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LOCAL

This RI forest has been devastated by beech leaf disease. Could it also hold a cure?

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Key Points AI-assisted summary

- Beech Leaf Disease, caused by foliar nematodes, is devastating beech trees in Oakland Forest and other areas.
- A research study is underway to test treatments, including fungicide injections and tree removal, to combat the disease's spread.
- The disease's rapid spread and potential ecological impact on wildlife are raising concerns among scientists and conservationists.

PORTSMOUTH – There are American beech trees in Oakland Forest that are older than the nation.

As the centuries passed and the surroundings transitioned from woods to farms to house lots, these elegant giants have hung on, thrived even, a constant presence on the Aquidneck Island landscape.

Whether they continue to tower over their little patch of Portsmouth, however, is far from certain.

The beech trees in this 20-acre old-growth forest are afflicted with an aggressive disease that has torn across the northeast quadrant of the country, indiscriminately infecting swathes of beeches wherever it appears.

The disease has spread to all of the beech trees here.

“There isn’t a single tree in this forest that doesn’t have it,” says Alex Chuman, conservation director for the Aquidneck Island Land Trust.

Chuman rounds a bend in the trail that cuts through Oakland Forest and stops at yet another clearing that wasn’t here just a few years ago.

The dense canopy of beech foliage that once shaded this part of the forest is gone now, replaced by dead tree after dead tree after dead tree, nearly a dozen trunks within view standing leafless like so many grave markers.

“I know I sound like a broken record, but five years ago this was all in shade,” laments Chuman. “These were all healthy trees.”

If there’s hope for beeches here and elsewhere, it could come with a research study that is set to get underway in Oakland Forest this summer.

The land trust, which owns the forest, is partnering with Bartlett Tree Experts to test out treatments for beech leaf disease that will include taking down some of the dead and sickened trees and injecting others with a fungicide with the aim of slowing the spread of disease and, ideally, allowing the remaining trees to recover.

Without intervention, the beeches will almost certainly die, Terry Sullivan, executive director of the land trust says as he walks with Chuman.

“It’s an ecological tragedy unfolding before our eyes,” he says.

A tiny worm wreaking havoc in beech trees

The audience inside Rosecliff gasps as a video starts playing before them.

Thousands of tiny worms appear in extreme closeup on a pair of projector screens set up inside the Gilded Age mansion in Newport. They writhe in a dense clump that resembles something out of a 1950s monster movie.

“It’s one that haunts our dreams,” Andrew Loyd, a plant pathologist with Bartlett Tree Research Laboratories, says of the video.

These are the kind of worms known as foliar nematodes that are causing beech leaf disease, explains Matthew Borden, another plant pathologist at the Bartlett labs in Charlotte, North Carolina.

The wriggly creatures are microscopic, but they have voracious appetites and can infest a tree in such astronomical numbers as to overwhelm it in just a few years. The many worms shown in the video spilled out from a single leaf that had been taken from an infected tree and cut open.

The Bartlett scientists are speaking at a forum on beech leaf disease hosted by the Preservation Society of Newport County, the nonprofit that owns 11 historic mansions and properties on Aquidneck Island.

European varieties of beech were planted in private gardens and public parks in and around Newport at the turn of the 20th century, when places like Marble House and the Breakers were built. There are 504 individuals inventoried throughout the city, but that’s believed to be a fraction of the total, says Scott Wheeler, superintendent of parks, grounds and forestry for the City of Newport.

The Preservation Society has counted 260 across just its holdings alone. All of them have beech leaf disease.

The good news is that only one so far has died. Bartlett is working with the Preservation Society’s landscaping staff to treat the trees with either a foliar spray or a root injection. As long as the disease is around, they will continue to have to give them regular doses of fungicide.

But that level of management is impossible in a forest setting, and the stands of native beeches across Rhode Island aren’t faring nearly as well.

How bad is beech leaf disease in Rhode Island?

The disease was first seen in the state in a forest in Hopkinton in 2020. Within two years, it had spread to every county in Rhode Island. The damage is worst in Washington County, where the disease has been present the longest, but it's also bad in Kent and Newport counties, says Alana Russell with the state Department of Environmental Management.

Every June, Russell, forest health program coordinator for the agency, conducts an aerial survey of the state's forests to look for signs of disease. In 2023, she found 480 acres of observable damage from beech leaf disease. Last year, the number spiked to 3,600 acres.

"I am keen to track stands that are showing any bit of recovery, resilience or resistance," Russell says, "but I have yet to see that."

An invasive believed to come from Japan

Scientists can't say definitively where the nematodes that cause beech leaf disease came from, but they've long suspected the source is Japan.

A team of American researchers visited the Asian country last fall to try to confirm the disease's origins and look for ways to manage it. They found symptoms of the disease to be widespread but severity to be low, says Cameron McIntire, one of the plant pathologists who made the trip.

"We believe that if the nematode co-evolved with the Japanese beech species that the trees may have natural defenses that do not exist among American or European beech," says McIntire, who works in New Hampshire for the U.S. Forest Service.

The disease first showed up in North America in 2012 in Ohio. It has since made its way into 13 other states, including all of New England, and Ontario.

"And it continues to move," Borden says. "Even for an invasive species, this level of spread is remarkable."

By comparison, beech bark disease, a fungal pathogen that appeared in North America in 1890, took nearly a century to spread from Maine to Ohio, says McIntire.

The nematodes that cause beech leaf disease are so small and light that it's believed they're carried forth in wind-blown water droplets or on birds and insects.

They overwinter in the long, cigar-shaped beech buds and attack leaves as they develop in the spring.

In the first year of infestation, banding in the leaves appears, which the worms cause by interfering with chlorophyll production. By the second year, the leaves may be crinkled, thick and deformed, or they may not appear at all.

Without functioning leaves, photosynthesis is interrupted, and the tree has trouble producing food.

An infested tree will often generate a second round of typically smaller, thinner leaves, but it must tap into its energy stores to do so. A healthy tree can only do this a few years in a row before those stocks are depleted.

Because saplings lack the carbon reserves of older trees, they can die in as little as two years from the disease. It's believed that mature trees can persist for six to 10 years.

"It's killing trees by starving them," says Loyd.

A step back in time

Entering Oakland Forest is like stepping back in time. This is what Aquidneck Island may have looked like when Giovanni da Verrazzano explored the New World in 1524.

The island, like the rest of what would become Rhode Island, was almost completely forested back then. Colonists started clearing the land for farms and the pace picked

up when the British occupied the island during the Revolutionary War and chopped down vast tracts of trees for firewood.

These days, it is one of the few forest habitats left on the 38-square-mile island. It's also the only forest in Rhode Island to have won designation through the Old-Growth Forest Network, a national nonprofit that works to protect America's oldest known forests.

Because the early settlers cleared more than two-thirds of Rhode Island's original forest, there are few places considered truly old-growth in the state and fewer still that are open to the public and easily accessible like Oakland Forest.

Some of the beeches here are more than 300 years old, according to a survey the Aquidneck Island Land Trust did in 2000 after saving the forest from a proposed housing development.

Many others are more than 200 years old. The largest are 10 feet in circumference and 85 feet tall. There are white oaks in the forest that are almost the same size.

The forest is also atypical in Rhode Island because it's dominated by beech trees, especially very old ones. Nine out of every 10 trees here are beech. That's in contrast to the state as a whole. Beeches constitute only about 10% to 15% of total forest trees in Rhode Island, says Fern Graves, principal forester with the DEM.

The species was even less common in the past when wildfires were a regular feature of the landscape. Beech trees, with their shallow roots and thin bark, are more susceptible to fire than oaks or hickories.

Albro Woods, in nearby Middletown, is another rare example of a forest that is almost exclusively made up of mature beeches. It too is being decimated by beech leaf disease.

Staff at the Aquidneck Island Land Trust first noticed signs of the disease in Oakland Forest in 2022. They weren't looking for it but soon saw evidence

everywhere.

When Graves visited that summer, “crowns were already significantly thinning,” she says.

She hesitates to go back again.

“I’d rather my last memory be a fond one,” she says.

Taking inspiration from the COVID response

Loyd draws parallels to the COVID pandemic as he talks about efforts to tackle beech leaf disease, using buzzwords like “social distancing” and “herd immunity.”

The study he is helping to lead in Oakland Forest will test whether those methods used to control the spread of coronavirus in humans can be employed with beech trees.

Because the disease spreads fastest in crowded forests with little diversity and where most of the trees are beeches, the idea is to cut down sick trees and thin the forest to slow the transmission rate, an idea akin to social distancing.

The intended effect would be like reducing the viral load in a human community. With fewer trees to feed on, the nematode population in the forest will almost certainly drop off, Loyd hypothesizes.

“If we look at beeches as manufacturing plants, one tree can make millions of nematodes,” he says. “By doing selective removals, we can reduce the local amount of inoculum.”

The trees that remain could benefit by getting more air, light and nutrients, becoming stronger and more resilient to infection. Some will be given root injections of fungicide, the same method of treating diseased trees employed at private estates like Rosecliff, in a bid to build up resistance and foster herd immunity.

Bartlett was looking for forests to test these methods and the Aquidneck Island Land Trust agreed to participate, realizing that it had nothing to lose. So did the Pennypack Ecological Restoration Trust in Pennsylvania, which is allowing Bartlett to work in a forest where the disease was found only last year.

Combinations of the treatments will be tried out on eight quarter-acre plots at each site. The work will start in July. Bartlett is paying for the entire cost of the study.

At the same time that Bartlett does its work, staff with the land trust will start clearing out multiflora rose and other invasive plants that have proliferated as beeches have lost their leaves and sunlight has penetrated through the overstory.

The Bartlett scientists will monitor the plots for five years to gauge the impacts of the treatments. What they learn could help land managers in other parts of the country save beech forests.

It's not the only research study looking into treatments. The New York Department of Environmental Conservation started thinning 270 acres of beech forest last year and another study in that state is looking at cost-effective applications of phosphites in forests to boost tree defenses, according to McIntire.

Nancy Stairs, cooperative forestry program supervisor with the DEM, says the states of Rhode Island and Connecticut have also applied for federal money to carry out a forest-thinning experiment together.

"But with the present direction of federal funding, we do not know whether that program will be funded," she says. "Just so you know, we have not given up."

The partners on the Oakland Forest study express a similar sentiment.

"There's a lot of really good momentum going right now," Borden says.

But they're also prepared for the worst. On two of the test plots at each research locus, they will plant oaks and other native trees to replace dead beeches.

It will mean that even if all the beeches do succumb to the disease, a place like Oakland Forest, though reconstituted, will remain.

There's still hope

It may be too soon for such a gloomy prognosis, however. Right now, many beech trees are proving more resilient to the disease than originally thought.

Yes, in places like Oakland Forest where beech is the primary species, the disease has spread fast and trees have died. But in other places, beeches may look worse for wear but they're persevering.

"It is surprising how long these trees seem to be holding on after being so heavily impacted for multiple years," Russell says. "I do not mean to imply that the trees are doing well, but I do want to say that a surprising number have not died yet."

McIntire says something similar. It's known that the disease kills beeches, but the country has yet to see "widespread mortality" in any one place, he says.

It has scientists rethinking the trajectory of a disease that they once thought would have a similar effect as blights that wiped out elms and chestnuts across the country.

But they say that research must continue to ensure a positive outcome and that the public needs to understand the value of the trees to the forest environment.

The American beech is considered a keystone species in northern hardwood forests, says McIntire. Woodpeckers forage in the trees, hawks and owls nest in them, and all sorts of birds and mammals, from deer and chipmunks and black bears to blue jays and turkeys, rely on nutrient-rich beech nuts for sustenance.

"Beech is considered among our most important species for native wildlife," McIntire says. "The loss of beech would have a cascade of ecological consequences that would reshape the structure and composition of our forests."

As Chuman and Sullivan step out of a thicket of rhododendrons that form a canopy over a stretch of the trail in Oakland Forest, they point out all the signs of beech leaf disease.

Here is one beech whose leaves are showing the telltale banding. There's another with crinkled, leathery leaves.

And one more with no leaves at all.

"You know it was a glorious tree at some time," Sullivan says. "Now, it's just a skeleton."

"Our study may not cure the forest," Chuman says. "But hopefully we can save some trees."