

Starved for fire, Wisconsin's pine barrens disappear

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Daijiang Li tracks biodiversity in Central Wisconsin forests. Credit: Daijiang Li

A century spent treating wildfires as emergencies to be stamped out may

have cost Central Wisconsin a natural setting that was common and thriving before the state was settled.

Pine barrens once stretched like a scarf around the state's neck, from the northeast down across Central Wisconsin and up again northwest to Lake Superior. As recently as the 1950s, University of Wisconsin-Madison surveys conducted by botany Professor John Curtis and graduate student James Habeck described the sandy, open spaces dotted with pin oak and jack pine and dashed with the lavender of lupine and the purple of blazing star.

"We know that the pine barrens used to be common in Wisconsin before European settlement, but now only about 1 percent of the original area remains," says Daijiang Li, a current UW-Madison botany graduate student. With botany Professor Donald Waller, Li authored a study [in the journal *Ecology*](#) outlining the factors driving a deep shift in the increasingly rare plant communities that once inhabited the Central Wisconsin pine barrens.

Or, maybe, inhabited what was once pine barrens.

"We're talking about a dramatic change," Li says. "It's probably better to say these sites used to be pine barrens. These sites are so similar with the closed-canopy pine forests around them that these pine barrens may be gone."

Li spent the summer of 2012 revisiting 30 pine barren sites in Jackson, Juneau and Monroe counties surveyed by Habeck in 1958. Li could tell that the sites have been untouched by flame in the intervening years—an important absence in pine barrens.

"We don't have background information on how frequent fires were in this system, but in a study of similar habitat in Michigan they found you could

expect a burn every 22 years," Li says. "Based on the information we have from talking to landowners and the Department of Natural Resources and our examination in the field, none of the land in our study has burned since the 1950s."

The most important difference since the 1950s surveys, Li thinks, is the winking out of the sun—at least from the perspective of plants on what is now forest floor.

About half the land in typical pine barrens is covered by forest canopy. Canopy coverage at the Wisconsin sites in 1958 was around 55 percent. In 2012, though, Li and Waller found trees shading an average of 90 percent of the sites.

"At some point, we began putting out the fires," says Li, whose work is supported by the National Science Foundation as part of a long-term forest monitoring project led by Waller. "And then more shrubs came out. More fire-intolerant trees survived, and they got taller. And with less fuel for fires, the sites became less likely to burn."

In response, the shade-intolerant plants (which, in pine barrens, also happen to tolerate fires well) began to disappear. Li and Waller anticipated that shift and expected plant diversity to fall as fire allowed the forest canopy to spread. They found the opposite to be true.

"Species diversity did not change significantly at all," Li says. "Interestingly, when we look at one square meter at a time, we find even higher diversity than Habeck did in 1958."

The plants present at those sites, however, have undergone wholesale change. Woody species have replaced forbs like aster, and ferns that prefer dim forests are now abundant. Pin oak and [jack pine](#) have ceded top tree status to white and red pine and red maple.

In a broader sense, the sites have lost variety. The pine barren sites of the 1950s may have been less diverse on an individual basis, but there was more differentiation from site to site.

"The old sites differed environmentally because of the periodic nature of fire - some burned recently, some a little longer ago, some hadn't for a long time," Li says. "But with fire suppression, the canopy closed everywhere—leaving few differences from site to site. Overall, that supports less variety and fewer of the rare species that occupy pine barrens. As we found elsewhere in Wisconsin, our plant communities are becoming more homogeneous."

Provided by University of Wisconsin-Madison

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