

Old-growth tree stumps tell the story of fire in the upper Midwest

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The researchers reconstructed the fire history of Hamilton County, Illinois, by examining fire scars and the growth rings of 36 old-growth trees. Credit: L. Brian Stauffer

Researchers have constructed a 226-year history of fire in southern Illinois by looking at fire scars in tree stumps. Their study, the most in-depth fire history reported for the upper Midwest, reveals that changes in the frequency of fires dating back to the time of early European settlement permanently altered the ecology of the region.

The researchers took advantage of a 1996 [timber harvest](#) of old growth post oak trees in Hamilton County.

"I was just amazed at the [fire](#) scars in these trees," said William McClain, a botanist with the Illinois State Museum who led the study

with researchers John Ebinger and Greg Spyreas, of the Illinois Natural History Survey at the University of Illinois. "I knew that the information that was in these tree trunks was really, really valuable."

McClain counted growth rings, fire scars and other distinguishing features of 36 of the old-growth post [oak trees](#) that had been cut. Luckily for the researchers, the fire-damaged trees had repeatedly healed, retaining their heartwood despite having been badly injured by numerous intense fires.

McClain is an expert in the fire history of Illinois and surrounding states, having collected and published accounts of fires from numerous historical records.

"These are written accounts of observed fires that record the date and location of each fire," he said. "And there are a significant number of Indian-started fires."

The new study, in the journal *Castanea*, confirms that the people who lived in Illinois before European settlers arrived were in the habit of setting fires in the region nearly every year, with fires in the Hamilton County woodland occurring at least every two or three years, McClain said. This repeated burning actually stabilized the prairies and open woodlands that dominated the region until the late 19th century, when the fire-suppression efforts of the new settlers allowed different plant species to take over, the researchers said.

The researchers found evidence of more than 100 fires in Hamilton County between the 1770s and 1996, when the trees were cut down. Prior to 1850, the woodlands burned roughly every two years. A "fire-free" interval followed between 1850 and 1885, as settlers rapidly colonized the area and suppressed fires.

Then in 1885, the fire scars appear again, probably as a result of the

localized burning of woodlots, which was a tradition in the region in the late 1800s and early 1900s, the researchers said.



William McClain (left), a botanist with the Illinois State Museum; with botanist John Ebinger and ecologist Greg Spyreas of the Illinois Natural History Survey at the University of Illinois, looked to tree scars for physical evidence of fires over a period of 226 years in southern Illinois. Credit: L. Brian Stauffer

"These smaller, less intense fires were probably started to enhance forage quality for livestock, improve visibility for hunting and to reduce the amount of flammable material in the underbrush," Spyreas said.

But by that time the previously "open woodlands," with limited shade and even a few prairie plants growing in the understory had become a dense forest with lots of shade. The shade-intolerant post oaks could not compete with fast-growing, shade-loving species, which until 1850 had been kept in check by the frequent fires.

After the brief period of fire suppression, only established post oaks could survive as other tree species closed in around them; the shade was already too dense for post oak seedlings to survive.

"We used to call these open woodlands 'barrens,' " Ebinger said. "And they were maintained by fires coming through, maybe not every year but at least every third year. Then, 30 years after the fires stopped, the barrens didn't exist anymore."

"For hundreds, maybe thousands of years, this was a stable post oak woodland," Spyreas said. "And then you have a gap of a couple of decades where there were no fires and suddenly the whole system is completely different. It's amazing how, from Kansas to Ohio, these ecosystems completely depend on fire to be stable."

More information: "Fire History of a Post Oak (*Quercus stellata* Wang.) Woodland in Hamilton County, Illinois,"
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