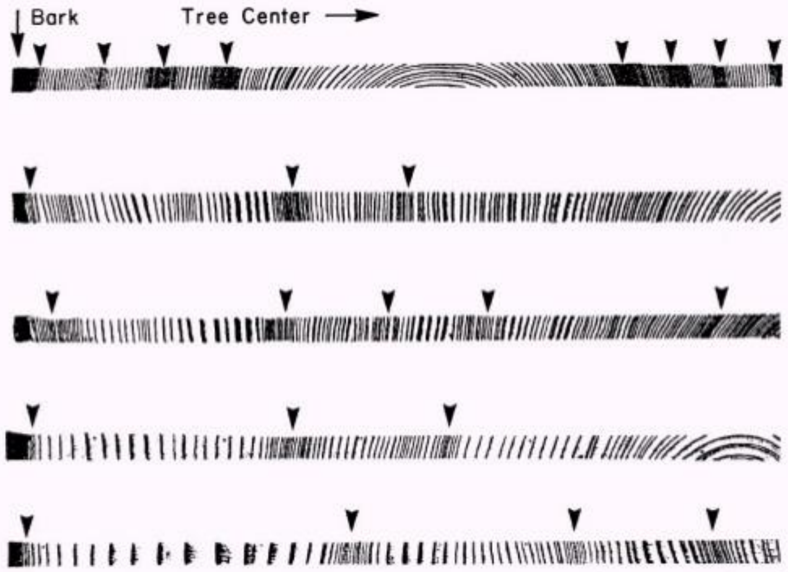



FIG. 2. Increment cores from five trees in stand numbers 2 and 20 with periods of pronounced and sustained growth reductions due to defoliation by western spruce budworms (arrows). Increased growth is also evident following many of the reduced growth periods.

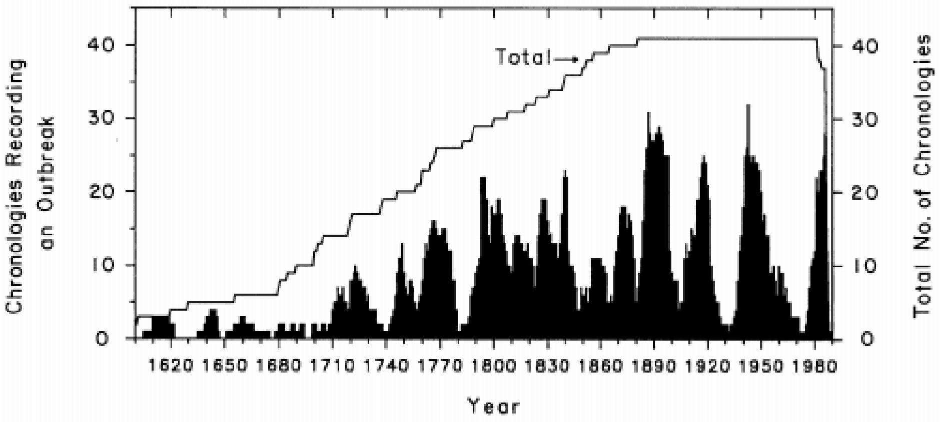



FIG. 8. Regional western spruce budworm outbreak occurrence in northern New Mexico, 1600–1989. The number of tree ring chronologies recording an outbreak were summed for each year to produce this series. The line above the area graph is the total number of chronologies sampled.

*Swetnam & Lynch. 1993 Multicentury, Regional-Scale Patterns of Western Spruce Budworm Outbreaks. Ecological Monographs*

# SNOW AND INSECT OUTBREAKS IN CENTRAL OREGON

Collaborators: Dr. Jim Speer (**Indiana State University**), Dr. Lawrence Winship (**Hampshire College**)

Clark, P.W. , J. H. Speer, L.W. Winship. 2017 *Extracting Climate and Pandora Moth Outbreaks from A 1,500-Year Long Ponderosa Pine Chronology from Central Oregon*. Tree-Ring Research

Related Works:

Speer, J. H., T. W. Swetnam, B. E. Wickman, and A. Youngblood. 2001. *Changes in Pandora moth outbreak dynamics during the past 622 years.* Ecology

Speer, J. H. and R. L. Holmes. 2004. *Effects of Pandora moth outbreaks on ponderosa pine wood volume*. Tree-Ring Research


INNER RING: 435CE
OUTER RING: 985CE

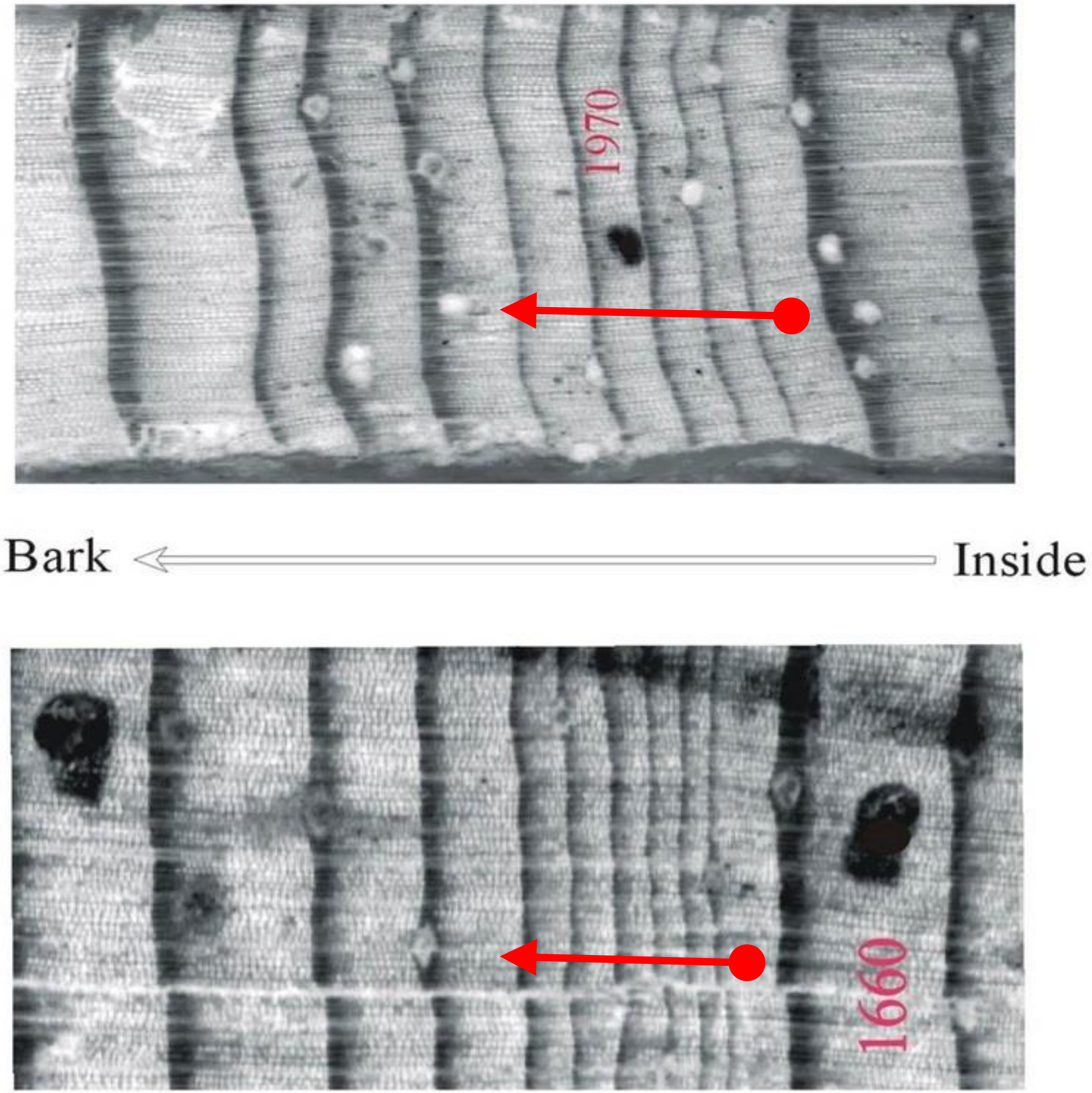
# PANDORA MOTH

# PANDORA MOTH OUTBREAK SIGNAL IN TREE RINGS

Year 1: Reduced latewood

Year 2: Fifty percent reduction in ring width compared to Y-1

Years 3 through 4-20: gradually resume to normal growth

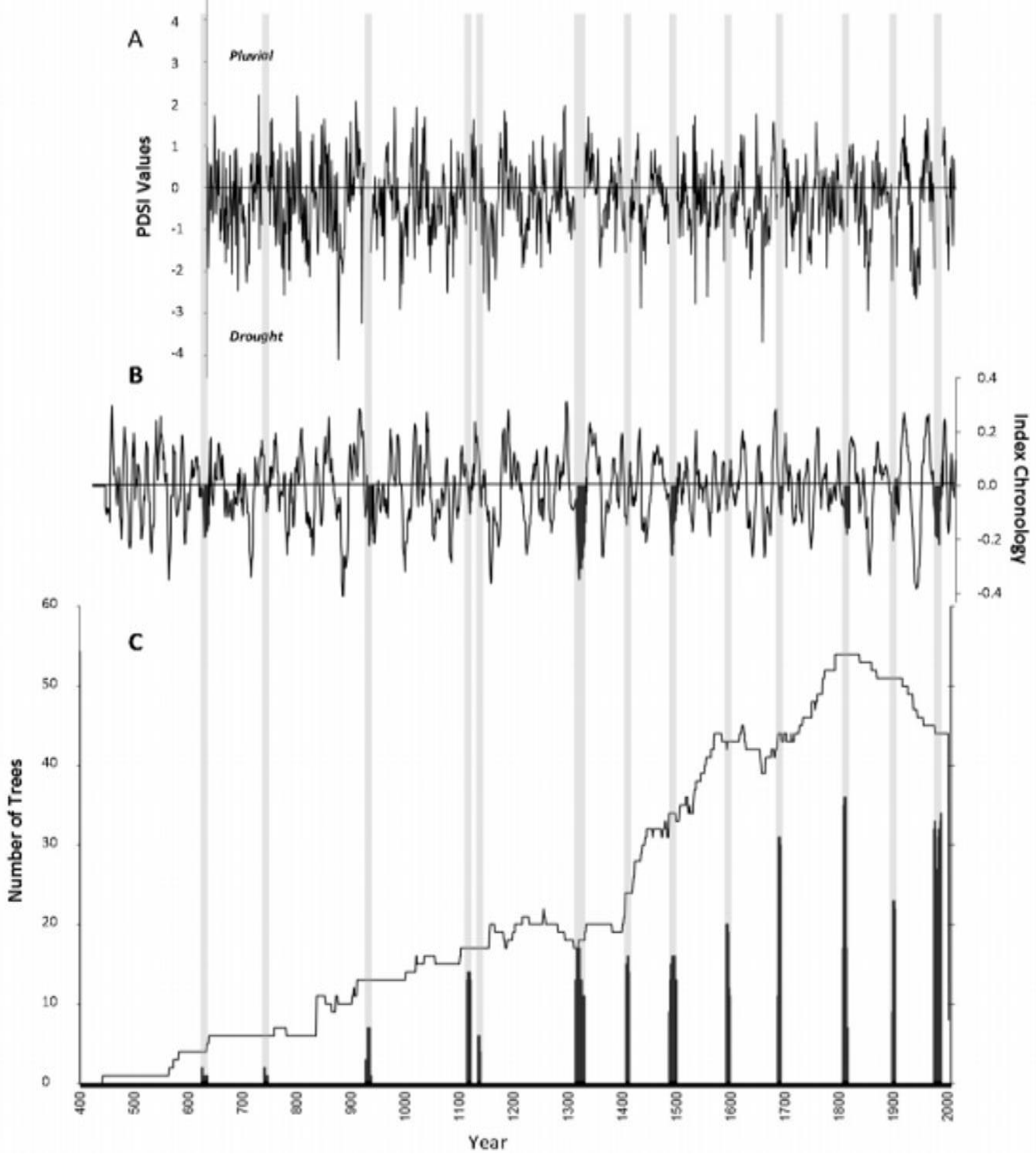


# PANDORA MOTH AND SNOWPACK RECONSTRUCTED

**A** The 1,376 year reconstruction of Fall to Spring Drought

**B** A 5-year running average of the final chronology with pandora moth outbreaks shaded in black.

**C** The number of trees recording pandora moth outbreaks (bars) as compared to total sample depth. The gray bars show the timing of pandora moth outbreaks across all three graphs.



# IMPLICATIONS

Ponderosa pine extremely long lived and preserved

Contributes to natural range of outbreak variability of endemic insect

Methods for decoupling limit factors in tree growth

# QUESTIONS?