

# UM ecologist has an idea for protecting Michigan forests as climate changes



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The Detroit News

Published 11 p.m. ET Dec. 3, 2022

A University of Michigan ecologist has advice for protecting Michigan's trees from the increasingly hot and dry weather that climate change will bring to the Midwest — let the trees get old.

Old trees are more resilient to extreme weather than their younger counterparts, according to a study by Tsun Fung Au, a postdoctoral fellow at the UM Institute for Global Change Biology published in the journal "Nature" on Thursday.

To understand how different trees weathered drought and hot temperatures, Au and his research partners analyzed more than 20,000 canopy trees, or those tall enough to get direct sunlight in a crowded forest, across five continents. They used tree rings to see how the trees of varying ages responded to droughts over the past century.



They found older trees — a designation that varies in years depending on species but in general means a tree that is more than 140 years old — were more able to withstand the dry, hot weather that will become more likely as the climate continues to change.

"We should stop cutting down forests anymore, because, as our paper has shown, even though we don't have much older forest, if we allow time to let them get older they will develop the resistance to climate extremes," Au said.

Like much of the Midwestern U.S., Michigan was heavily logged during the late 19th century. Michigan Department of Natural Resources Forest Planning Manager David Price calls it "the big cut era."

The state's forests are recovering, he said, and on average they continue to grow denser and older.

The state still has some small tracts of old-growth forests, such as 49 acres of mature white pine at Crawford County's Hartwick Pines State Park, some half-century-old white cedar trees at Sleeping Bear Dunes National Lakeshore and a 300 year-old white oak at Price Nature Center in Saginaw.

Michigan has more than 20 million acres of forest, according to a 2019 report by the U.S. Department of Agriculture. Most of it, roughly 61.5%, is privately owned. State and local governments own 23% and the federal government owns 15.5%.

The DNR manages roughly 4 million acres of forests through the state forest system, Price said. It harvests timber from 2.6 million of those acres.

It does not log the remaining 1.4 million acres. Those are the areas where more trees are left to age.



"We have a forest resource in Michigan that continues to mature and recover from the devastation of the big cut era," he said.

One reason older trees are protected from climate change may be because they have more time to develop root systems that can reach deep underground for water during droughts, Au said. Those root systems also make old trees better at transpiration — trees' process for carrying water from their roots to the undersides of their leaves.

Some of that water is released into the air, Au said.

"They can actually cool down their environment," he said. "That means they can buffer the drought effect if there are more older trees."

Old trees also store a lot of carbon that otherwise would drift into the atmosphere and further climate change.

"When we manage the forest, considering the age could be another aspect to see how we tackle or resist future climate extremes," Au said.

Justin Maxwell, an Indiana University climatologist who coauthored the study with Au, said states traditionally have managed their forests to promote trees that produce high-quality lumber. But that should change, he said.

"Our findings suggest that managing forests for their ability to store carbon and to be resilient to drought could be an important tool in responding to climate change, and thinking about the age of the forest is an important aspect of how the forest will respond to drought," he said in a press release about the study.

Diversity is one of the key things that make old forests especially strong, said Emily Clegg, director of land and water management for The Nature Conservancy's Michigan chapter.

"When we talk about diversity, what we're really talking about is diversity in species, diversity in age class and diversity in structure," Clegg said. "The more diversity you have in your forest, the more resilient your forest is going to be

to climate change, because you're not putting all of your eggs, per se, in one basket."



The Nature Conservancy owns and manages more than 100,000 acres of forest in Michigan after making a major purchase in the Keewenaw Peninsula this year.

About 80,000 of those are logged for timber, but also managed to increase the diversity of tree species that grow there and let more trees mature, Clegg said.

She pointed to a unique challenge foresters face in building a climate-strong forest: trees grow slowly.

"This is a decades game," she said. "Anything we enact today is going to take us a while to figure out if it's actually working or not."

The DNR is in the process of writing a new 10-year plan for the state forests, Price said. The department will embrace climate adaptation in the plan's next iteration with projects like increasing the diversity of tree species in forests and allowing trees in some areas to grow older. Price characterized those goals as "baby steps."

"In the longer term, we need more data about where our current forest types are located and what additional factors may lend toward greater resiliency based on the climate models," he said. "We just don't have that yet."

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