FOREST PATHOLOGY

Our Sick Trees

Research and the forest pathologist may provide ways to control and eventually eliminate tree diseases that cause an annual loss in wood equivalent to 2,000,000 five-room houses.

By BENITA TALL

➤ IMAGINE yourself standing on a wooden sidewalk, one inch thick and one-half mile wide, that extends across the United States from New York City to San Francisco. Stretch your imagination a little more and imagine that whole sidewalk collapsing—a long pile of rotten, decayed and diseased wood.

That will give you some idea of the amount of timber destroyed each year either directly or indirectly by tree diseases.

Diseases such as the chestnut blight, white pine blister rust, the Dutch elm disease, heart rots, and oak wilt take an annual toll of our trees that amounts to about 20 billion board feet.

These costly tree diseases come in many sizes and shapes, very much like diseases to which humans are subject.

Trees suffer from diseases associated with old age. The wrong environment such as overcrowding and malnutrition can result in a sick tree. Viruses and fungi cause some disease, while other diseases are tagged "cause unknown." One disease can kill completely and quickly. Another may kill slowly, all but undetected.

One difference, however, between tree and human disease is the number of scientists working on the problem of curing, treating and preventing disease. We have all kinds of specialists, research scientists, bacteriologists, public health officers, surgeons, nurses, internists and nutritionists to name a few. In contrast there are a handful of forest pathologists to do the research, treat diseased trees and control the spread of disease.

Much of this work is being done by the 65-odd forest pathologists, most of them PhD's, with the U. S. Forest Service's forest disease research division. The Government's forest disease research program, often in cooperation with the states and private groups, is directed at the problem of tree diseases.

War on Oak Wilt

What is being done to combat the oak wilt fungus is an excellent example of the disease research division's work.

Even though the current losses in oak timber amount to one-fifth of one percent of our oak supply annually, oak wilt poses a serious problem if left uncontrolled. Even with control measures undertaken by Federal, state and private forest workers, the wilt has been slowly but definitely spreading in the Appalachians and the Alleghenies.

It probably was active in Wisconsin and Iowa for 40 years or more before its identification as a fungus disease in 1942. It is now found scattered over a wide area in the Lake and Central States, from Pennsylvania to North Carolina and westward through Tennessee and northern Arkansas to eastern Kansas and Nebraska.

Oak stands ranging in size from a few to 100 acres in Wisconsin and Iowa have been practically denuded of trees. Scientists believe the disease fungus is not able to survive temperatures higher than 90 degrees Fahrenheit, which may be a natural limiting factor in its spread. Southeastern areas that have reported cases of oak wilt are largely in the cooler mountains or foothills.

One of the ways scientists believe that oak wilt is spread is by insects entering wounds caused by blazing, tree climbing and by lightning. Fungus "mats" are formed under the bark of diseased trees; these mats raise and crack the bark emitting an odor that attracts many insects to the infected tree. Squirrels and possibly other animals, birds and especially beetles may be responsible for spreading disease-causing spores to healthy trees.

Since the spore-bearing fungus mats are essential to the wilt's spread, one control method is to "cut and burn" infected trees before mats are formed. An oak dying of wilt usually loses its leafy crown so that an aerial survey of an area where the disease is suspected will usually show up injured trees.

There is also much evidence that oak wilt is spread underground through root grafts between a diseased tree and neighboring oaks of the same group; red and white oaks rarely graft with each other.

A root graft is a "merger" of the roots of different trees that sometimes occurs naturally because of pressure or continued contact. Recent experiments on oak trees on a 3,000-acre experimental forest near Bunker, Mo., may provide scientists with some needed basic information on the mechanism of fungus spread. Eight black oak trees were inoculated with a radioactive isotope. When radioactivity measurements show how the trees are connected or related to the other forest trees, the original eight trees will be inoculated with an albino strain of the oak wilt fungus. If this unique strain is then found in the same trees that became radioactive, the scientists will have evidence for fungus transmission through root grafts.

If oak wilt is currently the most highly publicized tree disease, it is certainly not the only important one.

Diseases with exotic names like Elytroderma needle cast—which has killed outright 50,000,000 board feet of high-quality pine within the past eight years—and with plain names like pole blight—61,000,000 board feet is the annual toll here—need to be studied. Dwarf-mistletoe, a relative of the popular Christmas-time plant, causes an annual loss to our western pines, firs, hemlocks and larches amounting to about 600,000,000 board feet or 60,000 five-room houses.

Basic Research Needed

How do you go about protecting trees from disease? It is a difficult and compli-

THE ONCE MIGHTY OAK—This felled white oak, a part of the George Washington National Forest in Virginia, shows the extent of internal decay and rot which has hollowed out the tree trunk. Tree diseases take an annual toll of our forests equal to 20 billion board feet of timber.

cated process, says Dr. J. R. Hansbrough, director of the forest disease research division. The biggest problem facing the forest pathologist is lack of basic information on what makes a tree "tick."

Scientists know a great deal about the heart and lungs, the muscle tissue, and digestive processes of animals. They know little about the physiology of trees. This is a big handicap for the forest pathologist. Many similar diseases affect both animals, including the human "animal," and trees.

"Heart trouble," or heart rots in trees, is a killer for both. Trees are subject to virus infections, fungus attacks and old age. Nutrition and environment influence growth and health for both. However, in contrast to the biologist studying animals, the forest pathologist's understanding of the factors that influence a tree's health have been limited to a narrow range of observations and experimentation.

No "Guinea Pig" Tree

There is no such thing as a "guinea pig" tree, one with a short enough life cycle to permit detailed study of the biological processes in a tree. Studying seedlings offers the scientist some basic information on tree physiology, but the results may not always be applicable to the full grown, mature tree. General studies on plant physiology, especially of simple one-celled plants, do not always apply to the tree.

Its very size and long life make the forest tree difficult to study.

Another problem is the way diseases attack only certain trees. Fusiform rust, the most important disease of loblolly and slash pines, does not cause as much damage on the rust-resistant longleaf pine. Red oaks generally die the year they become infected with oak wilt, while trees in the white oak group may not die for several years.

Even with adequate knowledge of tree physiology and pathology, economics would further complicate the study of forest disease research.

Every bit of the tree—from its crown to its roots—is useful economically. In addition to the well-known products such as pulp for paper, wood for furniture and charcoal, the forest is a treasure house of useful products. Crayons and explosives (from resins), soil conditioners and vanillin (from lignin), phonograph records and sausage cases (from cellulose), and musical instruments and barrel staves (from logs) are all forest products.

While much current research is necessarily directed at reducing the huge losses caused by existing disease, the ultimate goal of the forest pathologist is prevention. Research directed at preventing forest diseases holds the greatest promise for the future.

Breeding resistant trees—genetics—is one of the USDA's forest disease research division's most hopeful projects. The resistant tree of the future, like the human with an immunizing shot, is protected against disease and there is no longer need for controlling an epidemic, whether of oak wilt or the flu.