

Oak Wilt

Background

Oak wilt is a fungal disease, caused by the fungus *Ceratocytis fagacearum*, which infects and kills ornamental and forest oak trees. When the fungus is in a tree's vessels, adjacent cells develop balloon-like structures that extend into the infected vessels and plug them. This process disrupts the sap flow within the vessels and as a result, the foliage wilts and falls. Oak wilt is a threat to all oaks, but trees belonging to the red oak group (red, black, pin, and scarlet oaks) get this disease more frequently and succumb to it more easily than trees belonging to the white oak group (white, bur, and swamp white oaks). Dying oaks with wilt symptoms were reported as early as 1881 in Wisconsin. In recent years, oak wilt has expanded dramatically and can be found throughout Michigan.

Oak Wilt Symptoms

Red Oaks

Symptoms in red oak can occur as early as May. The leaves turn dull green or bronze, appear water-soaked, wilt, and then turn yellow or brown. Damage occurs from the tip and outer edges of the leaves, toward the midrib and base. Wilting leaves typically curl around the midrib, and the line between the bronze and green tissues in individual leaves is very distinct. These symptoms can spread through the crown within just two to three weeks. Heavy defoliation of both discolored leaves and green leaves accompanies leaf wilting and discoloration. The disease progresses rapidly, and some trees die within 1 or 2 months after the onset of symptoms. Most trees die within a year. Fungus may form beneath the bark and sapwood the year after the tree dies. Sometimes the mats raise and crack the bark, giving off a fermenting odor that attracts insects.

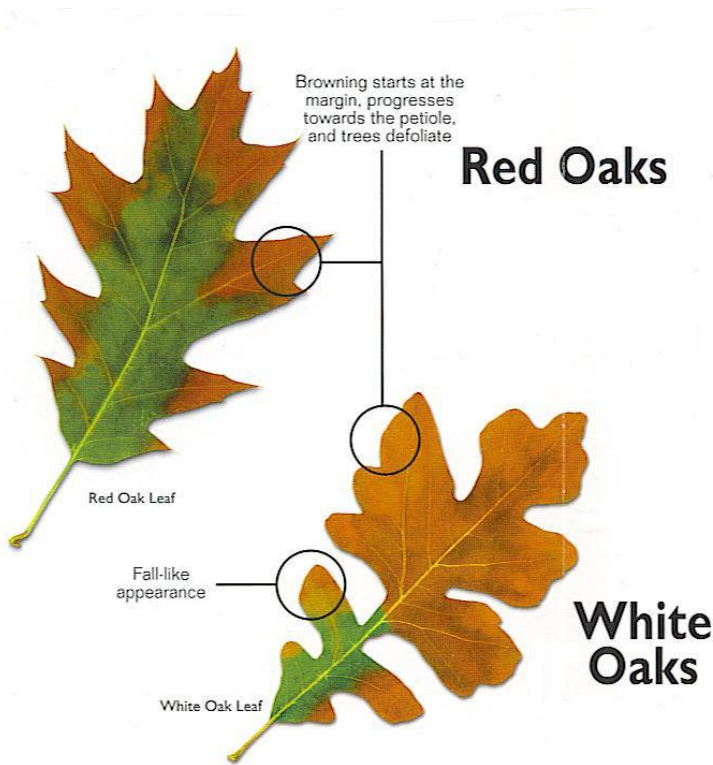


Oak wilt symptoms on red oak leaves

http://nyis.info/index.php?action=invasive_detail&id=46

White Oaks

The disease symptoms in white oaks are much more variable than in red oaks, although the foliage symptoms are often the same but do not spread as rapidly. Symptoms are often restricted to one or two branches at a time. If the fungus persists, a few branches are killed in a season, and over several years, the tree declines and may eventually die. Some white oaks seem to recover from the disease, but may harbor the pathogen and serve as symptomless reservoirs. White oaks, unlike red oaks, frequently have discolored infected annual rings when diseased. Fungus mats seldom appear on white oaks.



Oak wilt symptoms on red oak leaves versus white oak leaves

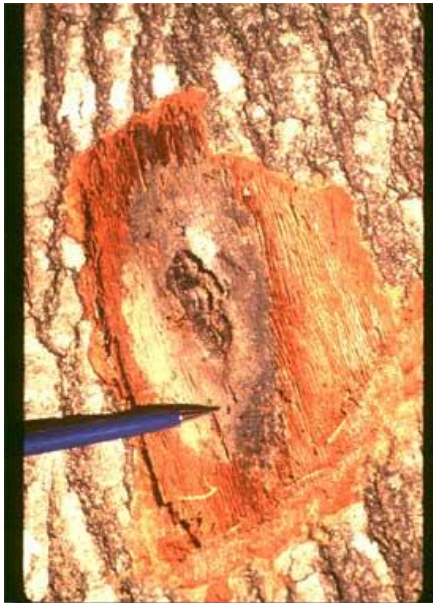
http://content.remastexas.com/dyna_images/agents/225/150768/20111105111241.JPG

Transmission

The oak wilt fungus is spread in two main ways: through the transfer of spores from diseased to healthy trees by insect vectors, and through the movement of the fungus from a diseased tree to a healthy tree through root grafts. Root grafts offer a path to transmit the fungus and are a major factor in the spread, especially in areas with deep, sandy soils and dense, pure stands of red oaks. Additionally at least two groups of insects—sap and bark-feeding beetles—can spread the fungus more than a mile. If an oak has fungus mats, they may enlarge and crack the bark, emitting an odor that attracts insects, such as the sap-feeding beetle. When these beetles feed on the mats of the infected tree, fungus spores stick to their bodies. As they move from diseased trees to wounds on healthy oaks, the disease-causing spores are transmitted to a new host. Additionally, oak bark beetles

can transmit the fungus by breeding abundantly beneath the bark of oak wilt-infected trees. After laying eggs, parents emerge carrying spores, and feed on healthy oaks. When the larvae hatch and develop into adults, they also carry infective spores and move to healthy trees.

Additionally, oak wilt can be transferred in firewood. Infected firewood can form spore-producing pads under the bark which attract sap-feeding beetles. Beetles feed on these pads and transfer oak wilt spores to healthy trees, sometimes several miles away. Healthy trees become infected when the spores enter through fresh wounds in the bark. Once transmitted, the pathogen spreads rapidly within an oak's xylem vessels.



Fungal mat of oak wilt disease

<http://txforestservicetamu.edu/main/popup.aspx?id=1643>

What can you do?

Currently, there is no cure for oak wilt in infected red oaks. Therefore, the only way to maintain healthy trees is by preventing the spread of oak wilt. Early detection and removal of dead or dying trees is essential.

Preventative Measures:

- Prevention is easy: do not injure or prune oak trees between the months of April and September.
 - Wounding may be accidental (i.e. lawnmowers), intentional (i.e. pruning live branches) or weather-related (i.e. wind storms). While fresh sap is only attractive to sap-feeding insects for several hours after a wound occurs, the beetles are numerous and widespread during this period and the risk of oak wilt being transferred is high.
 - Use wound paint on damaged oak trees
- Mechanical barriers between diseased and healthy trees can halt the spread of the oak wilt fungus through interconnected root grafts.

- A trencher or vibrating plow can be used to cut or break the grafted tree roots down to a depth of 2 to 4 feet.
 - Barriers must be placed far enough out from infected trees to ensure that the disease has been isolated in the root systems within the barrier circle. This will include trees that may not yet be infected, but are close enough to infected trees to be grafted.
 - Trees inside the barrier circle should be removed, cut, and covered with a tarp (with edges buried) until late-summer the following year to prevent beetles from reaching the spore pads
- All trees that die in any given year should be marked and checked carefully for fungus mats and oak bark beetle colonization by April of the following year.
- If the fungus mats or beetles are present, the entire tree should be burned, chipped, or covered with plastic for 60 days. It is important to destroy the mycelia (the sexual phase of reproduction for the fungus) and prevent sap-feeding insects from spreading the spores of the fungus to other oak trees.

Useful Links

http://msue.anr.msu.edu/news/oak_wilt_disease

<http://www.na.fs.fed.us/spfo/pubs/fidls/oakwilt/oakwilt.htm>

http://www.thecareoftrees.com/images/uploads/Oak_Wilt_disease.pdf

https://www.michigan.gov/documents/mdard/OakWilt_3-14_453040_7.pdf

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References

<http://www.na.fs.fed.us/spfo/pubs/fidls/oakwilt/oakwilt.htm>

http://www.thecareoftrees.com/images/uploads/Oak_Wilt_disease.pdf