

# Mighty hemlocks falling to tiny, hungry insects

State's giant trees being attacked faster than expected

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Only a small portion of the [state's hemlocks](#) — many that are hundreds of years old and stand 10 stories or higher — are expected to survive a scourge of tiny insects that has advanced here from the Northeast.

Chemical treatments are needed one tree at a time, and there's only so much money and time available.

Many of the long-lived evergreens already have died or are dying in [Great Smoky Mountains National Park](#) and elsewhere, leaving needleless gray hulks that no longer shade creeks and threaten to fall on whatever is nearby.

And the [woolly adelgids](#) — named for the clumps of whitish wax fibers they produce — are progressing more quickly than officials calculated [across the Cumberland Mountains and Plateau](#) toward some of the state's best-known scenery and hiking spots. The fast-reproducing Asian species has no native predator here.

At risk are hemlocks that ring two of the falls at Fall Creek Falls State Park and gorges of Savage Gulf that are lush with their canopies. Hemlocks, which are known as the “redwood of the East,” also line the Fiery Gizzard Trail about 90 miles southeast of Nashville.

“When you walk along a creek, like at Fiery Gizzard, the only big towering tree is the hemlock,” said Margaret Matens, with [Friends of South Cumberland State Recreation Area](#), which includes the trail and Savage Gulf.

“If they should die, the effect to the environment is staggering.”

The often rugged landscape where hemlocks once stood tall has changed from green to gray at Joyce Kilmer Memorial Forest in the Smokies, Shenandoah National Park and throughout the insects' destructive path that ranges from northern Georgia and Alabama to New England.

More than the scenery suffers. Streams and aquatic life do, too.

“Removal of these trees has all kinds of ripple effects that we're just beginning to understand,” said [Jon Evans](#), a biology professor at the [University of the South, Sewanee](#).

Hemlocks are a “keystone species” that have little value as timber but are found along springs and streams where their feathery canopy keeps the water cooler in summer, and at a more even temperature year-round, than if open to the sky.

That means healthier, more oxygenated water for aquatic creatures, and it helps keep algae growth under control. Trout and endangered Blackside dace are among the fish that depend on the cool waters. Neotropical migrants including Swainson's warbler seek out the hemlocks. Green salamanders and scores of other species are part of their ecosystems.

The trees grow slowly, creating a multileveled forest with branches serving as a ladder for animals to climb into the tops of taller trees. Their needles release oxygen and their bodies hold carbon sequestered over the years as they grow.

Having masses of them die and rot releases that carbon back to the atmosphere and overloads the waterways with woody debris, Evans said.



*Dead hemlocks stand out amid other evergreens and colorful hardwoods in autumn at the Chimney Tops area of the Great Smoky Mountains. / Tim Phelps / Tennessee Department of Agriculture / Forestry Division*

## Funding limited

A group of largely state agencies formed the Tennessee Hemlock Conservation Partnership with the [Tennessee Chapter of The Nature Conservancy](#) in 2011 to strategize about the 550,000 acres of public lands — 80 percent of it state-owned — in the Cumberland Mountains and Plateau.

Finding out where the hemlock stands are — and which are a priority to protect — has begun with [mapping paid for](#) by a Nature Conservancy grant and donations from Friends groups at [Fall Creek Falls](#) and South Cumberland state parks. A state forestry division employee as of last month is working full-time on the issue, but with state money slim, much of the protection effort [depends on donations](#).

Based on the data so far, about 24,000 acres in Tennessee could have hemlocks, and treatment costs can run upwards of \$80,000 per 500 acres with currently available methods. That could amount to about \$4 million or more.

“We won’t have enough funding to save them all,” said Trisha Johnson, a conservation coordinator with The Nature Conservancy, adding that she hopes the group gets enough to save 10 percent of the best.

Chemicals aren’t costly to treat trees — it’s about \$1 for each foot the tree is in diameter. But it’s time-consuming to reach the trees and to administer the pesticide individually. This is done by squirting the mix into the ground around the tree or, if near a stream, injecting the tree itself. The largest hemlocks, whose trunks can be five feet in diameter, take longer to circulate the substances and are less likely to fight off the insects. At Savage Gulf, in advance of the insects, more than 8,500 trees one foot in diameter or larger received protective treatment in a project ended two weeks ago.

That could protect many of those trees for up to nine years. There are additional 23,100 mature hemlocks there, and 90,000 at Fall Creek Falls State Park, according to the [Landscape Analysis Lab](#) at Sewanee that did the mapping to locate the trees in these areas.

## Beetles released

The woolly adelgids, one of many invasive species that land managers are trying to control, arrived in the United States in the mid-1900s and were first seen in Tennessee in 2002. They could be carried from place to place by birds, infested landscaping material, or people or animals that they might cling to.

And then they proliferate.

“They are egg-laying machines,” said Pat Parkman, director of the University of Tennessee’s [Lindsay Young Beneficial Insects Laboratory](#).

All are females that reproduce twice a year — with no need of a male. In one year, a single insect, with subsequent generations, can result in 90,000 additional adelgids.

They are small, less than one-sixteenth of an inch, and secrete their woolly mass to protect themselves and their eggs.

[Adelgid-eating beetles](#), another line of defense, are being grown at the UT lab and set loose at locations around the region. This includes a species native to the West Coast and another from Japan, where the woolly adelgid originally came from.

About 800,000 beetles from the lab have been released, some on state lands, including [Tennessee Wildlife Resource Agency’s](#) North Cumberland and Catoosa wildlife management areas and Roane Mountain and Cumberland Mountain state parks. But there are many more woolly adelgids in these locations than beetles. The beetles have to thrive and build up, which could take several years.

“We’re trying to get out ahead of this,” Parkman said. “It’s sort of an arms race.”

In a test, a helicopter dropped an adelgid-killing fungus blended with whey on a few heavily infested acres of TWRA land. It reduced adelgids significantly, but the U.S. Environmental Protection Agency hasn’t yet approved the concoction for large areas.

Tennessee has the advantage of learning from other states and also the National Park Service that experienced the insects sooner. In the Great Smoky Mountains, a dramatic change in the forest has already taken place with “a lot of the old growth trees hammered early on,” said Jesse Webster, with the park.

Aggressive treatments begun in 2002 are avoiding “ecological extinction” of the park’s hemlocks, so at least pockets will remain and new hemlocks will follow, he said. The park has chemically treated trees in campgrounds, on roadsides and at back-country campsites and finds it cheaper than having to later remove large dead trees, which otherwise are a serious hazard.

### **Volunteers trained**

Private lands are another matter.

Wendy Fish of Nashville learned through [Save Georgia’s Hemlocks](#) how to apply the pesticides and has taught others in her hemlock-strewn vacation community near Savage Gulf.

“We call them ‘Woolly Day,’ ” she said of neighborhood work sessions.

She and the neighbors treated 1,000 trees last month and have many more to go.

“We’ve very motivated,” she said, adding that the community had expected to have a couple of more years before the insects arrived.