

Forest Pest Bulletin



DEPARTMENT OF AGRICULTURE
AND NATURAL RESOURCES
DIVISION OF RESOURCE
CONSERVATION & FORESTRY

BULLETIN NUMBER 4

Revised: June 2021

DUTCH ELM DISEASE

CAUSAL AGENT

Ophiostoma novo-ulmi

There are several different species, races, and strains of this pathogen with the above being considered the most aggressive. Dutch elm disease (DED) entered the United States in the 1930s in Ohio and was first detected in South Dakota (Minnehaha County) in 1967. It spread throughout the state with the last county, Harding, recording its first infection in 1985.

HOSTS

Ophiostoma is exclusively a parasite of trees in the Elm family (*Ulmaceae*). All Elms native to South Dakota, American elm (*Ulmus americana*), Slippery elm (*Ulmus rubra*) and Rock elm (*Ulmus thomasii*) are moderately to highly susceptible to the disease. The two European elms planted in the state, the European white elm (*Ulmus laevis*) and the Scotch (Wych) elm (*Ulmus glabra*) are also moderately susceptible. Many of the Asian elms, such as Siberian elm (*Ulmus pumila*) and their many hybrids have moderate to strong resistance to the disease. Dutch elm disease resistant Asian elms available for planting in the state include: Accolade elm (*Ulmus* 'Morton'), Cathedral elm (*Ulmus* 'Cathedral'), Discovery elm (*Ulmus davidiana* var. *japonica* 'Discovery') and Triumph elm (*Ulmus* 'Morton Glossy').

SYMPTOMS

Dutch elm disease is spread via beetles carrying spores from infected trees or root grafts between infected and healthy trees. The symptoms and the progression of the disease differ between trees that are infected through beetle activity and those which are infected through root grafts. Root grafts are formed when elm trees grow in proximity to one another (less than 50 feet) and the roots connect and form a biological union. Trees infected by root grafts wilt



Figure 1: Early wilt symptoms.
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and die rapidly; this frequently occurs in the spring soon after the trees have leafed out and the symptoms typically progress upward from the lower branches. Beetles that transmit diseases are referred to as vectors. The first symptoms of trees infected by beetle-carried spores are yellowing of leaves on one or more branches. These leaves turn brown, wilt, and begin falling by mid to late-summer (Fig. 1). The disease spreads to adjacent branches and eventually to the trunk and roots in one or more years depending on the susceptibility of host elm.

Symptom patterns for trees infected by beetles relates to the feeding habits of the two common vectors, the Native elm bark beetle (*Hylurgopinus rufipes*) and the smaller European elm bark beetle (*Scolytus multistriatus*). The smaller European elm bark beetle feeds in small twigs, usually high in the crown of a mature tree, while the Native elm bark beetle bores under the bark of branches 2-4 inches in diameter to feed. The Banded ash borer will attack trunks, so the disease can move rapidly if they are the vector.

The fungus moves through the vascular tissue of the tree, mainly the large vessels that carry water up the tree. It can persist in the sapwood for several years after the tree dies. When bark on infected branches is peeled back, brown streaks in the wood indicate the presence of an infection (Fig. 2). The streaking is very characteristic of the disease and is often used as the diagnostic test for the presences of the pathogen, however, laboratory tests can be used for a confirmation. There are other organisms that can cause similar leaf symptoms. Aphids and scales, two sap-sucking insects, can also cause the leaves of an infested tree to turn yellow and fall. The difference between injury from these insects and Dutch elm disease is that the leaves from disease-infected trees will brown and wilt and the sapwood of infected trunks, branches and twigs will have the streaking.

LIFE CYCLE

A common disease cycle for the disease begins with beetles feeding in the small twig crotches of a healthy tree and introducing disease spores that were attached to their body into the sapwood of the tree. The fungus grows in the vessels causing plugging and discoloration. The disease spreads downward to the roots and the tree dies, in part, from the disruption of the vessels carrying water up to the leaves. The fungus continues to move via root graft to any nearby healthy elms. Also, the fungus residing in the now dead branches produces spores that are carried by a new generation of bark beetles as they leave the tree to seek out a new host.

MANAGEMENT

There currently is no cure for Dutch elm disease, it can only be managed. The chemicals Thiabendazole (*Arbortect 20S*) and Propiconazole (*Alamo*) can be used as preventative treatments, reducing the risk of a healthy Elm dying from the disease. The use of these chemicals therapeutically (after a tree is infected) is less effective and should be limited to elms with less than 10% foliage yellowing in the tree. Regardless of



Figure 2: Symptomatic streaking under the bark.

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whether the chemicals are used as a preventative or therapeutic treatment, they can only protect against infestations that resulted from beetle transmission of the disease. They cannot protect against disease via root graft infection. These chemicals must be injected at the base of the tree, so the soil needs to be excavated around the tree just prior to injection and macroinjection or infusion where large volumes of diluted chemical solution are used is more effective than microinjection. These treatments need to be done every three years, drilling new holes each time, and will continue through the life of the tree if protection is to be maintained. In urban areas, an effective sanitation program can reduce the rate of tree loss due to DED to a level the community can live with, approximately 1 to 2 percent loss per year. A good sanitation program focuses on the prompt removal of infected trees, usually within several weeks of the disease being detected, and prohibiting the storage of Elm wood with bark still attached. If infected elms are cut into firewood with the bark attached, the beetles can still inhabit the wood and spread the disease the following year.

Due to numerous pesticide labels and/or label changes, be sure the product label includes the intended use prior to purchase or use. Please read and follow all pesticide label instructions and wear the protective equipment required. Spraying pesticides overhead increases the risk of exposure to the applicator and increases the likelihood of drift to non-target areas. Consider the use of a commercial applicator when spraying large trees due to the added risk of exposure and equipment needs. The mention of a specific product name does not constitute endorsement of that product by the South Dakota Department of Agriculture and Natural Resources.

For further information contact your nearest South Dakota Division of Resource Conservation and Forestry office. Hot Springs 605-745-5820; Lead 605-584-2300; Mitchell 605-995-8189; Pierre 605-773-3623; Rapid City 605-394-2395; Sioux Falls 605-362-2830; Watertown 605-882-5367.

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