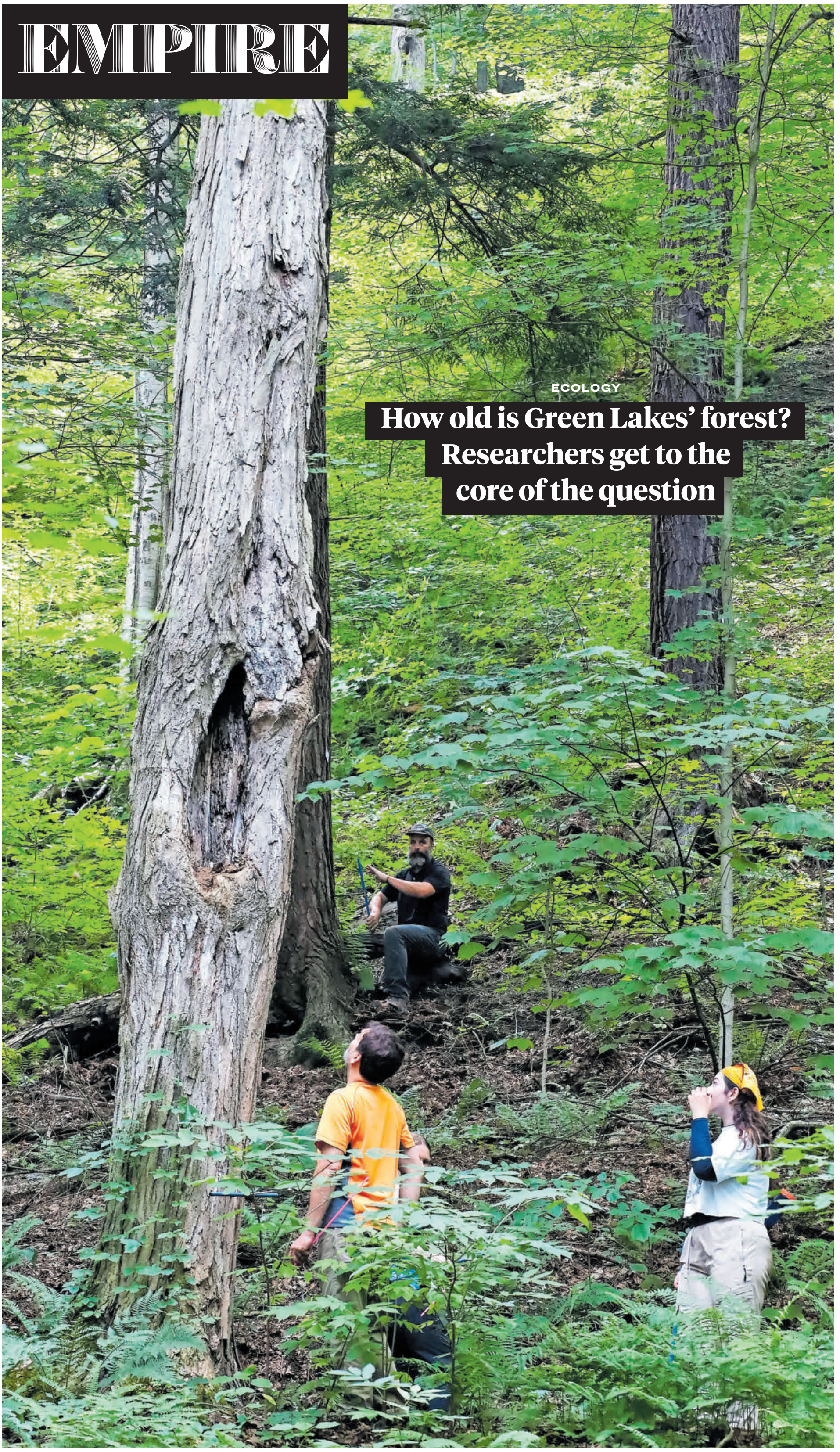
EMPIRE



ECOLOGY

How old is Green Lakes' forest? Researchers get to the core of the question

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What exactly are "old-growth" trees? There are various definitions. Tree expert Neil Pederson says they are trees that escaped the European colonists' axes, which in New York state would be around 300 years. Around here, people are proud of the big old specimens standing tall at Green Lakes State Park, but are they that old? Pederson, a senior forest ecologist with Harvard Forest, came to find out. *Pages 4-6*

EARTH

Forestry Fitbits

Startup ePlant is installing TreeTags, tiny water-stress sensors, across urban landscapes, orchards, vineyards and forests imperiled by climate change. **Page 6**

OUTDOORS

Branching out

Whether you want to cut your own or pick one ready to go, you'll find plenty of Christmas trees at farms spread out across the region. **Page 8**

HOLIDAYS

Cozy gifts

Life, especially around the holidays, can be stressful. We've found gifts to help. Pamper your loved ones — and yourself — with these stress relievers. **Pages 10-11**

COVER STORY

ECOLOGY

Does Green Lakes State Park have an old-growth forest?

Harvard senior forest ecologist Neil Pederson searches for the oldest pocket of trees on the steep slopes next to the trail around Round Lake at Green Lakes State Park in Fayetteville.

A Harvard University scientist leads a team of researchers to find out

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One sultry day last July, under skies dimmed by smoke from forest fires burning in Canada, Neil Pederson, 55, a senior forest ecologist with Harvard Forest, searched Green Lakes State Park for old-growth trees to core.

Backed by a $1 million National Science Foundation grant, Pederson and his team have cored thousands of trees in pockets of old growth forest across the Northeast, from Maine to New Jersey, Pennsylvania to New York.

Pederson's three-year study, now finishing its second year, aims to reconstruct the history of a landscape that has all but disappeared. Green Lakes, he hoped, would provide one small piece of the puzzle.

Pederson defines old-growth trees as those that escaped the axes of European colonists, which in New York is around 300 years old. Many authorities, including the state Department of Environmental Conservation, claim Green Lakes contains old-growth forest.

But to Pederson's knowledge, nobody has ever cored trees in Green Lakes to determine if they are, in fact, old growth. It was a mystery hiding in plain sight.

His team cored about 30 trees that day. Then he began analyzing the cores in his lab. The initial results surprised him.

"There is a good percentage of old trees, older than I expected," he wrote in a recent email, "whether it's old growth or not hardly matters."

OLD GROWTH SANCTUARY

Nearly two million people visited Green Lakes last year, making it by far the most popular state park in Central New York. It has a nice beach, well-maintained trails and otherworldly turquoise waters that lend the park its name.

But most visitors probably don't realize that Green Lakes is truly special in less obvious ways.

The park's crown jewels, Green Lake and Round Lake, are two of only six meromictic lakes in the state. Because their upper and lower layers don't mix, they serve as rare time capsules for scientists seeking clues about environmental changes going back to the last ice age.

Green Lakes is also one of the few state parks outside the Adirondacks that contain old-growth forest, according to the Old Growth Forest Network, which classifies 1,000 acres of the park — roughly half its size — as old growth.

Bob Orwig, senior forest ecologist, counts rings in the cut face of a hemlock tree. At first glance Orwig estimated the tree to be 200 years old. Core analysis later revealed it to be around 300 years old. *Photos by Steven Featherstone, sfeatherstone@syracuse.com*

As Pederson's team descended the trail to Round Lake, they marveled at the unusually diverse range of big hardwoods populating the slopes: basswood and beech; hop hornbeam and bitternut hickory.

A sign on the shore estimated a nearby grove of 90-feet tall eastern hemlocks to be 400 years old. Not far away, another sign proclaimed the lake's listing in 1973 as a National Natural Landmark, along with "100 acres of surrounding old-growth forest."

Pederson, who visited Green Lakes many times while growing up in Fulton, wasn't convinced that Green Lakes was an old-growth sanctuary.

"Old growth" is a term of art, he said, with many definitions that typically correlate size with age. The bigger the tree, the older it's presumed to be.

But it's hard to tell a tree's age by simply looking at it, Pederson said. You need to core it and count the rings.

"This is a really great place to grow trees," he said. "It's wonderful. It should be protected. It's beautiful. But is it old? I don't know."

A SACRED PLACE

Not one inch of the Northeast's forest cover has been left untouched by humans. After hundreds of years of intensive logging, plowing, grazing and paving, less than 1% of it is now considered to be old growth.

"We've seen places cut that are hard to believe," Pederson said.

He hoped that Green Lakes was a historically "sacred" place, he said. Sacred to the Haudenosaunee, sacred to European settlers who later claimed it for themselves. Maybe they had preserved some part of it long before it became a state park in 1928.

If so, Pederson and his team had only one day to find that sacred remnant, because they had to be in Fredonia the next day to core trees in Zoar Valley.

On the trail, Pederson compared his observations with his colleague, senior forest ecologist Dave Orwig. Despite 60 years of field experience between them, the forest's secrets eluded them.

Orwig poked around in the undergrowth, calling out his findings: baneberry, bloodroot, blue cohosh.

"We're seeing all these things that suggest what we kind of know," said Orwig, "it's a rich site."

A WASTE OF TIME

Halfway around Round Lake, Pederson still hadn't found a stand of trees old enough to core, and he was beginning to wonder if Green Lakes was a waste of his time.

There were plenty of big, impressive trees here, he said, but the entire site was essentially a tree nursery with optimal growing conditions. Every species got huge, quickly.

Old trees — really old trees — often grow slowly over decades, centuries even, Pederson explained. They struggle to survive in poor soils, or in the shade of taller trees, their trunks twisting and turning toward gaps in the canopy.

Gnarly trees with crusty bark and jagged crowns—that's what Pederson was looking for.

In a moment of serendipity, the team stumbled upon a saw-cut hemlock tree lying right next to the trail. Pederson bent over to examine it.

"Well, look at this," he chirped. "Very nice of them to cut this for us. It's got slow growth on the inside."

Orwig estimated it to be around 200 years old. Promising, but middle-aged for a hemlock. They pressed onward.

TULIPTREE CATHEDRAL

If there's one place in Green Lakes that just feels like an old-growth forest it's the "Tuliptree Cathedral" on the southwest corner of Round Lake. Here, tulip poplars with trunks as thick as Gothic columns rise as high as 140 feet into the sky, supporting massive arching canopies.

But where some imagine a natural cathedral, Pederson and Orwig saw possible evidence of clearcutting that had created a gap in the original forest which these tulip poplars colonized.

They placed the grove's age at around 130 years old, during the era of industrial-scale logging.

"I think this side of the lake is a bust," Pederson sighed.

After debating whether they should bother coring any trees at Green Lakes, the team settled on doing just one plot instead of their standard two. But where?

Pederson stared up into the airy green canopy of the Tuliptree Cathedral, scratching his beard.

"It's an awesome site, it's beautiful. I would love to spend time here, but in terms of older trees, we have a better chance over there," he said, indicating a spot near the 200-year-old hemlock stump.

"That's the one known fact we have," he said.

THE LOG

Orwig knelt next to the hemlock log, etching marks into the cut end with his thumbnail in 100-year increments.

100, 200...

"It's definitely older than we think," Orwig said excitedly. "It's probably 250."

Laura Smith, a research assistant, put it closer to 300 based on a "magic inch" of paper-thin rings that could easily contain 100 years of slow growth, she said, probably when the tree was in the understory.

"If that's right, there weren't many Europeans around, fur trappers maybe,"Pederson said. "This was Haudenosaunee. That's really special."

"If that's right, there weren't many Europeans around, fur trappers maybe. This was Haudenosaunee. That's really special."

Harvard Forest senior forest ecologist Neil Pederson speaking about research assistant Laura Smith's estimation that a hemlock log was close to 300 years old.

Jordan Shar, bottom left, Bob Orwig , top left, Neil Pederson (pointing) and Laura Smith debate about where they should take core samples of trees at Green Lakes.

Reinvigorated by the discovery, the team unpacked their gear and got to work.

Using a laser range finder, Pederson plotted out a 20-meter circle, squeezing into it as many species as he could: yellow birch, sugar maple, basswood, ash. Even the dead hemlock log.

Meanwhile, the other team members scrambled up and down the steep slopes, clawing through buckthorn thickets, skirting around poison ivy vines, measuring, drilling, sliding in the loose soil and occasionally falling on their rumps.

CORING

Many tree ring studies focus on a few soft conifer species like spruce, pine and hemlock, Pederson said. One of the unusual aspects of his study is the sheer variety — 37 species so far — of hardwoods it includes.

The trouble is that hardwoods are, well, hard. His team literally burned through equipment.

At one point, while boring into a slender hop hornbeam tree — a.k.a. ironwood — Pederson's cordless impact wrench began smoking. Screws shook loose from the chuck and fell onto the ground.

Jordan Sharp, a graduate student from Kentucky, scarcely cored two inches into a huge sugar maple before her impact wrench torqued out.

She switched to an increment borer, a T-shaped device that she twisted by hand like a giant corkscrew.

The loud squeak of increment borers and hammering of impact wrenches echoed across the lake for hours. At the end of the day, they'd cored 19 trees inside the plot and about 10 others outside it.

The cores would go back to Pederson's lab where they'd eventually be mounted and sanded and studied. But that was months away. As the team hiked out to the parking lot, all they cared about was where they were going to eat dinner before hitting the road.

Research assistant Laura Smith uses an increment borer to get a core sample from a tree.

Hardwood trees are often too dense for power tools to penetrate all the way to the center.

FUTURE OLD GROWTH

After conducting a preliminary analysis of seven cores from Green Lakes, Pederson says that he's happy with the ages of the trees his team selected. There were some surprises, too.

For one, Laura Smith's field estimate of the 300-year-old hemlock stump was right on the money. And a giant tulip poplar that Pederson guessed was only 120 years old turned out to be around 190 years old. Moreover, he could see evidence of past drought periods in its rings.

And despite being merely one-third the size of the tulip poplar, the ironwood tree that made Pederson's impact wrench start smoking is about 150 years old, 40 years older than he'd first thought. Proof, he says, that size doesn't always equal age.

But none of these ages "fully support the idea of an old-growth forest," says Pederson, adding that he's consistently found older trees in the region.

Ben Morse, park manager of Green Lakes, acknowledges that while Pederson's initial findings indicate some of the park's signage might be off in terms of tree ages, the data are "very cool," and he hopes Pederson's team comes back to do more research.

"The data that they collect, and share with us, is beneficial to both parties," says Morse. "The more that we know about our natural resources, the better we are able to protect them."

As a scientist, Pederson is careful about using terms like "old growth," which are often loaded with romantic sentiment. Still, he appreciates the feelings behind the sentiment, even if they're not grounded in fact.

Because the fact is, everybody loves big, old trees. Calling them old growth is a way of celebrating that. For this reason Pederson calls Green Lakes "future old growth."

"It's a beautiful, impressive forest now," he says. "In 100 years it'll be even more impressive."

Graduate student Jordan Sharp attempts to bore into a big sugar maple on the slope next to Round Lake.

Orwig measures the diameter of a tree next to Round Lake while Neil Pederson records the data.

Neil Pederson slides a plastic straw over a fresh core sample taken from a tree at the park.