Forest Pest Fact Sheet

January 2017

Dutch Elm Disease, *(Ophiostoma ulmi.)* and *(Ophiostoma novo-ulmi)*

BACKGROUND

Dutch elm disease (DED) is caused by two species of fungus. It can be spread by tiny elm bark beetles, from elm to elm via the trees' root systems, or by contaminated tree pruning tools. The fungus blocks the elm's water and nutrient conducting system. The elm tree can die over a period of two to three years, or in as little as three weeks.

DISTRIBUTION

First identified in the province in Regina, Saskatchewan in 1981, DED can now be found in most areas of southeast Saskatchewan. Since 2007, the extent of DED has remained consistent; however, the distribution of the disease has varied. Major river systems such as the Qu'Appelle, Saskatchewan, Assiniboine, and Souris have sustained high rates of mortality to their American elm tree populations due to DED since the 1980s. Over the past 2 decades, DED has caused the death of many American elm trees along these river valleys in spite of management activities which typically include early detection followed by rapid removal and sanitation activities.

DESCRIPTION OF LIFE STAGES

Ophiostoma spp. produces two types of asexual spores:
Conidia (sticky) produced on synnema (asexual fruiting body) in bark and tunnels of dying trees. Conidia germinate on healthy elm forming mycelia which grow and penetrate the xylem through border pits (holes) in xylem cell wall.

Asexual spores (conidia)

Image: M.F. Brown and H.G. Brotzman

Mycelial growth in xylem cells of elm tree

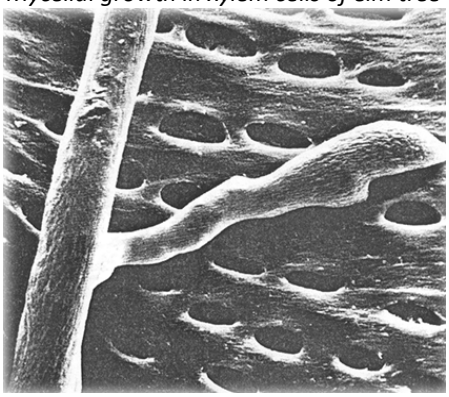


Image: Strobel & Lanier 1981. Dutch Elm Disease

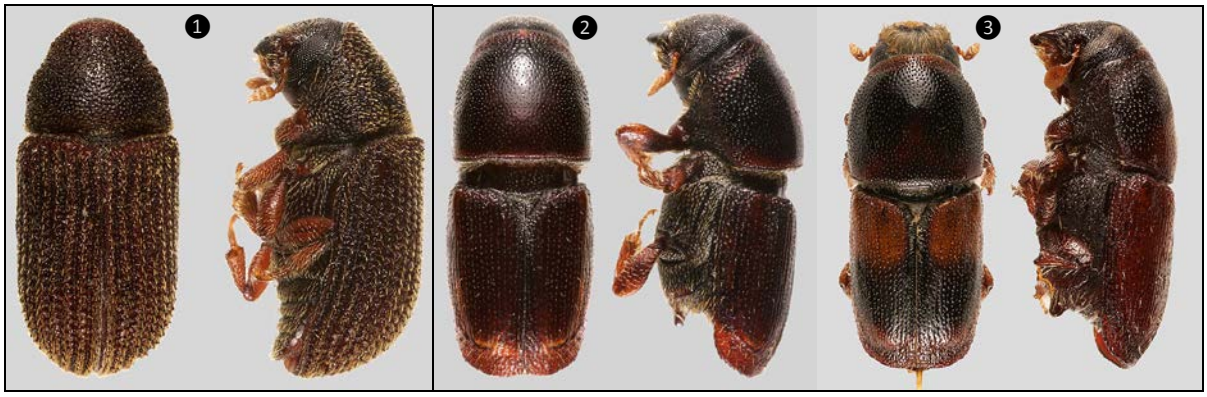
HOST SPECIES

DED attacks both American elm (*Ulmus americana*) and sometimes Siberian elm (*Ulmus pumila*) trees. Older American elms that have not been properly maintained and watered tend to be most susceptible to infection from this fungus.

LIFE CYCLE

Spores of the DED fungus are stored in xylem vessels and reproduce through budding. Dispersal of spores is via the bark beetles that burrow under the bark and lay their eggs in wood galleries. DED can be distributed over long distances in elm logs and in firewood.

There are three species of beetle associated with spreading DED in North America: Native elm bark beetle *Hylurgopinus rufipes* (1), the European elm bark beetle *Scolytus multistriatus* (2), and The banded elm bark beetle *Scolytus schevyrewi* (3). All three varieties of beetles are attracted to healthy elms by host volatile chemicals (kairomones) produced by the trees. Beetles carrying spores of the DED fungus bore into the inner bark and, while feeding, deposit these spores in the wood. The European elm bark beetle feeds in the crotches of twigs; therefore, most infections occur in twigs. The Native elm bark beetle bores in the bark of branches and small trunks, causing infections in major branches.



Images: Guy Hanley, Minot State University

From the point of inoculation, the fungus moves upward and downward by two modes: in the liquid within xylem vessels and through the growth of fungal hyphae between xylem vessels after germination. The DED fungus reaches the roots within one season of infection, where it continues to grow. The fungus grows in the roots and ascends the trunk in a wave of infection that kills the entire tree or a major part of it. Where elms are planted close together, the fungus may move from one tree into the next through root grafting. The fungus can also survive for a time as a saprophyte in dead plant tissue.

SIGNS, SYMPTOMS AND DAMAGE

Foliage symptoms: DED symptoms initially appear as wilted leaves that progress to yellow and, eventually, dried and curled leaves. Where symptoms appear can provide a clue as to the initial site of infection. Upper tree canopy infections are most often due to beetle attack or human contamination. Infections in the lower part of the canopy are often due to root graft DED spread.

Signs and symptoms normally first appear in late spring, but if the tree was infected the previous year and not removed, symptoms may appear in early spring. An elm tree can succumb to DED in several weeks to several years depending on the health and vigour of the tree.

Characteristic leaf wilt

Image: Saskatchewan Ministry of Environment

Symptoms in upper canopy

Image: Saskatchewan Ministry of Environment

Symptoms in upper canopy

Image: Saskatchewan Ministry of Environment

Symptoms in upper canopy

Image: Saskatchewan Ministry of Environment

Vascular symptoms: Branches and stems of elms infected by the DED fungus typically develop dark streaks of discoloration in the sapwood. Simply remove the outer bark of an infected branch and view the sapwood to see if discolouration is present. In newly infected branches, brown streaks characteristically appear in the sapwood of the current year.

Characteristic sign of staining in sapwood

Image: Saskatchewan Ministry of Environment

MANAGEMENT PRESCRIPTIONS

There are no known cures for DED-infected American and Siberian elm trees.

Management of the disease includes:

- Rapid disease identification and sanitation of all DED infected wood.
- Treatment of the remaining stump by removing all bark to 10 centimeters below the soil surface or applying a herbicide to the fresh cut surface.
- Monitoring remaining elm trees for symptoms of DED and also undertaking a regular maintenance schedule of elm trees to improve their health and vigour.
- No pruning during the annual pruning ban, from April 1 to August 31.
- Unless authorized, respect regulations prohibiting elm transport, storage and use.

WHAT THE PUBLIC CAN DO

There are two major ways in which the public can participate:

- Do not transport store or use elm firewood.
- Report dead and dying elm trees to local forestry agencies.

REFERENCES FOR ADDITIONAL INFORMATION

How to Identify and Manage Dutch Elm Disease
NA-PR-07-98
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http://www.na.fs.fed.us/spfo/pubs/howtos/ht_ded/ht_ded.htm

Dutch Elm Disease
PP-324 (Revised)
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