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Adirondack forests changing: maples dying, beech may rule

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By Hart Seely

A mile into the woods, the old logging trail had vanished, leaving a vast confusion of greenery in every direction.

"About 500 feet further," State University College of Environmental Science and Forestry professor Paul D. Manion said, peering into a hand-held Global Positioning Satellite unit. "We're almost there."

In the quest to protect New York's Adirondack forests, scientists use technology to analyze soil, uncoil strands of DNA and, sometimes, just to get where they hope to go. Despite all the advances, they're not there.

With a growing sense of urgency, scientists seek an understanding of the forest that allows them to distinguish the cycles of nature from the follies of humanity. In an era when rains bring pollution, the climate may be changing and the next environmental crisis could crawl from the Pandora's box of an overseas shipping crate, the consequences of being wrong can take generations to heal.

"You can make all kinds of calculations about acid rain or global warming or whatever," Manion said, as he untangled his way. "But it won't get us anywhere until we understand how the forest operates."

At stake are the public and private forests of the Adirondack Park, an area roughly the size of Vermont, which have shrugged off catastrophic fires, loggers bent on clear-cutting and an annual invasion of tourists. These forests rose after the glaciers of 10,000 years ago. They'll outlast the abuses of civilization.

But people might not recognize them.

Across the central Adirondacks, majestic old trees are steadily dying, and blighted dense thickets are sprouting in their wake, leaving scientists to ponder a critical question: Is this the latest cycle of nature, or is something new here going

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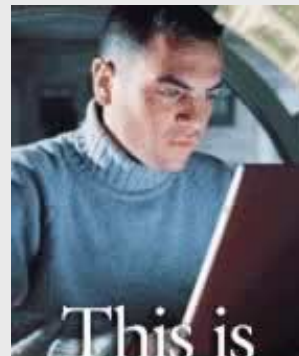
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In the next decade, the large paper birch trees will die across the Adirondacks, their distinctive white bark vanishing from the landscape. It cannot be stopped.

Those birches sprouted from the ashes of early 20th-century fires that razed vast sections of the forest. Before, few birch saplings could fight their way up through the dense canopy. The fires opened windows of opportunity, and they thrived.

"Now they're dying, simply because they're 80, 90 years old," said Donald J. Leopold, an ESF professor of forest and wetland ecology. "You simply can't expect much more time out of them."

Trees only live so long. In the forest, their deaths let other species take over, whether humans like the change or not.

In the western United States, to the dismay of people, forest fires periodically spur massive regeneration of trees. Forest ecologists say a three- or four-year drought could turn the Adirondacks into a fire hazard, but the mountains historically are drenched by rains.

Other events have reshuffled the Adirondack forests.

New Yorkers caught a glimpse of nature's hand in 1995 when a microburst flattened parts of the forest, and again in 1998 when an ice storm snapped thousands of trees like twigs. Neither event was unprecedented. In fact, accounts of blow-downs date back to ancient Mohawk Indian legends of "flying heads" - winds so powerful that they had personalities.

Scientists say that around 1750, something happened that forged the central Adirondack forests, as people have come to know them. They suspect "flying heads."

The maples

At Huntington Wildlife Forest, a 15,000-acre preserve in the center of the Adirondack Park, ESF professor Richard W. Sage Jr. knelt near the base of a maple tree so huge that two adults could barely stretch their arms around it.

He pushed a long stick into a hole in the tree, until it disappeared. The maple, about 250 years old, is rotting from within.

"We don't expect maple to live much beyond 300 years in this environment," Sage explained. "If we were to come back to this site in 50 years, we would not find any maples to speak of, except for a very rare remnant."

Across the central Adirondacks, most of the towering sugar maples, which give autumn its dazzling colors, are believed to have sprouted during a relatively brief period around 1750 - an era when a young George Washington was advising British troops in the French and Indian War.

Something gave those maples a boost. It might have been an ice storm, a hurricane or fast-moving winds. Whatever it was, it toppled as much as one-half of the forest's tallest trees. That's all it took.

"A very short period of time can dictate what a forest will look like for a very long period of time," said ESF professor William F. Porter, of the Adirondack Ecological Center at Huntington Forest.



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Maples weren't the only tree species to rise from that event, but the others have died of old age. "What we see in these maple trees is the last component of that forest," Sage said.

Soon, they'll be gone. It cannot be stopped.

"When this tree falls over, the next-tallest trees will occupy the open spot," Sage said. "See around here, they're all waiting for the light."

He motioned to the thick, knee-high understory of beech tree saplings.

"When that window of opportunity happens for them, these beech trees, they're going to claim this site. We see that happening over and over in a lot of places. ...

"Now, the question is, why is the beech in this position? Why isn't the sugar maple competing at that same level? Both have that ability to persist for long periods of time, waiting for that hole to open. ... Why beech?"

The forest formula

A mile deep into the woods, a low rumble grew louder until it overwhelmed all else. Then it diminished, and the forest became still. It was the sound of a dump truck, rolling somewhere, far off in the distance.

Manion said it's common to be standing in a remote spot and get a reminder of civilization.

He stood at Site No. 6107, near Harrisville in the western foothills. The site, picked randomly by a computer, was in a dense forest near a hogback ridge, surrounded by toppled trees covered with bright green moss.

"There was a serious blowdown here at one time, and this area is regenerating," Manion said. He pointed to a huge white birch that rose above all others.

"See that strike on it?" he continued. "It was hit by lightning at one time. ... That will generate an infection spot for decay fungi, and it will weaken it. Eventually, it will speed up the process of that tree dying."

He bent to reveal the leaves of a maple sapling. "See how this tree is smaller than the rest?" Manion said. "It soon will be over-topped, and it will die. It's one of the five that won't grow another inch."

One in five: that's Manion's formula of the forest.

For the last six years, teams from the ESF campus have hiked into forests across New York state to survey the living and the dead. By bushwhacking to remote locations, Manion's teams have compiled a database of more than 30,000 trees.

The unprecedented volume of this data helped Manion establish a mathematical model that can, in essence, gauge the health of a forest. It's based on one question: In a normal forest, how many trees must be dying?

The study, published last fall, shows that in a healthy Adirondack forest, one in every five trees - no matter how big or small - will die before it grows one more inch in diameter.

Four trees live, one tree dies.

If more trees are dying, something's wrong.

If fewer are dying, something's wrong.

The data show the Adirondack forests to be lush and healthy, with trees species dying consistently near the 20 percent rate. Four live, and one dies.

But in one species, death rates soared to 33 percent - way out of whack. The species was the beech.

The beeches

Scientists believe current deer populations in the Adirondacks far exceed those of 200 years ago. Cruel winters and the abundance of predators, such as the timber wolf and cougar, made the mountains a harsh habitat for deer. That changed as settlers cleared the land of predators.

Around 1900, deer populations began to jump. Studies suggest the mid-1900s saw some of the highest Adirondack deer populations in centuries. And their dining habits re-created the forest.

Deer love to eat maple and birch saplings; they disdain beech. So for decades, as competing species were being devoured by deer, generations of beech saplings thrived.

"What happened 250 years ago set the stage," Porter said. "What happened 100 years ago, with deer populations, set another stage. And then, what happened 50 years ago set another stage. ... Each of those events lined up to create what we have here today."

Porter motioned to a low-lying thicket of beeches, none of which would ever grow past a foot in diameter. They will produce no wood, create little animal habitat and grow no taller than 30 feet. Doomed trees, every one, dominating the forest.

He might have been looking at the future.

Almost 50 years ago, the third event that Porter mentioned hit the Adirondacks with little fanfare. Beech bark disease, imported by humans from Europe, began killing beech trees.

A nasty collaboration of bug and fungus, the disease came to Nova Scotia around 1934 and advanced steadily southwest. To this day, it has marched unstoppable into the Midwest and down the East Coast.

It begins with a tiny insect that taps into the beech bark, like a mosquito bite, modifying the tree's live cells. When the fungus invades - and it is everywhere in the forest - the tree's natural defenses don't detect it. The fungus kills the bug, the living cells and the layer of tissue between the wood and bark. A cottony outgrowth forms on the bark, and the beech tree dies.

The disease hit the Adirondacks in the 1960s, at a time when SUNY-ESF researchers were studying the overgrowth of beeches in the lower tiers of forest. They blamed it on the selective eating habits of deer and the preferences of the timber industry. For decades, loggers had harvested high-quality birch and maple, leaving behind the less-valuable beech.

Ecologists were starting to worry about the dominance of beech trees and an imbalance in the forest. Then came beech bark disease. "When this pathogen arrived, it was as if it just said, 'Whoa, look at all this, ...'" Sage said.

Within 15 years, the disease killed nearly nine of 10 large beeches at Huntington Forest, as it did across the Northeast. Scientists have compared the effects of the disease on trees to that of a smallpox epidemic on humans.

To foresters studying ways to control beech overgrowth, such a disease might seem heaven-sent. But nature had a surprise.

Beech trees possess a unique aspect of self-preservation. When something disturbs a beech root - be it a hiker's boot, heavy wind or a falling chunk of ice - the plant reacts by sprouting a new shoot.

By attacking large trees, the disease caused more beech saplings to sprout and continue choking the forest.

And every one of those rising offshoots is of the same genetic identity as the dying beech above them. Which means they have no resistance to beech bark disease.

Thus, a new cycle has begun: Dense beech thickets grow rapidly in the understory, choking off other trees, until the beeches get large enough to be taken by the disease. It kills them, prompting new shoots to sprout from damaged roots.

"If you look at this forest here, it's all beech," said Ralph D. Nyland, an ESF professor of forestry and natural resources management. "That sugar maple is what, 250 years old? It may have another 50 years, 100, if it's lucky. What's going to replace it? Beech. Everywhere, it's beech.

"My fear says that if we come back here and have this discussion in 50 to 100 years, we could go from Lake Champlain to Lake Ontario, across the Adirondacks, and find nothing but one giant beech brush - where the beeches grow up to four to six inches in diameter, get the disease, snap off and let new root suckers come up. And if so, the forest you see today won't exist. ...

"It's a frightening scenario," Nyland said. "And it's frightening to me even more, because people won't think about it."

The search for answers

Scientists still seek ways to halt the spread of the beech bark disease.

Recently, foresters in Maine and Northeastern Canada - where the disease first arrived - reported that 1 out of 100 beeches are showing resistance to the disease. Manion's teams have also found old beeches that appear unaffected, though none at Huntington Forest has outlasted the blight.

So what should be done, if anything? Some researchers, including Manion, strongly disagree with the assessment that the Northeast is moving toward a vast beech thicket. And in areas such as the Adirondack Forest Preserve, where state law forbids human encroachment, the idea of fighting blighted beech thickets with herbicides or chainsaws makes no sense financially or politically.

"All we can do is pose the issue," Porter said. "But as this maple forest begins to fall apart over the next generation, we're setting the stage for something that's going to persist for a very long period of time."

And scientists note that despite best efforts to leave wilderness forests untouched, no such places really exist.

"We are responsible for bringing beech bark disease to this country," Sage added. "We were responsible for creating the kinds of deer densities that proliferated the beech tree. We've had an enormous impact on this forest, even if we never went in with a chainsaw and a skidder."

At Huntington Forest, Sage and Porter hiked to a stand of trees that looks, as best as anyone can surmise, like the forest that existed 250 years ago. Twenty years earlier, they removed about half the tallest trees, cut back on the beech overgrowth and restricted deer access until the saplings grew tall enough.

From there, they let nature run its course.

Today, dozens of tree species intermingle. Trees that will die at the ripe old age of 75 stand beside those that could live to the year 2280. But Sage wouldn't predict how it would look by then. "When you wait 100 years, unexpected things can happen," he said.

Twenty-one years ago, Manion wrote a book on the diseases that kill trees, a topic he's studied his entire career.

"For years, most of my writings were warnings," he said. "I've shifted from being the pessimist, from beating the drum that there's something bad out there, to saying, 'Hey, let's stop a minute and figure out what's going on.' "

His surveys show forest death rates keeping constant, even if beeches have died too fast for comfort. With the disease beginning to attack smaller beech trees, it may be burning itself out. Manion said the beech tree will become a smaller component of the forest, leaving the maples, hemlocks and birches to poke through.

"The forest is going to make it through whatever gets dumped on it," he said. "It will just change, that's all. ... And it might not be the changes we want."

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