



## Oak Wilt

### INTRODUCTION

Oak wilt is a vascular disease caused by the invasive *Bretziella fagacearum* fungus. The origin of the fungus remains unknown, but is widespread throughout the eastern US, occurring in 24 states and Washington, D.C. Currently the fungus threatens Ontario as it has been found less than 600 m from the Canadian border near Windsor, Ontario and has been detected in northern New York State within the past decade.

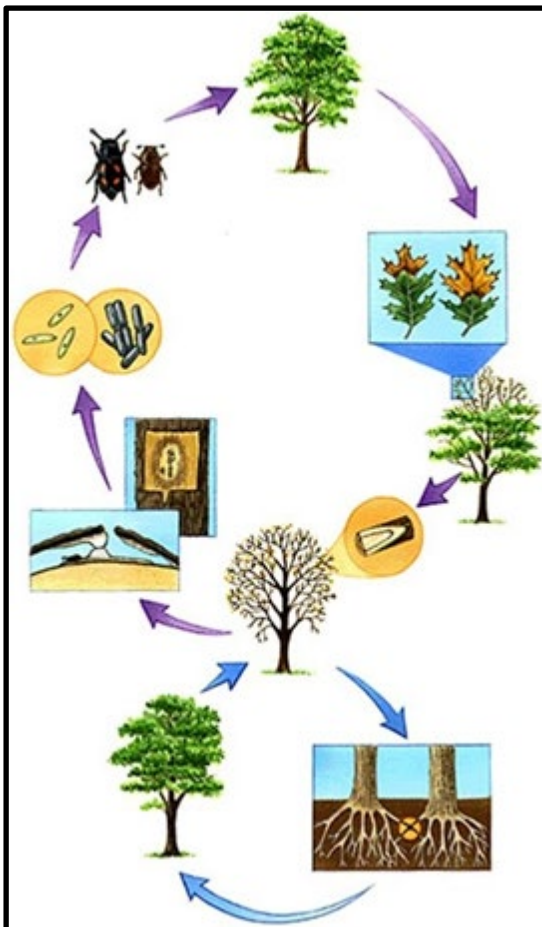
Oak wilt threatens oak (*Quercus*) species. Trees in the red oak group (e.g. northern red, black, Shumard oak) are extremely vulnerable to oak wilt, while trees in the white oak group (e.g. white, bur oak) may recover or slowly die.

Due to its economic, ecological, and aesthetic value, a widespread oak wilt infestation in Canada could be devastating. Oaks grow in woodlots and forests and are planted along streets, in urban parks. Oaks are of ecological importance for the habitat they create for birds and small mammals and their acorns are an important food source for animals large and small: from black bears to squirrels and whitetail deer to blue jays. Oaks provide valuable lumber that is commonly used for furniture, flooring, and in barrels for the whiskey and wine industries.

### LIFE CYCLE

Infection of oaks by the *B. fagacearum* fungus tends to occur mainly in the spring. Infections can be transmitted from tree to tree by overland spread and below ground via roots. Overland spread requires an insect vector to transport fungal spores from infected trees. In the northern range of oak, the main vector are sap beetles which are attracted to the sap produced when an oak is wounded. The beetles carry spores from

infected oaks to wounds in uninfected oak trees spreading the infection to a new area. In the southern range of oak, bark beetles are also considered a vector. The other form of infection occurs below ground through the roots. Oaks growing in close proximity form root grafts. These connections allow the disease to spread to surrounding trees without the need for a



*Bretziella fagacearum* life cycle showing the natural spread of oak wilt.

(Image: Julie Martinez, Scientific Illustrator)

vector. Once infected, the fungus grows and spreads through the xylem, which is the tissue responsible for water movement in plants. As red oaks near death, fungal spores can be transported throughout the tree so that any part of the tree can be infectious.

### SIGNS AND SYMPTOMS

The signs and symptoms of oak wilt are most obvious in June or July when trees become water stressed due to lack of precipitation and vessel clogging caused by the fungus. Starting from the top of the tree or the tips of branches, leaves begin to wilt and bronze. This unique discolouration causes leaves to bronze from the tip towards the base progressing inwards towards the midrib, although the midrib itself may remain green. Eventually, this results in premature leaf fall.



A red oak (*Quercus rubra*) leaf that has begun to bronze and wilt from the tips inward. (Photo: Invasive Species Centre).

Once the tree dies, the fungus creates distinct sporulating mats, often referred to as pressure pads, in the spring and fall. These white, grey or black fungal mats are the spore producing fruiting body of the fungus and develop between the wood and bark of the tree. As the mats grow, they cause pressure between the wood and bark that builds until vertical cracks occur in the bark. By peeling the bark back from around the crack, the mat can be exposed for positive identification. It also has a distinct sweet fruity smell.



A sporulating mat (pressure pad) with the bark peeled away. (Photo: Invasive Species Centre)





A cross-section of an oak branch with vascular streaking. (Photo: Invasive Species Centre).

Removing a small branch and examining a cross section, or peeling back the bark on a branch can reveal vascular streaking of the xylem. As a vascular disease, *B. fagacearum* grows within the tissues of the tree causing a discolouration. This effect is more frequently observed in white oaks.

For definitive diagnosis of oak wilt, an expert will often need to be consulted and a sample may need to be examined in a lab.

**DAMAGE**

The effects of oak wilt can be catastrophic. Due to its ability to spread through root grafting, entire stands can be infected over the course of a few years. Infected red oaks often die within one year. White oaks can take 2 –15 years to die, though some trees may recover. This mortality can lead to the loss of wood fibre and important habitat and food source for animals. It can also transform oaks from carbon sinks into carbon sources and could reduce the erosion control provided by oaks.

**CONTROL**

To prevent introduction to Canada, the Canadian Food Inspection Agency has imposed phytosanitary regulations for the importation and movement of living oaks and oak wood products in Canada.

Currently there is no cure or natural control for oak wilt. White oaks tend to be more resistant to the fungus due to their higher drought tolerance. White oak also have a higher number of tyloses, outgrowths on vascular cells that can block the vascular tissue to prevent further damage caused by disease or drought, which contribute to their resistance. Ongoing research aims to better understand flight periods of insect vectors in Canada and eventually prevent or slow infection of Canadian oaks.

Infected trees can be removed but the wood must either be debarked, chipped, or split and the wood dried. Alternatively, the wood can be wrapped in plastic and the edges of the plastic buried. Infested wood can also be burned or buried. When trees are symptomatic, root connections can be broken by using a vibratory plough or backhoe to protect the uninfected trees within the stand. This should be done immediately prior to tree removal as cutting can drive sap fluids downward into the roots, possibly spreading into grafted oaks.

**WHAT CAN I DO?**

Suspected infections of oak in Canada by oak wilt should be reported to the Canadian Food Inspection Agency and the provincial agency responsible for forest health.

Although there is no cure for oak wilt, property owners and land managers can take steps to reduce the likelihood of introduction or spread of oak wilt. Guidelines from the US suggest to avoid pruning oaks from April to July when sap

beetles are in flight to prevent the transmission of the infection. Ontario Ministry of Natural Resources and Forestry research scientists are currently investigating the flight period of these beetles in Canada to tailor pruning guidelines for this country. Should pruning or wounds occur on oaks during this time, a light application of tree wound paint can be administered. When pruning or sampling oaks, tools should be cleaned between trees to prevent spread of the fungus.

In high risk areas, like along the US - Canada border, high value oaks and trees near infected stands can be treated with the fungicide propiconazole which may delay symptoms in red or live oaks and prevent infection of white oaks for 2 to 5 years post treatment. Any fungicides used should be approved by the Pest Management Regulatory Agency of Health Canada and applied by a licensed applicator according to label instructions. Stand management and silvicultural practices can be used to prevent an epidemic by increasing the vigour and overall health of an oak stand. Increasing the diversity of other species with oak can reduce the likelihood of spread through root connections.

**CONTACT INFORMATION**

Great Lakes Forestry Centre  
1219 Queen Street East  
Sault Ste. Marie, ON P6A 2E5 Canada  
Tel: 705-949-9461  
E-mail: [GLFCWeb@nrcan-mcan.gc.ca](mailto:GLFCWeb@nrcan-mcan.gc.ca)  
Web site: [nrcan.gc.ca/forests/research-centres/glfc/13459](http://nrcan.gc.ca/forests/research-centres/glfc/13459)