Abstract Title:
Twentieth Century Changes in the Climate Response of Yellow Pines in Great Smoky Mountains National Park, Tennessee

is part of the Paper Session:
Dendrochronology I: Dendroecology I

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Abstract:
Previous dendroclimatological research has shown that tree growth is primarily a function of temperature and precipitation. This study evaluates yellow pine climate-tree growth relationships at five sites on the western end of Great Smoky Mountains National Park using correlation, response function, moving correlation, and wavelet analyses. Winter mean minimum temperatures influenced yellow pine growth at all five sites, but spring precipitation and growing season moisture conditions also affected growth. Growth was positively associated with Atlantic Ocean sea surface temperature anomalies (SSTAs) and North Atlantic Ocean (NAO) index values, suggesting that positive phases of the both the Atlantic Multidecadal Oscillation (AMO) and the NAO lead to above average annual tree growth. Pacific Ocean climate variability did not have a strong influence on yellow pine growth in Great Smoky Mountains National Park. Climate-growth relationships were temporally unstable at all of the five sites. In the mid-20th century, the response to growing season precipitation and moisture conditions weakened. Simultaneously, the response to winter and fall mean minimum temperatures strengthened. The shift may have been influenced by an AMO phase change, age-dependent climate responses, changes in phenology, decreased drought frequency, data quality, atmospheric pollution, or site characteristics. Because the relationship with temperature strengthened since 1950, yellow pines in Great Smoky Mountains National Park do not show evidence of divergence between temperature and tree growth. Still, this network of chronologies is not ideal for climate reconstruction because the climate-growth relationships were unstable over time.

Keywords:

dendrochronology, tree rings, climate, divergence

New Query