

# Will Elm Trees Vanish from the Golf Courses?

by

Arthur Mason and William E. Knoop, Ph.D.

*American elms have a chance to survive if certain precautionary measures are taken. Researchers are also diligently at work to find ways to combat Dutch elm disease, which has already killed too many trees. Unfortunately this disease has been occurring on British Golf courses as well.*

THE AMERICAN ELM (*Ulmus americana*), once a picturesque landmark of many golf courses across the country, is gradually disappearing from the landscape. This tree is in a battle for survival against a foreign invader.

Our beautiful, graceful American elms are under attack by a fungus (*Ceratocystis ulmi*) that produces symptoms commonly called Dutch elm disease. This fungus was first discovered in Holland in 1919. It is generally believed that the fungus found its way into the United States in Carpathian elm logs shipped from Europe to be used for furniture veneer and spread un-noticed until detected by a Cleveland pathologist in 1933. Now Dutch elm disease has spread from the eastern United States to the Rocky Mountains, leaving broad bands of dead trees.

## Carriers: Beetles

The principal carrier of the fungus is a tiny beetle known as the smaller European elm bark beetle, *Scolytus multistriatus*. Although of less importance, the native elm bark beetle, *Hylurgopinus rufipes*, can also be a carrier of the fungus.

The smaller European elm bark beetle usually breeds in logs and in dead or dying trees, including those killed by Dutch elm disease. The female beetle enters the tree and forms a 1- to 2-inch long tunnel or brood chamber parallel with the grain just under the bark. She lays from 80 to 140 eggs in niches along the sides of the brood chamber or main gallery.

After the eggs hatch, the larvae tunnel away from the parent gallery across the grain forming a brood gallery. Following larval development and pupation in the outer bark, the young beetles break through the surface of the bark and leave the tree. The beetles that emerge from a diseased tree carry the fungus spores on their bodies. These beetles transmit the fungus spores by feeding on the tender twigs of healthy trees.

The disease may also spread from infected trees to healthy trees by natural root grafts when elms grow close to each other.

The adult beetles feed on living elm trees throughout the growing season. Elm trees attacked by the fungus in the spring and early summer usually are more seriously affected than those attacked later in the season. The reason for this is that the long vessels of the trees' spring wood are near the bark surface and are open and functioning early in the season. Spores of the fungus introduced into these vessels by the insect are carried rapidly to all parts of the tree. These spores germinate quickly and the resulting fungal growth culminates in disease development that may kill the tree.

## Symptoms

The symptoms of Dutch elm disease include wilting and yellowing or drying of the leaves followed by leaf drop. If the disease progresses unabated, the tree will die. Symptoms

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usually occur on one or several branches, then spread to other areas of the tree. In some case the entire tree may suddenly show disease symptoms simultaneously and die within a few weeks. If a branch displaying symptoms is cut with a knife and examined, a brown ring may show in the annual growth ring and brown streaks may be seen just under the bark.

Are all American elms doomed? What is being done? What can be done? How long does a diseased elm have to live? What should one do if he suspects that an elm tree has the diseases? These are typical questions asked about Dutch elm disease.

*There is no positive cure for Dutch elm disease at this time*, although recent research indicates there may be a breakthrough in the control of the disease. New developments will be discussed later in the article. Up until now, however, once a tree had been invaded by the fungus there has been no chemical or other treatment that could be effectively used to kill the fungus.

### Avenues of Prevention

There have been four ways to reduce the chances of Dutch elm disease contamination, as follows:

1 *The practice of good sanitation, which includes the prompt removal and burning of dead and dying branches and trees.* This will aid in reducing the beetle population by eliminating their breeding sites. If antiburning laws prevent this recommended treatment, then the infected wood should be carried away and buried. Stripping and burying the bark from the main trunk and stump will also prevent beetles from breeding.

2 *Keeping elms vigorous with fertilizer treatments and sufficient water.* Spring and fall are the most favourable times of the year to fertilize trees. Any complete commercial fertilizer such as 10-6-4, 10-10-10, 7-8-6 or 10-5-5 is suitable. For large trees the amounts generally recommended are 3 pounds of fertilizer for each inch of tree diameter at breast height. For small trees, 1 to 2 pounds per inch is generally adequate.

The fertilizer should be put in holes that have been previously placed in the ground under the trees. These holes should be 15 to 18 inches deep, made with a crowbar, 1½ inch auger or other sharp instrument. The holes should be dug 3 feet apart in concentric circles 3 feet apart, starting 3 to 4 foot from the trunk and extending just beyond the drip line. The holes should be filled with the selected fertilizer to 3 inches from the top. The top 3 inches of the holes can be filled with sand or a core of soil to prevent patches of abnormally green grass from developing around the holes. This is followed by soaking the areas under the trees after fertilizing.

Water alone in dry areas is important. Watering from 2 to 4 hours at a time twice a week is recommended if the soil is not a heavy clay type.

Soil testing is important and the results of soil tests may determine the fertilizer and water amounts and schedules. Contacting the nearest county agricultural extension service for advice on soil testing is advised.

3 *The fumigation of the soil around the diseased tree to prevent the spread of the fungus to nearby elms via root grafts.* This is necessary only if elms are closely spaced Vapam or MC-2 (methyl bromide plus chloropicrin) may be injected into the soil around the tree to kill possible root grafts.

4 *The prevention or reduction of the feeding by the elm bark beetles in living elms, especially during the spring and early summer by applying an insecticide.* Since various states have different pesticide regulations, the county agent should be consulted for the suitable chemical pesticide that is legal and available in the given state. Methoxychlor has generally replaced DDT in the control of the elm bark beetles. Methoxychlor is applied at the label-recommended doses as a dormant spray - i.e. before the buds break in the spring.

If Dutch elm disease is suspected and expert advice is desired, there are several places to which one can turn. State universities can help through their Co-operative Extension Service facilities. The Extension Service has a county agricultural agent in nearly every

county in every state. There are also university or state specialists who can give assistance. These are free services. There are also a great number of commercial tree maintenance services that are in the business to save trees and improve the vigor of their growth.

### The Future

Research is continuing in an attempt to develop or find disease-resistant elm trees and to develop fungicides that will control the fungus. This has been and will continue to be a long process.

Some successes with a new fungicide (benomyl) injected directly into the tree have been reported. Preliminary trials in the laboratory and the greenhouse at the University of Wisconsin have revealed the potential of benomyl treatments, which have now been extended to field tests. A Michigan State University plant pathologist has also been conducting studies that have shown that treating mature American elms with the systemic fungicide benomyl resulted in a significantly lower number of trees becoming naturally infected with Dutch elm disease.

This fungicide is now registered in some states for Dutch elm disease control but is restricted to use by trained arborists only. Conclusive results on its overall effectiveness are yet to be revealed. In the meantime, the remaining elms should be protected by the best methods known: by maintaining tree vigor, by sanitation, by reducing breeding areas for the beetles and by correct use of recommended chemicals.

*With grateful acknowledgements to the "Golf Superintendent"*

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