TREE-RING RECORD OF DROUGHTS AND SEVERE WINTER STORMS IN THE OUACHITA MOUNTAINS SINCE 1745

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Severe winter storms cause serious damage to trees, timber, power lines, and transportation systems each year. In the Ouachita Mountains, historical records of these storms extend back only 117 years, and many of them are of low-quality or have missing data. Dendrochronology helps fill in and correct the historical record by providing a severe winter storm signal in *Pinus echinata* Mill. that extends back to 1745. Drought may be associated with the occurrence of severe winter storms, creating similarities in tree-ring patterns. Using the Palmer Drought Severity Index (PDSI) to de-trend tree ring data may remove the severe storm signal along with the drought signal. The winter storm signal is consistent with injury to the tree by trunk breakage, branch loss, and bending. Except for storm year, trees that break have wider growth rings than those that don't, suggesting greater exposure to ice accumulation. Missing rings on high-quality sites occur only in years with severe storms. The winter storm signal is:

$$R_i = (Y_i + Y_{i+1}) / (Y_{i+2} + Y_{i+3}) \quad (1)$$

where: R_i is the ratio of ring width in the 2 years after the storm to that of the succeeding 2 years, and Y_i is the ring width of the year of the storm.

Values of R_i usually run between 0.700 and 0.900. The proportion of R_i values that exceed an index value, usually between 0.100 and 0.300, determines whether Year *i* had a severe storm. The Index value is chosen to maximize the number of correct predictions of historical storms. Major winter storms occurred once in 16 to 20 years; two out of three known ice storm years produced trunk breakage, giving a probability of 0.042 that an ice storm will cause damage to Ouachita shortleaf pines in any given year. Tree rings permit estimation of annual precipitation and low temperatures and identification of years with severe winter storms. Future research might make it possible to distinguish between wind storms, ice storms, and other severe storms and estimate precipitation by season. Tree-ring chronologies are a powerful tool for weather and climate studies at a finer scale than is possible with any other method or proxy.

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