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Oak Wilt in Minnesota

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Oak wilt, caused by a fungus *Ceratocystis fagacearum*, is responsible for killing large numbers of oaks annually in Minnesota. Oaks are undoubtedly the most valuable and plentiful of our shade trees. In contrast to Dutch elm disease, which has been very difficult to control, oak wilt can be more readily controlled and this valuable resource saved.

Oak wilt, present in many of the eastern states, is most common in the Upper Midwest, including Minnesota. It has spread very slowly north to approximately North Branch and St. Cloud and west to Mankato.

The greatest concentrations are in and adjacent to the seven-county metropolitan area surrounding Minneapolis and St. Paul (Figure 1).

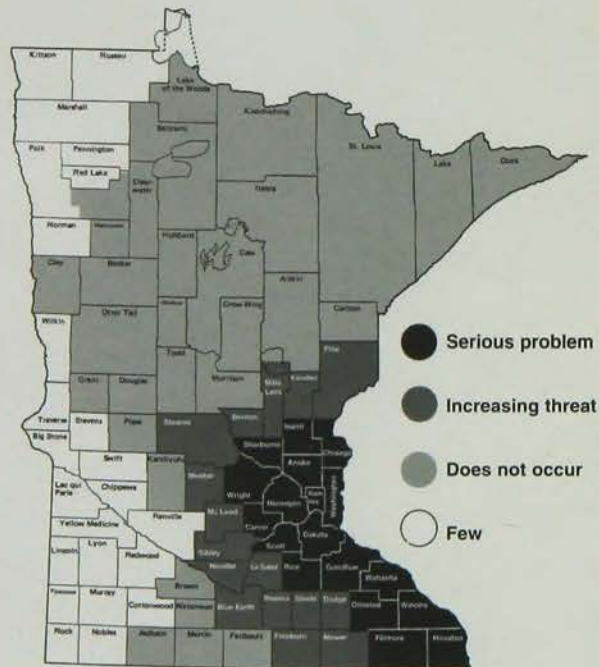


Figure 1. Distribution of oak wilt in Minnesota.

SYMPTOMS

Red oaks, such as Northern Red Oak and Northern Pin Oak, are highly susceptible to infection by the oak wilt fungus (Figure 2). Oak wilt is easily identified in red oaks by the rapid wilting of affected trees. After symptoms first appear, a red oak will generally wilt completely in two to six weeks. The trees wilt from the top of the crown down and individual leaves wilt from leaf tip and margins to the bases, turning

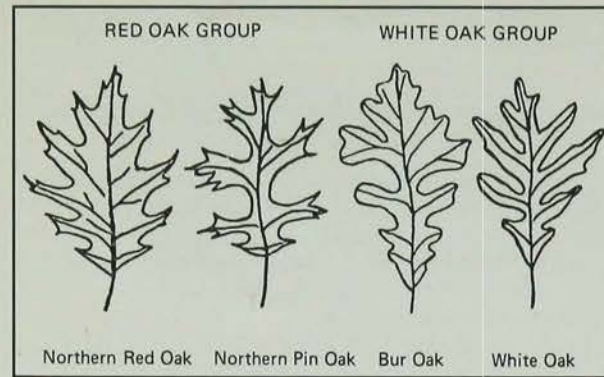


Figure 2. The four most common species of oaks in Minnesota.

bronze to brown (Figure 3). Fallen leaves are often green at the base. White oaks range in susceptibility from moderate (Bur Oak) to low (White Oak) (Figure 2). Infected white oaks die slowly, a branch at a time, often surviving for many years. Leaf discoloration of affected white oaks resembles autumn colors.

In both red and white oaks, the outer ring of springwood vessels will be plugged with brown material (tyloses and gums) and streaks of brown may be obvious on the outside of the wood. The vascular discoloration is most easily seen in cross sections of infected branches of white oaks (Figure 3), and less readily observed in affected red oak branches.



Figure 3. Left: Red Oak leaves in process of wilting. Right: Cross-section of White Oak branch shows discoloration often seen as small dark dots in the wood just under the bark.

INFECTION PROCESS

The oak wilt fungus spreads in two ways. Most new infections are the result of the fungus moving from infected to healthy oaks via grafted root systems, which are common. Trees as much as 50 feet apart may be grafted together. Root grafts may occur occasionally between different species of oaks.

The only way that the fungus can cross highways, rivers, and open fields is by insect vectors, primarily by sap beetles of the Family Nitidulidae. This spread occurs infrequently, but is important as the means by which new oak wilt infection centers are started. Sap beetles are commonly attracted to the sporulating mats produced by the fungus between the bark and wood of oak wilt-killed trees. These mats are commonly produced between April and late June on red oaks that wilted during the previous summer (Figure 4). This is also the same period of time that red oaks produce large springwood vessels and are particularly susceptible to infection. Several species of the same sap beetles are also attracted to fresh wounds on healthy oaks during spring (mid-April to late June). Visitation of such wounds by *Ceratocystis fagacearum*—contaminated beetles then results in oak wilt infection. Oak bark beetles, important oak wilt vectors in some parts of the U.S., are not considered important vectors in Minnesota.

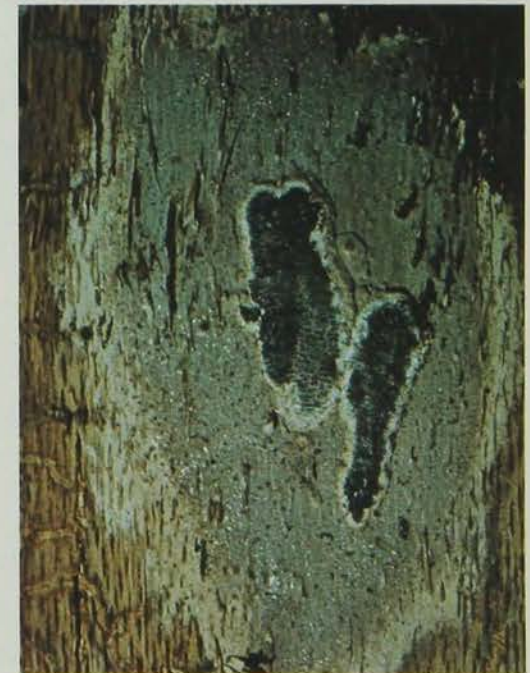


Figure 4. A sporulating mat produced during May by the oak wilt fungus between the bark and wood of a tree that wilted during the previous summer. The dark areas in the center of the mat are pressure pads that crack open the bark.

MANAGEMENT STRATEGIES

Stopping spread of the fungus through common root systems is most important and can be done by mechanical barriers using a vibratory plow with a 5-foot blade. Barriers in the soil must be positioned outside of trees with the fungus. Often two lines are recommended: a primary line outside of apparently healthy trees and a secondary barrier outside of every obviously infected tree (**Figure 5**). The fungus can be in a tree for 2-3 weeks without leaf symptoms appearing. Barrier placement requires experience. If buried utilities are present, the soil sterilant, Vapam, can be used, but it is not nearly as effective as the mechanical barrier.

Overland spread by insects can be prevented by following these guidelines on when to prune and when to paint.

- **High Risk Period.** April, May and June: don't wound or prune! If trees are accidentally wounded or pruning is unavoidable, cover the wounds immediately-within minutes-with one of the preferred materials such as water-based paint or shellac.
- **Low Risk Period.** July through October. On rare occasions-depending on weather conditions and insect populations-infections may occur. Covering wounds is optional.
- **Safe Period.** November through March. This is the preferred time for pruning since the fungal pathogen and insect vectors are inactive.
- Tree climbing irons should never be used on living oak trees.

As further precaution, infected red oaks on which spores may form in spring (**Figure 4**) should be eliminated by debarking, burning, burying, or wrapping and sealing in 4-6 ml plastic until July 1. Experience is needed to detect these trees before spores are produced. The spores are carried by the sap beetles to wound oaks during May and June.

Logs from wilting, or recently wilted trees should not be moved in any form, including firewood, to areas where oak wilt is not present. Oak wilt mats may form on these logs. Long distance movement of firewood obtained from such logs has accounted for establishment of oak wilt centers in distant areas that previously had been unaffected by the disease.

In high value white oaks, systemic injection with propiconazole by qualified arborists may prevent infection of trees adjacent to oak wilt affected ones. Propiconazole treatment of white oaks exhibiting early symptoms of oak wilt (less than 30% of crown affected) can also prevent further disease development for at least 2 years.

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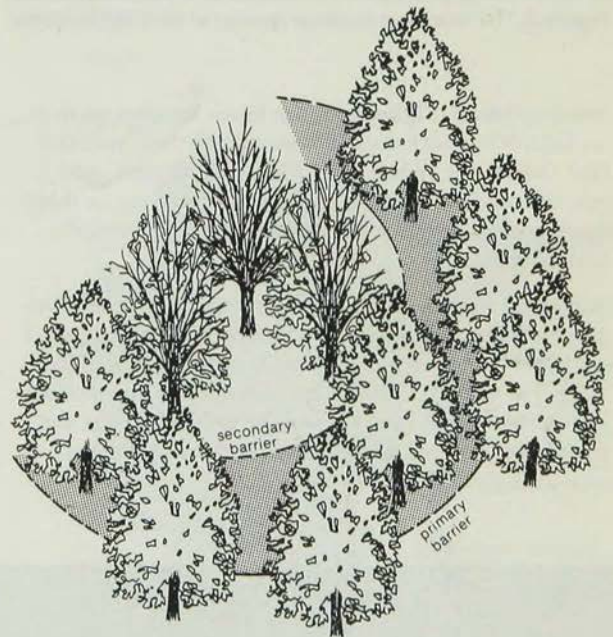


Figure 5. Diagram of root graft barriers around infected trees.

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