Scientists remove thousands of aspens to glimpse forest's future

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Armed with chainsaws and pry bars, University of Michigan researchers and their colleagues recently hastened the end for nearly 7,000 mature aspen and birch trees in a large-scale, long-term experiment to glimpse the Great Lakes region's future forests. A band of bark was stripped from each tree to kill it without cutting it down.

The main goal of the federally funded experiment Forest Accelerated Succession Experiment (FASET) is to determine how much heat-trapping carbon dioxide forests of the Upper Midwest will remove from the air in coming decades.

Forests can help offset human-caused climate warming, and scientists want to know how big a role these particular forests will play.

The work began this month at the University of Michigan Biological Station near Pellston, at the northern tip of the state's Lower Peninsula. Project scientists say it's one of the largest experiments of its kind ever undertaken.

"Are the forests of the future going to be taking up more carbon than today's forests" That's the big-picture question, and we think the answer is, 'Yes, they will,'" said Christoph Vogel, a U-M forest ecologist.

"These aspens would naturally fall out, one at a time, over the next 20 to 30 years," he said. "By imposing this artificial treatment, we're doing it all at once. I think it will give us a good picture of what the forest will

look like in 20 or 30 years."

If Vogel and his colleagues are right about a future rise in carbon storage, Great Lakes-area forests will play an increasingly important role in helping to soak up carbon dioxide (CO2), an invisible gas blamed for global warming.

But here's the big question to be addressed by FASET: Just how much CO2 will future forests remove"

Finding the answer is not as straightforward as it might seem. Scientists can't simply measure the current CO2 uptake and project that number into the future because the region's forests are in flux. In fact, they are on the cusp of the most profound change since the forests were clear-cut in the late 1800s.

Today across the Upper Midwest, the aging aspen and birch trees that dominate the forest canopy are starting to die of old age. The sun-hogging aspen and birch are gradually giving way to understory species---red maple, beech, white pine, red pine, and red oak---currently stuck in partial shade.

As the aspen and birch drop out, the increased sunlight should boost the growth rate among the pines, oaks and maples, leading to a more complex, multi-layered canopy. The FASET experiment is designed to speed up that transition, acting like a time machine that allows scientists to measure future carbon uptake now.

"We're simply accelerating the natural process of succession to allow the pine and the hemlock and the oak to come up and take their position in the canopy a little faster than they otherwise would, so that we can address the question, What will these future forests be like"" said Peter Curtis, an Ohio State University ecologist and the FASET principal

investigator.

Aspen and birch will be killed in an 83-acre "treatment stand" using a technique called girdling. Instead of felling the trees with chainsaws, workers use the saws to inscribe two shallow, parallel cuts that encircle the tree trunk. Other workers follow with hammers and steel pry bars, stripping a band of bark from the trees.

Girdling trees kills them while preventing them from sprouting new shoots. Sugars produced in the leaves can't make it down to the roots, which slowly starve. But water, minerals and growth hormones called cytokinins continue to flow up to the canopy.

If the trees were simply cut down, cytokinins would accumulate in the roots and signal the tree to sprout new shoots. The end result, over time, would be even more aspens.

In the coming years, atmospheric carbon dioxide uptake in the treatment stand will be compared to uptake in a control stand about a mile away. Both sites have large towers topped with sniffers that send air samples to analytic instruments inside mobile laboratories below.

The U-M Biological Station, established in 1909, covers about 10,000 acres. Nearly all of it is designated as a nature research area.

Measurements collected since 1999 show that the U-M experimental forest adds about 7,000 tons of carbon each year to its total mass by pulling in carbon dioxide during photosynthesis and storing the carbon as new wood.

Vogel and his FASET colleagues from Ohio State University and Indiana University predict that once the aging aspens and birch are removed and the treatment stand has a chance to recover, the carbon storage rate in

the treated area could increase by as much as 40 percent.

It's expected to increase because removing the aspens and birches will allow more sunlight to reach the understory trees. A more complex, multi-layered canopy will rise up to replace the aspens and birches.

FASET results will be of interest to climate modelers and forest ecologists---even policymakers. The project is funded with a $650,000 grant from the U.S. Department of Energy's National Institute for Climate Change Research.

Source: University of Michigan

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