New study: Controlled burns may not help oaks

Morton Arboretum research finds fires may hinder growth

By Patrick M. O'Connell
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A new study from the Morton Arboretum suggests frequent controlled burns in forests have a more nuanced effect on the woods than previously understood, changing the soil in unexpected ways that may hinder the growth of oak trees.

The research indicates annual fires, one of the most common woodland management tools, may have a negative effect on oaks.

The study does not suggest that land managers abandon controlled burns as a restoration tactic but indicates there are tradeoffs for oak trees and native plants. More research on how fires affect the soil, trees and plants in the different ecosystems of the Midwest is needed to better understand the interactions, said the study's coauthor, Meghan Midgley, a soil scientist at the arboretum.

"I think the challenge is figuring out the nuance," she said.

Controlled burns are used by forest managers as a way to help oak regeneration while reducing the number of invasive plants and shrubs, like buckthorn. Oak trees, once the dominant species in the Midwest, have suffered a drastic decline for years. They need sun and space to grow in both savanna and forest ecosystems, scientists said.

Midgley presented her findings last week at a gathering of representatives from area forest preserves, the Illinois Department of Natural Resources, the U.S. Department of Agriculture and conservation groups at the arboretum. The study was published Thursday in the journal Forest Ecology and Management.

"It's really hard to figure out whether the burning is helping or hurting the soil in the aggregate," she said.

The main goal of the 2015 study, which Midgley conducted with Quinn Taylor, a researcher at the arboretum that summer, was to look at the impact of controlled burns on the soil itself. Previous studies tended to focus on above-ground vegetation and fires' effects on growing trees and plants.

"Maybe there's a clue in the soil," Midgley said.

To conduct the study, she and Taylor took soil samples from 15-by-15 meter plots in the East Woods at the arboretum that have been burned nearly every year for 30 years and at an adjacent forest that has not been burned.

After analyzing and comparing the samples, the researchers found that annual burning increased soil nitrogen levels. Oaks had adapted to low levels of nitrogen, but the increase may deter oak seedling growth relative to other types of trees.

"In contrast with management goals, controlled burning often fails to enhance oak proliferation or decrease the abundance of invasive plants," the study says. Frequent, low-intensity burning, it concludes, "may produce soil environments that are incompatible with restoration goals."

Staff and scientists at the arboretum will be meeting to discuss the future of the annual burn area and whether to decrease the frequency of controlled burns.

Oaks are more resistant to fire than other hardwood species, and so controlled burns have been considered an effective way to help the native trees recover in the Chicago area and the Midwest, where they have been crowded out by elm and maple trees and fast-growing invasive plants. At one point, oak savannas, open vista landscapes punctuated with tall, sprawling, majestic trees, made up at least 27 million acres stretching from Ohio to Missouri. By one estimate, less than 1/100 of 1 percent remains.

A recently released report from the Department of Agriculture on Illinois forests said oak mortality is on the rise, particularly within large-diameter stands and among black oak and white oak. Mature oak trees continue to dominate the landscape, but there is little oak regeneration on the forest floor, according to the report.

Other oak research has focused on forests in southern Ohio and Missouri, Midgley said, but not in the upper Midwest or the forests around Chicago. The arboretum research helps provide a new glimpse into the effects of controlled burns on the forests in Illinois.

Midgley said future studies should focus on forests with different soil types to determine how fires affect soils there. The soil at the arboretum has a high clay content.

Jim Anderson, director of natural resources for the Lake County Forest Preserves, invited Midgley to head north to continue her research efforts on the varied forest lands in the northern suburbs.

Scientists in the forest preserves and state lands across the Chicago region have been working to restore oak ecosystems, and controlled burns are one technique used in the ongoing efforts. Research plots are already set up in Lake County, Anderson said.

The group that met at the arboretum, the Chicago Wilderness Oak Ecosystems Recovery Working Group, is mapping the region's oak habitats and targeting an array of suburban areas for specific restoration efforts. It is also working with private landowners to pay for restorations and help residents learn the techniques for returning their land to the native savannas and woodlands so oaks can thrive again.

Lydia Scott, director of the Chicago Region Trees Initiative, said Midgley's research can aid in these efforts by helping land managers and scientists determine how often to use controlled burns as a restoration tool.

"We don't want the message to be that burning is bad, because it's not bad," Scott said. "This is just more information we can use to determine how to make it more effective."

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Morton Arboretum staff conduct a controlled burn on the arboretum grounds. New research suggests burns may have a negative effect on the oaks they are intended to help.