

Probing Question: What causes trees to be diseased?

April 16 2012, By Melissa Beattie-Moss



Elms along Pugh Street Mall on Penn State's University Park campus. -- June 23, 2011. Credit: Penn State

From the delicate cherry blossoms of Washington, D.C. to the towering redwoods of northern California, many towns and institutions across the nation are known and loved for their iconic trees. Count the majestic elms of Penn State's University Park campus among these beloved arboreal symbols—but if you literally count them, you'll notice there are fewer today than ever.

The culprit is elm yellows, a disease that threatens the health of over 200 majestic American elms on the Penn State campus. Elm yellows is just one of many tree diseases that contribute to the decline and death of trees in the United States.

What are the main causes of American tree diseases and have we made progress in preventing and treating them?

"There are many tree diseases—most of them caused by fungi—that occur year in and year out in the northeast and can damage their appearance, but most of those do not kill the trees," explains Gary Moorman, professor of plant pathology at Penn State. "These diseases include leaf spots, powdery mildews, needle diseases and twig cankers, and they occur to varying extents every year depending upon the weather."

However, Moorman notes, the most damaging diseases that currently threaten trees in the Northeast "are ones that are vectored or moved about by insects," and many of those are fatal.

One such disease is bacterial leaf scorch. The bacteria—spread by leafhoppers, treehoppers, and spittlebugs—clog the tree's water-conducting tissues, causing the leaves to brown and the tree to gradually decline and die.

"Particularly in the southeast part of Pennsylvania, but also as far west as Chambersburg, the bacterium is severely affecting oaks and can also be found in sycamore, elm, maple, and even dogwood," says Moorman.

"There is no cure for an infected tree," he adds. "Arborists licensed to do so can inject trees with tetracycline to suppress the symptoms and prolong the life of the tree. However, injections must be done every year and only very highly valued trees are treated because of the expense and labor required."

Many researchers in the field are working on better detection and treatment methods, as well as the development of disease-resistant tree and plant species. At Penn State, Moorman and his colleagues are

studying plant-insect interactions involved in the spread of elm yellows. Leafhoppers—tiny insects that feed on tree sap—are a particular focus. "Although there are many different leafhoppers that feed on elms, not all of them can move the phytoplasma to another elm," explains Moorman.

"At this time, we don't know how many different leafhoppers are involved in the spread of elm yellows. We have trapped over 30 different species of leafhopper and found that a few of each have ingested sap containing elm yellows." Notes Moorman, one of his graduate students, Padmini Herath, has even developed a test that can be used on elm tissue or leafhoppers to detect the presence of elm yellows.

"The problem with that disease," he adds, "is that the phytoplasma moves to the roots of the tree and kills them rather quickly. As a result, elms usually die within a year after being infected. We have lost many elms on the perimeter of the main campus to elm yellows." This spring, the disease also [claimed one of two elms](#) that graced the front corners of Penn State's iconic Old Main building for generations.

The other scourge of the elm tree, Dutch elm disease, "has been in Pennsylvania since the 1930s, slowly killing elms," says Moorman. The disease is caused by a fungus, which is spread by bark beetles. "It is known that trees infected by elm yellows are very attractive to elm bark beetles," he explains. "Many elms are being infected by both elm yellows and Dutch elm disease and there has been an explosion in the elm bark beetle population over the last two years."

Penn state entomologist Greg Hoover has been monitoring elm bark beetle populations over several years, adds Moorman. "Based on Hoover's data, the elms can be sprayed at specific times to suppress peak bark beetle activity and thereby lessen the spread of Dutch elm disease."

While there's currently no cure for these diseases, there is something we

can do and that is to grow disease-resistant trees, says Moorman. There are several Dutch elm disease-resistant elms but only one hybrid—Homestead—that is resistant to both Dutch elm disease and elm yellows. "The greatest threat to our trees comes from people introducing non-native pathogens, insects, and mites into our ecosystem. Our native trees and shrubs usually have no resistance to these and there are no natural enemies here to suppress introduced pests, such as the Dutch elm disease fungus, emerald ash borer, the Asian long-horned beetle, and viburnum leaf beetle. These are all in the northeast because of human activity."

Great care must be taken, says Moorman, to avoid pests hitchhiking into our country on imported firewood, logs for lumber, and wooden shipping crates, among other products. After all, he concludes, American [trees](#) are not only part of our history and legends—from Johnny Appleseed to George Washington's cherry tree—but are a living national treasure to preserve for future generations.

Provided by Pennsylvania State University

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