

Trees can't outrun climate change. Should humans give them a lift?

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One tree at a time, David Saville has made it his life's work to bring back West Virginia's red spruce forests—and maybe help preserve the species hundreds of miles farther north while he's at it.

Last year, Saville spent weeks hiking up peaks like Panther Knob, Dolly Sods and Top of Allegheny to collect hundreds of pounds of the tree's pinky-sized cones. At home in Morgantown, he kiln-dried and tumbled them to extract their seeds. Now they are tiny trees.

Next spring the [seedlings](#), bearing genetics from the southern end of the tree's range, will go into the ground in Vermont and New Hampshire. The hope is when they start making their own cones in 30 years, they'll be able to survive in a warmer northern climate.

"We're anticipating Mother Nature would migrate the red spruce northward," Saville said. "We're just accelerating that."

He's is one of hundreds of foresters, arborists, scientists and researchers working to give species like the red spruce a lift north to outrun a climate that's changing faster than they can keep up with. Although still somewhat controversial, as the extent and speed of temperature rise becomes clear, such "assisted migration" is increasingly being contemplated.

"The goal," said Tony D'Amato, a professor of forestry at the University of Vermont, who's overseeing the experiment, "is to help them deal with these really unnatural conditions that don't have an analog in the past."

With a warming climate, insect devastation and [habitat destruction](#), as many as 1 in 6 U.S. tree species outside of Alaska are threatened with extinction, a study published last month found. They include the Torrey pine of California, Arkansas's maple-leaf oak, Georgia's Franklin tree, American chestnuts and the East Coast's black ash.

Those trees evolved to be adapted to the climates in which they originally grew, said Brad St. Clair, an emeritus research geneticist who worked for decades in the forest service's Pacific Northwest Research

Station in Corvallis, Oregon. Historically the migration rate for trees is between 650 to 1,300 feet a year, he said.

"To keep up with climate change, it's going to need to be about 10 times that," he said. By the end of the century, mossy, rainy Portland, Oregon, is predicted to look more like Redding, California, which is dry and sweltering in summer. "Plant populations aren't going to be able to keep up."

After more than 30 years of discussion in the U.S. forestry community, multiple trials are now underway to test how well assisted migration works and whether it disrupts existing ecosystems.

Helping tree species get to more hospitable climes, sometimes also called managed relocation, simply means planting them in climates to which they're genetically suited. It's just that their native climate has changed, said Gerald Rehfeldt, a forest geneticist who published some of the first papers on the topic in the 1990s.

While the climate hasn't radically changed yet, projections show by mid-century it will be a much bigger problem, St. Clair said.

"We have to do something now if we are to have any hope of keeping up with it," he said.

What's natural these days?

The idea of playing God with species, moving them farther north than they'd naturally get on their own in time, is controversial. A central belief of the environmental movement has been that nature should be left alone as much as possible—human tinkering, however well-intentioned, can too easily go wrong.

"The red flags go up," said Forest Service geneticist Jessica Wright, who is planting test reforestation sites up and down the West Coast. "It's something that needs to be done with a lot of consideration. You're opening a Pandora's box."

There are plenty of examples of the best intentions going awry. The Tree of Heaven, imported from China as a popular landscaping tree, became invasive across much of North America, even secreting a chemical toxic to nearby plants. The glossy privet crowds out native species in the eastern U.S. The Bradford pear, originally brought from Asia in the 1960s, is so invasive several states have banned its sale.

But the alternative to moving trees to climes for which they are better adapted is letting natural selection take its course.

"That's fine, if you like to see lots of dead trees and you like big megafires as a result of those deaths. And if you don't like wood, or the habitat that went with the forests," St. Clair said.

Many argue there's no such thing as "natural" at this point. Humans have introduced tremendous change by burning fossil fuels since the Industrial Revolution began in the 1750s, said Cuauhtémoc Sáenz-Romero, a research biologist at the University of Michoacana de San Nicolás de Hidalgo in Mexico.

"The forests cannot follow their natural cycles because we now have 420 parts per billion of CO₂ in the atmosphere," he said. "The normal level is 260."

A fringe idea no more

Increasingly, the mainstream forestry community sees assisted migration as a necessary tool as the planet warms.

Wright hopes her test plots of seedlings will provide insight into how trees in California, Oregon and Washington will fare toward the end of the century. While 80 years is a long time for humans, it's the blink of an eye for many [tree species](#).

"We're substituting space for time," she said.

Such efforts are meant to give the trees a chance, not to change the face of the forests. "We're moving populations within a species range," she said. "It can't be, 'Let's plant Joshua trees in Oregon.'"

In Vermont, D'Amato wants it made clear no one's talking about replanting entire forests.

"We're just trying to introduce a few of these trees so that 50 to 100 years from now we'll have some seed-producing individuals adapted to the change that can sustain the forest moving forward," he said.

Sometimes the work is not to move but simply save species for a time when they might be reintroduced in a new, more favorable home. An international network of arboretums is working to act as lifeboats for threatened species.

In Chicago, the Morton Arboretum has planted specimens of two threatened oak species from the South, the maple-leaf oak and the Georgia oak, in case they become even rarer in their current homes because of warming temperatures.

"We're trying to be proactive in the sense that we want to plant the species that will be well-adapted to these future climate change scenarios," said Silvia Alvarez-Clare, the arboretum's director of global tree conservation.

Without intervention, a species might slowly move northwards a few hundred feet a generation.

"Now it's happening so fast, there's not even one or two generations for the trees to adapt," she said.

While arborists in the United States are cautiously testing these ideas, in Canada's westernmost province, assisted migration is now law.

In April, the province of British Columbia made it mandatory that tree replanting on logged provincial land be done according to climate. Previously, the seedlings had to come from the same general area. Now they come from as far as 250 miles south.

The province replants 300 million seedling trees a year on logged land.

"You want to get your seed from where it's 3.8 degrees warmer now, because we need to recognize there's already been 2.7 degrees of climate change that's occurred in the last 80 years," said Greg O'Neill, the province's [climate change](#) adaptation scientist.

Saving butterflies by moving trees

It's not just trees but entire ecosystems that are at stake. Take the beloved monarch butterfly.

For millions of years, the iconic insects have made an epic 2,500-mile journey from Canada to Mexico. There they overwinter in mountainside forests of *Abies religiosa*, called oyamel in Spanish and sacred fir in English.

Today, the trees at lower elevations are struggling.

"The rainy season now starts one month late, and what is worse, ends one month early," said Sáenz-Romero. In part because of this habitat loss, the monarch was added this summer to the International Union for Conservation of Nature's "red list" of endangered species.

A [pilot project](#) in Mexico is trying to help. In the Monarch Butterfly Biosphere Reserve, a UNESCO world heritage site 80 miles west of Mexico City, Sáenz-Romero is planting sacred fir seedlings higher up the sides of dormant volcanoes where it's cooler. He wants to see if the trees, and the monarchs that depend on them, can better survive there.

His research found that moving the trees 1,300 feet up the mountain—the equivalent of a 3.6-degree cooler environment—kept them healthy.

The unanswered question is whether the monarchs will move to the new forests.

"We hope," said Sáenz-Romero. "We pray."

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