

Lake States Fire Science Consortium

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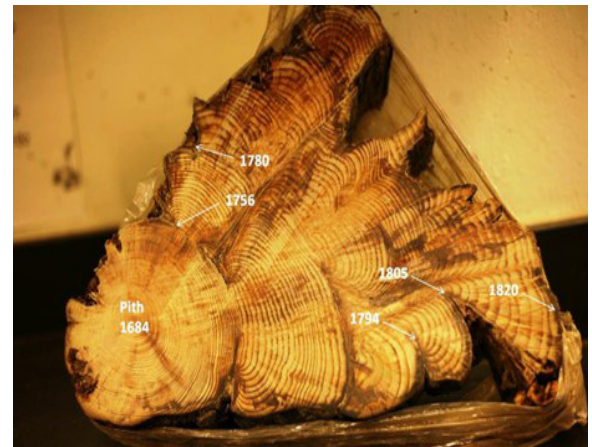


Interactions between fire, human activity, and climate in the Great Lakes region

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The fire history of a region allows us to understand patterns of how past fires occurred and how those patterns have changed over time. Because many of the forests in the Great Lakes region experienced large influences of Native American communities on fire occurrence, the specific effects of European settlement and climate on fire occurrence patterns over the past 300 years are uncertain. Researchers from the University of Missouri used dendrochronology (the science of dating tree rings) to date fire occurrences and tie them to specific years and climate conditions in northern temperate forests in northern Wisconsin, USA.

Tree chronologies were built across four forest sites in the Chequamegon-Nicolet National Forest in Wisconsin, USA. Tree cross-sections were collected from 98 live and remnant red pine (*Pinus resinosa*) stems and the spacing between the annual tree rings was used to build a continuous dating record starting in 1591. The researchers identified 465 fire scars across 98 trees, over the 426 year chronology, and found that fire scars occurred only between the years 1591 and 1948. The period of time with the lowest number of fires was from 1665 to 1718, and after 1920. The period of time with highest fire occurrence occurred between 1719 and 1820. Out of 54 years in which fire events occurred, 30 fire-years occurred during dryer periods and 24 during wetter ones. Few burn scars occurred in younger stands (<100 years old), indicating the absence of fire in Northern Wisconsin region since the reestablishment of Wisconsin forests after the cut-over of the 19th century. Additionally, the authors found that red pine recruitment and regeneration occurred after large fire events in at least two of the study sites.



MANAGEMENT IMPLICATIONS

1. Drought and climate are directly tied with fire severity in the sandy outwash plains of Northern Wisconsin, with drier years being more likely to experience fire events compared to wetter years.
2. Human activity was historically (and is currently) highly correlated with fire ignition.
3. The average time between fires prior to 1937 was approximately 10 years. After the early 1920-1930s, this fire return interval increased to over 44 years. Thus, the timing of fire application should be related to the management goals of the forest/landowner.

Want to learn more?

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The dates and distribution of these fire scars is related to both the climatic conditions of the region and the human population dynamics of the time period. Periods of peak fire occurrence were related to the migration of the Fox and Sauk tribes into northern Wisconsin between 1660 and 1775. A sharp decrease in fire levels in the 1770s and 1780s corresponded with a massive smallpox epidemic in the region, followed by the subsequent recovery of tribal populations. Fire frequency decreased after 1925 (i.e., only two fires in 85 years). The researchers found that fire occurrence was related to climatic trends, with drier periods having more fires than wetter periods, which was in agreement with existing fire chronologies across the Great Lakes region. The researchers found that drought was the best predictor of fire severity during years in which fires occurred. However, fire frequency was mainly controlled by non-climate factors.

Reference

Guyette, R. P., Stambaugh, M. C., Dey, D. C., Marschall, J. M., Saunders, J., & Lampereur, J. (2016). 350 years of fire-climate-human interactions in a Great Lakes sandy outwash plain. Forests, 7(9), 189.