

Tree rings reveal forest fires from hundreds of years ago

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Like clues from an Agatha Christie mystery novel, trees can provide secrets about past events, and their rings are especially good at providing information about fires, some of which happened hundreds of years ago, according to studies from a Texas A&M University researcher.

With wildfires often in the news, Charles Lafon, associate professor of geography, has studied the fire history of forests throughout the southern and central Appalachian Mountains. He says [trees](#) can reveal key information about fire events, and some trees have a lot to tell — one tree he examined endured 14 separate fires through its lifetime. He has published the research in *Applied Vegetation Science and Physical Geography*.

Lafon analyzed the tree rings of several pine species and found clear evidence of "scarring," a disfiguring of the wood that is the unmistakable sign of a previous fire. More examinations showed that trees in the area had sustained numerous fires over the past centuries.

"We found one tree that has had at least 14 fires, and we found many other trees that had endured multiple fires," he explains. By piecing together the fire-scar record from numerous trees, he and his students and collaborators learned that fires occurred frequently, about once every 2-10 years. He found some trees with scars dating back to the mid-1600s. So far, they have not discovered any trees old enough to provide a record of even earlier fires.

"The fires probably were ignited by a combination of humans and lightning strikes," Lafon adds.

"We know that Indians often set fires to clear areas, and from records we have learned that the early settlers of the area also set fires so they could clear lands for grazing and planting crops," he says. "Eventually, by the late 1800s and early 1900s, there was a tremendous amount of logging because America needed a lot of timber at that time. Devastating fires accompanied the logging, and those fires motivated the fire protection campaign of the 20th century.

"The point is, there have always been fires in forests. Sometimes fires are a good thing because they are nature's way of starting over and producing new growth, and sometimes they are destructive."

Lafon says that interestingly, fires showed a dramatic decrease after the 1930s.

"That's about the time the U.S. Forest Service and other agencies started to increase public awareness of forest fires, and they introduced the 'Smokey the Bear' campaign to tell people that they could prevent forest fires," he says. "And when a wildfire did occur, they suppressed it to halt its spread. Their efforts worked — the trees show that it did because they are fewer fires in the last 50 to 70 years."

Lafon says tree rings can show if a fire occurred, and by taking several samples and cross-referencing them to other trees, it is possible to determine the precise year — and even the time of year — when a particular fire occurred. The trees, in turn, have adapted to fires.

"Many tree species that inhabit fire-prone areas have thick, protective bark," he points out. "Some trees depend on fires for their own reproduction. One such tree is the Table Mountain Pine. Through a

feature called serotiny, its cones often will not open to release the seeds unless they are heated by a fire, ensuring that the new seedlings emerge at an optimal time to survive and grow — right after a fire has cleared away the competing vegetation."

Likewise, the seeds of the Peters Mountain Mallow, a herbaceous plant related to cotton, require high temperatures, such as those produced by a fire, for germination, Lafon explains. Without fire, its reproductive efforts fail. In the early 1990s, the plant hovered on the brink of extinction before The Nature Conservancy began conducting controlled burns to restore it.

One of Lafon's graduate students used fire-scarred trees growing near the mallows to estimate how often fires burned the mallows in the past. The Nature Conservancy is using that research to guide their controlled burning program.

"The bottom line is that fire scars can tell us a lot about ecological changes," he notes. "We can tell when a fire occurred and often how severe that fire was, and we can learn how forests changed as fire frequency varied over time. The decline in fire frequency during the 20th century, for example, permitted tree species like red maple to encroach into pine and oak forests. Now the pines, oaks and other fire-associated species like the Peters Mountain mallow are declining in abundance, reducing the commercial value of the timber and diminishing the quality of wildlife habitat.

"Today, agencies like the U.S. Forest Service, the National Park Service, The Nature Conservancy and private landowners use controlled burning to try to restore the fire-associated vegetation. They are applying our [fire](#) history research to guide these efforts."

Provided by Texas A&M University

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