

PREVENTING OAK WILT IN CANADA

by Violet Butterwort and Sharon Reed

WHAT IS OAK WILT?

Arborists across North America have been on the lookout for oak wilt, a fungal disease that can kill oak trees within weeks. The fungus that causes it, *Bretziella fagacearum*, has been slowly spreading in the United States for decades. It has even been found less than 1 km from the Canadian border in Michigan. Oak wilt has not been detected in Canada.

All oaks can be affected by the disease but species in the red oak group are most susceptible. Affected trees show characteristic symptoms of vascular wilt pathogens, including rapidly browning leaves and bark cracks above fungal pressure pads (Figure 1). In our lab, at the Ontario Forest Research Institute (Ministry of Natural Resources and Forestry), we're studying oak wilt disease transmission and how to prevent its establishment in Canada.

HOW IS OAK WILT TRANSMITTED?

Oak wilt is known to spread through oak root systems and via insects (Figure 2). The more common transmission route is through roots. When roots from different oak trees graft underground, the fungus can grow from an infected tree to a healthy one, eventually killing both. Although most transmission occurs through root grafts, aboveground transmission by

insects is an important part of the disease cycle because it is the source of new infection centres. Nitidulidae sap beetles are attracted to oak wounds and fungi. These beetles will eat and lay eggs in the oak wilt fungus. The sticky spores of *B. fagacearum* then become attached to the parent and offspring beetles. When a new oak tree is wounded, beetles can carry fungal spores from an infected tree to a healthy, wounded tree. In the southern United States, the oak bark beetle

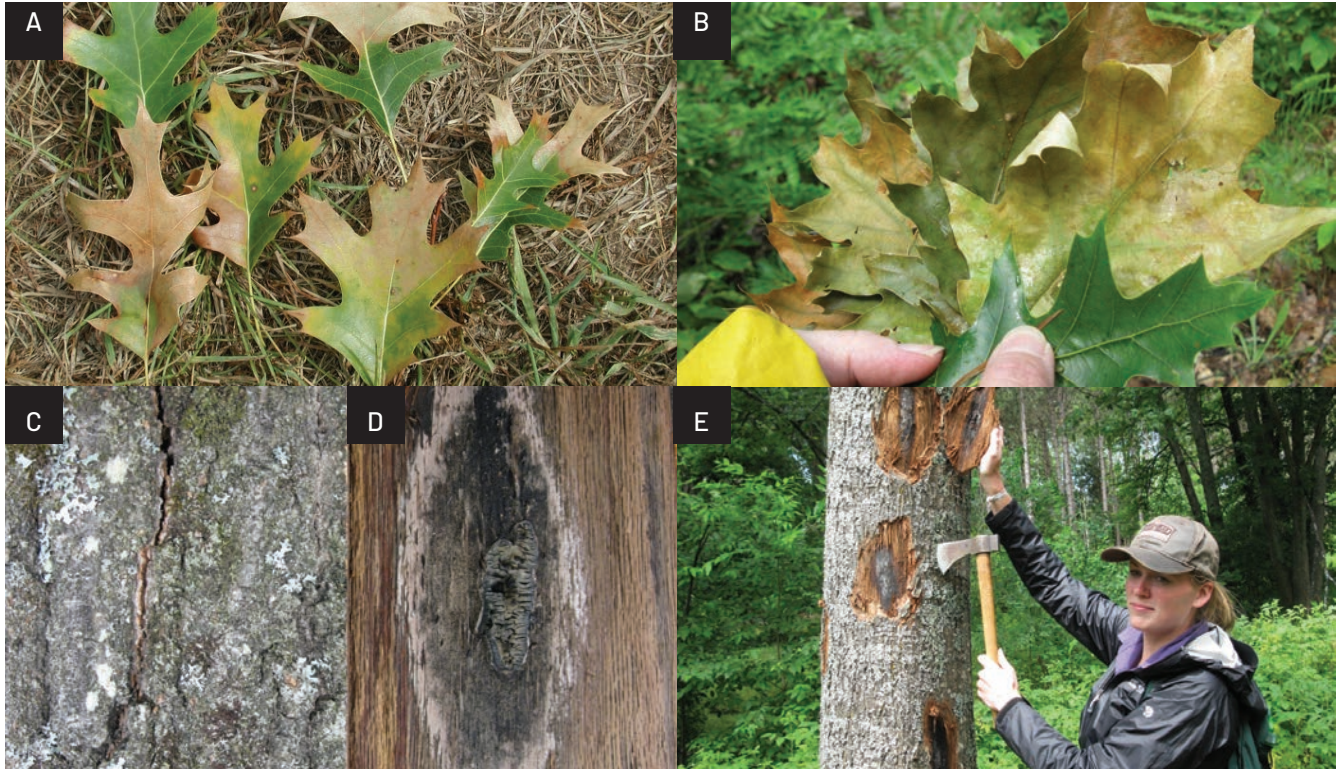


Figure 1. Signs and symptoms of oak wilt. A: Leaf browning from distal tip to base. B: More variable leaf symptoms. C: Cracked bark. D and E: *Bretziella fagacearum* spore mats growing beneath cracked bark. (Credit: A – Joseph O'Brien, USDA Forest Service, Bugwood.org.; B-E Sylvia Greifenhagen, MNRF, retired)

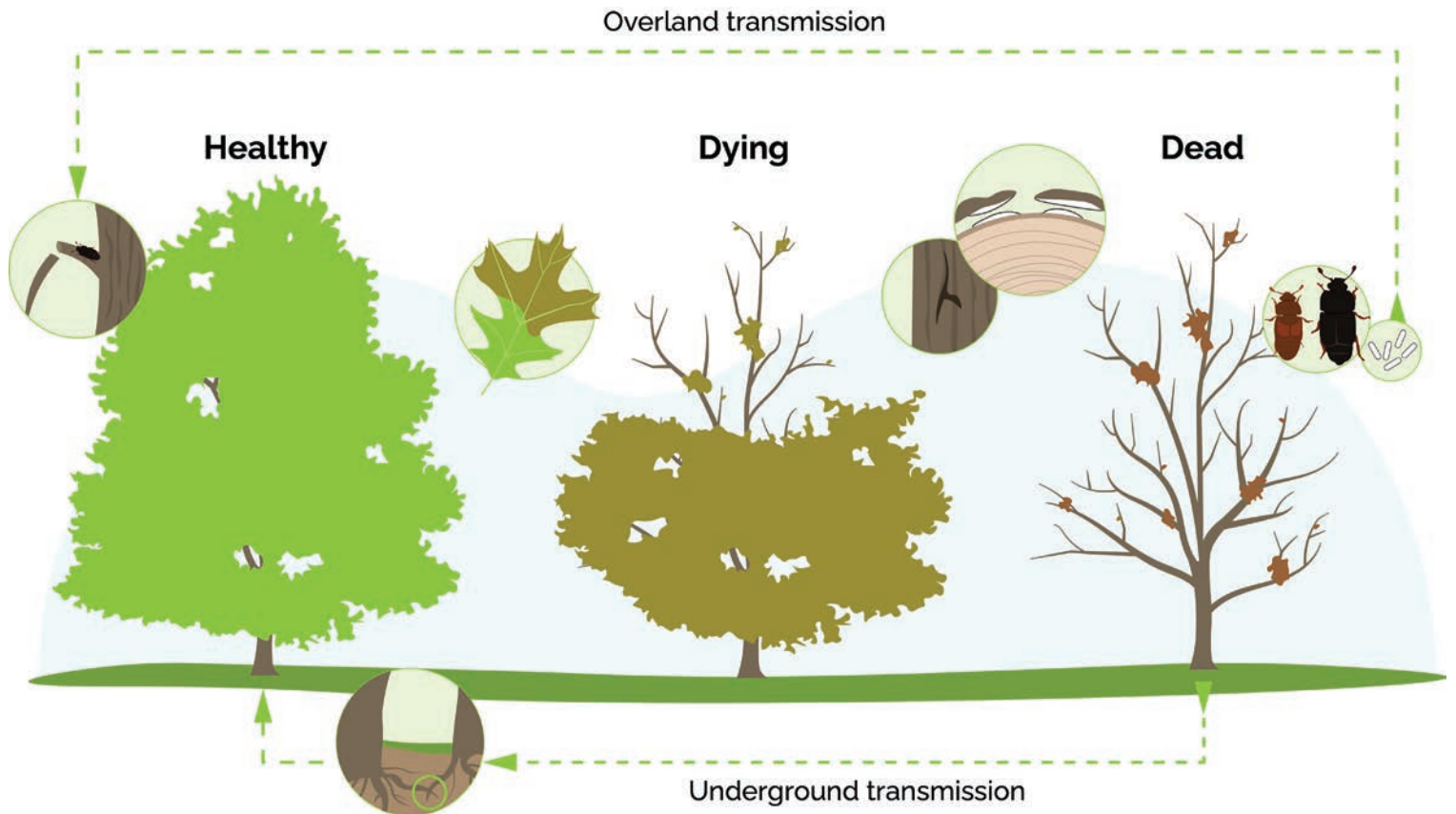


Figure 2. Oak wilt transmission mechanisms below and above ground. (Credit: Leah Hodgson, MNRF)

is also thought to potentially transmit oak wilt (EFSA PLH Panel 2019). Beetle transmission is why, in much of the United States, oaks cannot be pruned during times of year when beetles are attracted to oak wounds. For beetles to infect a tree with the fungus, a fresh oak wound is needed (Zuckerman 1954, Hayslett et al. 2008). The times of year when beetles are most active is referred to as the “high-risk period” for oak wilt infection.

An effective management tactic for oak wilt is adherence to the high-risk “do not prune” period (Figure 3). In the United States, the high-risk period is based on factors like what beetle species are present and how long beetles take to develop. Prior to our study, the high-risk period hadn’t been determined for Canada. We’re performing research to determine and refine the



Figure 3. An oak wilt awareness billboard for the high-risk disease transmission period in Minnesota. (Credit: Joseph OBrien, USDA Forest Service, Bugwood.org)



Figure 4. Technicians collecting sap beetles from flight traps (left) and oak-wound traps (right). (Credit: Sylvia Greifenhagen (left) and Leah Hodgson (right))

high-risk period and strengthen our preventative management strategy.

How will our research help prevent oak wilt spread?

Our research directly supports oak wilt management by providing organizations with evidence needed to designate a high-risk “do not prune” period. The high-risk period reduces the chance of oak wilt transmission by limiting oak pruning to months when beetles aren’t as attracted to oak wounds and can’t transmit the fungus from tree to tree.

To determine the high-risk period, we collected sap beetles in Ontario, Manitoba, and New Brunswick. These different collection locations helped us gather information about when the high-risk period occurs among regions and climates. We focused the risk period on the two species that most frequently transmit the disease in the United States: *Colopterus truncatus* and *Carpophilus sayi*. These two species were among the top three most common sap beetle species in our study, so they have great potential to transmit the disease in Canada.

We used our activity data for the two beetle species to build degree day models—which use a relative measure of warmth. The models showed that, for the two species we studied, 90% of flight occurs between 1 April and 31 July. However, our observations indicate that the high-risk period could be safely shortened.

Early in the growing season we noticed a lag between when beetles fly and when they visit oak wounds. That’s because we have been using two different methods to collect beetles: flight traps and oak wound traps. Flight traps were baited with pheromones and bread dough to capture a broad sample of sap beetle species active in an area (Figure 4). Wound traps showed us which beetles are visiting oak wounds and are most likely to transmit the pathogen (Figure 4). In 2022, beetles started flying in mid-April but didn’t visit oak wounds until Mid-May. Moving into 2023, we are further investigating whether wound attraction can be tied to other seasonal processes such as oak leaf out or bud break. Stay tuned for updates on our pursuit of the most effective high-risk period for in the oak-growing regions of Canada.

Oak wounding has also helped us narrow down the list of potential oak wilt vectors from the more than 100 sap beetle species in Canada. We identified twelve species of sap beetles that visited fresh oak wounds in Canada, including two known vectors: *Colopterus truncatus* and *Carpophilus sayi*. Another beetle genus, *Epuraea*, also shows potential to spread the disease and deserves further research.

What the future holds and what can you do?

In the future, you can expect to hear more about oak wilt because the risk of this disease establishing in Canada continues to increase. New records of the disease are made each year in the United States, often near the Canada-U.S. border. If oak wilt infected trees are ever detected in Canada, a rapid response plan is likely to be activated that could include more monitoring, eradication efforts, or slow-the-spread management.

As arborists and community members, we can contribute by being aware. If you suspect your oak trees might have oak wilt, contact the CFIA

(cfia.surveillance-surveillance.acia@canada.ca) or the Invasive Species Centre. If the disease is confirmed in Canada, be diligent in respecting the regulations on when it's safe to prune oak trees. Pruning windows may be legally mandated. And stay tuned for our future research findings. We are committed to performing research that improves forest resilience for the benefit of all Ontarians, all members of the ecosystem, and beyond.

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