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Survey project maps tree death along Appala ridges

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By Don Hopey, Post-Gazette Staff Writer

In the Allegheny National Forest's Tionesta Scenic Area, 30 percent to 40 percent trees on some slopes are dead or dying.

On Clingman's Dome, a 6,640-foot peak in Great Smoky Mountain National Park, mortality rate is closer to 60 percent standing dead.

In the Shenandoah National Park in Virginia, there are so many dead trees that hikers on the Appalachian Trail are warned by park rangers to be careful where they pitch their tents because of the risk of injury or death from brittle falling branches.

The big trees on the highest peaks and ridges of the Appalachian Mountains from Maine to Tennessee are dying because of something in the air.

Acidic pollution from coal-burning power plants, industry and automobile exhaust wafting onto the protruding spine of the Appalachians, poisoning the soil and causing a multitude of species -- maples, beeches, black cherry, dogwood, hemlocks, spruce and pines -- to die in epidemic numbers.

"We are seeing serious, AIDS-like mortality in the higher elevation eastern forests," says Harvard Ayers, a professor of anthropology and sustainable development at Appalachian State University in Boone, N.C. "It will take decades, probably centuries, to recover."

Ayers, who as director of the Northern Hardwood Damage Survey has been mapping tree mortality in the Appalachians of North Carolina, Tennessee, Virginia and West Virginia since 1997, was in Franklin, Venango County, last week to begin survey flights in Pennsylvania, starting with Allegheny National Forest.

Using topographic maps, global positioning satellite locators and laptop computers, Ayers and his colleagues have spent hundreds of hours flying over the Appalachian treetops, plotting and documenting the dead trees.

"The spine of the Blue Ridge is bad off," Ayers said. "It's the highest in the east and most of the wind and pollution."

Ayers said the summit of the Appalachian's highest peak, 6,684-foot Mount Mitchell in North Carolina's Black Mountain Range, stands surrounded by the ghostly remains of spruce and fir trees that have died in the past 25 years.

Other documented areas of high tree mortality include the Adirondack Mountains in New York, the Blue Ridge Parkway corridor and Mount Rogers in southwest Virginia; and the Dolly Sods and Otter Creek Wilderness areas in West Virginia.

"Throughout the South, any trees above 4,500 feet to 5,000 feet have been harmed. We're seeing the same kind of problems in West Virginia above 4,000 feet elevation," Ayers said.

"In the Allegheny National Forest, you've got as bad a problem at 2,000 feet elevation as we see at 5,000 feet in the South. Pennsylvania is at the epicenter of acidification; it's certainly understandable that the Allegheny would be hard hit."

The Appalachian forests at high elevations are vulnerable because they get more heavily loaded on them and their thinner, ridge-top soils are less able to overcome its effects.

Pollution-laden westerly winds bring smokestack emissions from the Midwest and the South, as well as auto exhaust from more local sources. Up to 60 percent of the sulfur dioxide load is emitted by coal-burning electric utilities, with emissions especially high from power plants, Ayers said.

As a result, the Smokies, the Shenandoahs, the Blacks and the Adirondacks, once heavily wooded mountain ranges, now suffer from some of the highest levels of air pollution in North America.

An October 2000 analysis of air pollution monitoring data at national parks by Air Quality Voices, a nonprofit conservation organization, found four of the five most polluted parks are in the East. They are: Great Smoky Mountains in Tennessee and North Carolina; Shenandoah in Virginia; Mammoth Cave in Kentucky and Acadia in Maine. The Sequoia/Kings Canyon in California.

The pollutants of concern are sulfur dioxide and nitrogen oxides, which mix with water vapor in the air to form sulfuric and nitric acids that damage trees and ground in the form of acid rain or acidic mists and fogs.

North Carolina State University scientists have found frost on Mount Mitchell with a pH as low as 2.1 -- an acid level between battery acid and lemon juice.

The acids also fall to Earth in dry form. And nitrogen pollutants also can react with organic compounds and sunlight to produce leaf-destroying, ground-level ozone.

"Western Pennsylvania's acid rain deposition is among the worst," Ayers said, "but there are higher elevations in the Smokies, above 6,000 feet, that get 100 inches of acid rain a year, and so get more acid rain."

"But with the concentration of power plants around Pittsburgh and to the west, it's not surprising you can see why the Allegheny National Forest is having problems."

How damage occurs

How the acids cause stress to trees is only partly understood. In rain, mist or fog the tree leaves, weakening leaf structure and sometimes causing discoloration or fall. In the soil, they generally interfere with plants' ability to absorb nutrients like potassium and magnesium.

The acids also can leach poisonous metals like aluminum, cadmium and mercury from soils, directly damage tree roots, and reduce the number of microorganisms and earthworms, which are important to nutrient cycling and forest regeneration. In fact, scientists have found that the soil is so poisoned by acid precipitation that no earthworms are present.

Disappearing earthworm populations are a good indicator of soil health, Ayers says. When they start going out, half of the processors of forest litter are gone and the trees suffer.

If the trees aren't killed outright by the acid deposition, they can be weakened enough that they are more susceptible to damage from cold winters, high winds, drought and disease.

The U.S. Forest Service and some academics whose research is funded by coal and utility interests have been slow to identify acid deposition as the culprit for the damage affecting a wide variety of tree species, but Ayers said the evidence is overwhelming.

"They say maples are dying of maple thrips and beeches are succumbing to beech disease and one or two other things. Sometimes they say it's the bugs that are killing them but those bugs have been around forever," he said.

"There are a dozen species of trees being hammered all at once, all at higher altitudes. Air pollution is making everything a whole lot worse. It's tipping the balance."

View from the air

Bud Miller throttled up the Civil Air Patrol's single-engine Cessna, rolled it down the runway and eased it into the air with a minimum amount of wing wobble before heading left over the Allegheny River, the town of Tionesta and the Tionesta Reservoir and on to the Allegheny National Forest.

From our cruising height, 500 feet over the rolling Allegheny Plateau, the forest looks like a soft green patchwork quilt with squares of clearcuts and young trees irregularly scattered among the maturing forest. Dirt roads thread through the trees, linking small strips of open land.

As we approached the Tionesta Scenic area, the number of brown and gray tree trunks in the forest increased dramatically, looking like big, lacy mushrooms.

"All this on our right is unhealthy forest," said Ron Hancock, a graduate student at Appalachian State and executive director of the Project for Appalachian Community Environment, who is sharing the plane's backseat with a global positioning device and a laptop computer.

"I use the GPS to accurately locate where we are on the topographic map on the and then look out the window to identify how much forest decline there is," he said. "There's an incredible amount of decline."

The plane turned toward Bradford and passed over the Kinzua Bridge. Along the Lewis Run there again are lots of dead trees.

"This isn't as bad as the Tionesta Scenic Area but there are a lot of gray snags," he said.

In the last area we fly over, near the Kinzua Reservoir, there are a lot of brown and yellow trees. They look like old broccoli spears that have been in the veggie drawer a long time.

"At Tionesta, we were probably looking at 30 to 40 percent of the trees if not already dead then in serious decline," Hancock said back on the ground at the Franklin Park. "The other areas were maybe 15 to 20 percent dead or dying."

Hancock and Ayers decided to start their mapping of Pennsylvania with the Allegheny National Forest because it's a large, fairly contiguous forest. They also plan to fly over northern tier counties the Laurel Ridge and Chestnut Ridge.

"What we're after now is to demonstrate the serious northern hardwood problem even in New York, down through the Smokies, for a map we'll be putting together in December," Ayers said. The map and an accompanying paper will be published in Appalachian Voices.

It will be hard to get a true picture of the problem in the Allegheny National Forest because it is fragmented by timbering, especially the cutting of dead and dying tree stands.

"Those cuts are keeping a lot of the mortality from being recognized," Ayers said. "You've got to see the bodies to do the body counts, and if they cut them out, we can't see them."

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