

# Dutch Elm Disease

## Elm Tree Protection Program



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## History of Dutch Elm Disease

Dutch elm disease (DED) is one of the most widely known plant diseases in the world. The causal fungus, *Ophiostoma ulmi*, was first isolated in Europe in 1920. Today, eighty years later, the disease is still a threat to elm populations. Currently, there is no cure for Dutch elm disease. However, one can still find stately elms in Seattle and the Puget Sound area today.

A quarter of a century has passed since the first case of DED was discovered in Washington in 1974. The disease was most likely spread from Boise, Idaho to Walla Walla, Washington along the Interstate 84 corridor by travelers carrying diseased elm wood for firewood. In 2001, three infected trees were identified in Seattle, with an additional five diagnosed in 2002.

Ironically, the most powerful form of DED education comes from experiencing firsthand the removal of a beloved elm tree. Neighborhoods that have witnessed these removals are usually eager to protect their remaining elms.

## Biology of Dutch Elm Disease

The fungus, *Ophiostoma ulmi*, invades the vascular system of elms (analogous to the veins of animals). Essentially, it prohibits water movement in the tree and causes excessive wilt. Within the first season of the initial infection, the fungus typically reaches the root system and becomes systemic. A systemic DED infection soon results in the death of the elm tree. While inside the tree, the fungus produces microscopic spores that can play a role in spreading the disease.

## Identifying Dutch Elm Disease

The sooner DED is diagnosed and properly dealt with, the less likely the disease will spread. The first symptom of DED is a sudden wilting or drooping of leaves, often in a single branch or limb of the tree canopy. The wilting leaves are grey-green in color, but within days or weeks turn light brown.

This browning of the leaves is called "flagging" (Fig. 1) and will usually start at the tips of the branches and work its way down the tree. Flagging will occur if the elm is infected in the early summer months.

If the tree is infected in late summer, the leaves will prematurely turn yellow and fall off, followed by smaller leaves than normal the next spring. The fungus will continue to move through the tree's vascular system and will eventually kill the tree. The longer an infected tree is left standing, the more likely it is that the disease will be transmitted to healthy trees. Twigs from the flagging branches may be checked for brown streaks in the sapwood by removing the bark. Elm bark on young twigs should peel off fairly easily with a fingernail or a pocketknife. Healthy elm wood (under the bark) is nearly white with no markings. Brown, linear discoloration running parallel to the twig is called streaking (Fig. 2). To confirm the disease collect 5 or more twigs, at least 6 to 8 inches long and 3/8 to 1 inch in diameter, and send them to a diagnostic laboratory. If possible, twigs should include the area of transition between live and dead wood.

Samples should be refrigerated and sent to the lab within four days. It is important to get positive confirmation from a reputable lab since there are some root diseases and insect infestations that mimic DED flagging. The lab will take the streaked wood and attempt to grow the actual fungus on a laboratory media.

## Spread of Dutch Elm Disease

There are three ways the DED fungus is spread:

### 1) Elm Bark Beetle

The elm bark beetle is the primary vector for Dutch elm disease. Elm bark beetles are small insects that breed, feed and overwinter in elm wood. In the course of their life cycle, they come in contact with the DED fungus. When this happens, tiny fungal spores stick onto their backs. These spores can

then rub off later, when the beetle has moved to a healthy elm. The beetle breeds and overwinters in dead or dying elm wood and then feeds in the 2 to 4 year old branches of healthy trees during the growing season.



The life cycle of the elm bark beetle is important to note because it shows the pattern of beetles moving from diseased trees into healthy trees. Adults lay their eggs in diseased and dead elm wood. They are attracted to these trees by chemical signals.

The eggs hatch into larvae, which tunnel beneath the bark. The fungus, already present in the sick tree, grows into these tunnels and produces spores. The disease is then spread as beetles, carrying the fungus spores with them, emerge from the diseased tree and fly to feed on healthy elms. The adult beetles feed on twig crotches and branches located near the top of elm trees. They can carry DED from infected elms to healthy elms several miles away.



Fig. 2

## 2) Root Grafts

Dutch elm disease is also spread through natural root grafts. Trees growing close together will join at the roots, sharing nutrients and water. This is called root grafting. When an elm becomes infected, the fungus is able to travel from the diseased tree to the healthy tree through roots. This method of contraction is very lethal since the disease arrives systemically and can begin affecting the entire tree immediately.

## 3) Human Activity

DED can be spread by human carelessness, which is probably how the fungus first arrived in Washington. The elm bark beetle can live in elm wood that is stored for firewood. When infested wood is transported, the beetles can emerge and infect nearby elms in new locations. This is why proper disposal of elm wood is an important factor in controlling DED.

## Pruning Elm Trees

As mentioned above, elm bark beetles breed in dead elm wood. Routine pruning of dead wood will reduce the number of beetle breeding sites and help make elms safer and healthier. In Seattle, the season for pruning elms is October 15 through April 15. The pruning season is timed to coincide with the time of year when beetles are not actively flying. Check with your municipality to see if there is a moratorium on pruning elms.

Fresh wounds play a role in attracting the elm bark beetles, thereby increasing the chances that a tree will become infected. All wood removed from an elm, dead or alive, needs to be chipped; burned; debarked; or buried within 24 hours. This kills the developing larvae and eliminates potential breeding ground for the adult beetles. The most common practice is to have the wood chipped. When working with an arborist, make sure they are aware of any quarantine or moratorium.



Fig. 3

## Fungicides

The major fungicide on the market for DED at this time is Arbotect. It is used to help prevent the infection of DED. With complete and even coverage of the entire crown of the tree, you ensure that the fungicide is present in all 2 to 4 year old branches. If and when infected beetles come to feed, the fungal spores will be disabled by the fungicide, thus preventing infection.

The Arbotect applicator system uses pumps. (Fig. 3) hoses and a power source to pump approximately 30 gallons of solution into the tree.

Alternative treatment methods might also be considered, especially since scientists are constantly researching and developing new products. Be sure to research local and state regulations before implementing any elm protection/injection program.

## Removing Infected Elm Trees

The longer an infected tree is left standing, the more likely it is that the disease will be transmitted to healthy trees. Should an elm need to be removed, immediate replanting at the site will ensure a future green canopy. Check with an arborist to determine what tree is best suited for the location and with your local government to see if a planting permit is required. If you wish to replace with an elm, there are several DED resistant elms available, such as Allee Lacebark Elm, Homestead Elm, and Accolade Elm. Contact a local nursery for availability.

## Elm Protection Program Seattle Department of Transportation

The Seattle Department of Transportation (SDOT) will provide inspection of Elm trees which are located within street rights-of-way. This will include the collection and testing of samples, to determine if trees are infected with DED. Trees that are located on private property will be evaluated upon request, but no sampling or testing will be provided.

SDOT may be able to provide assistance to homeowners who wish to prune or inject their elm trees, in order to curb the spread of the disease.

Assistance may also be available when diseased trees must be removed from the street right-of-way. For more information, or to request an inspection, please contact the City Arborist at 206 684-7649.



## Seattle Parks and Recreation

The Seattle Parks and Recreation Department is using an integrated pest management program (IPM) to monitor and protect elm trees that are located in developed parks and other City owned greenspaces. The management program consists of removal of infected trees, removal of dead branches from healthy trees and injecting selected trees to curb the spread of the disease.

For more information, or to report a potentially infected tree in a park, please contact the Senior Urban Forester at 206 684-4113.

## Monitoring Elms

Neighbors and property owners looking for DED may be the first to spot an outbreak. Organizing concerned citizens to patrol for DED symptoms can be one of the best methods for early detection of the diseased trees.

Survey your area once a week from mid-June through August. Look for the following: Wilting, drooping, gray-green or yellow leaves (Fig. 4) on one or more branches in the crown of the tree. Leaves turning brown a few days after wilting. Most leaves fall, but some will remain on the tree.

Check firewood piles for elm wood. Elm wood is distinguished by bark that is dark gray/brown in color, has broad intersecting ridges and a rough, flaky appearance. The bark cross section has alternate brown and beige layers, a feature distinctive to elms. If a tree appears to show signs of DED, loosely tie flagging tape around the trunk for identification, and notify your city's Urban Forestry staff.

Remember, it is important to have branches from the suspected tree tested at a reputable laboratory for positive DED identification.

## GOOD LUCK!

Now you are ready to help save your neighborhood's elm trees. We hope that this document has helped you.

Bibliography:  
*Haugen, Linda; How to Identify and Manage Dutch Elm Disease. USDA publication NA-PR-07-98.*

*Portland OR Urban Forestry; Dutch Elm Disease Survival Guide.*

*Fig. 2 photo courtesy of Kansas State University*

