OAK WILT AND eDNA

Frequently Asked Questions

Oak wilt is a vascular disease of oak trees, caused by the fungus *Bretziella fagacearum*. The fungus restricts the flow of water and nutrients through oak trees and causes wilting foliage, eventually leading to tree death. In 2020, researchers found oak wilt fungal eDNA in Ontario.

To learn more about oak wilt signs and symptoms, visit the Invasive Species Centre website.

Q. What is environmental DNA (eDNA)?

A. Environmental DNA is DNA that is collected from the environment. DNA is present in any cellular material of an organism. DNA from an organism's cellular material can be deposited into both terrestrial and aquatic environments through the shedding, excretion, or loss of any part of the organism – for instance when humans shed skin cells or hair. In the case of oak wilt eDNA, entire beetles were used to test for fungal DNA.

Q. Is oak wilt fungal eDNA the same thing as oak wilt disease?

A. Oak wilt is a disease caused by a fungus. The term "oak wilt" describes the disease itself once the fungus infects trees. The fungus that causes oak wilt is called *Bretziella fagacearum*. The fungus can infect oaks and cause oak wilt by either being deposited into open wounds on the tree by insects or through the root systems that connect healthy and diseased trees. Spores from the fungal mats on infected trees will only infect an oak by getting into a fresh, open wound. Therefore, it is important to seal open wounds on your oaks during high risk periods.

Q. How is eDNA collected and processed?

A. eDNA is collected in environmental samples, whether that is water, soil, or otherwise. Samples tested for oak wilt eDNA include fluids and beetles taken from collection cups on traps used to collect nitidulid beetles, the family of insects known to carry oak wilt fungal spores. For processing, scientists identify

a genetic marker that is unique to the species of interest. They can now test to see if that unique marker is present in their environmental sample.

Q. How can we use this information?

A. eDNA can be used as an early detection tool for invasive species. eDNA can be detected in a system even at very low levels. This technique is already used to monitor for several aquatic invasive species such as rusty crayfish, Asian carps, and zebra/quagga mussels. eDNA detections can help to inform traditional ground surveys. Surveys can be focused in areas where oak wilt fungus eDNA has been detected, as we know these areas are at risk.

Q. What does the presence of oak wilt fungus eDNA mean?

A. The presence of oak wilt fungal eDNA does **not** mean the fungus is currently infecting trees in the province. eDNA does **not** mean that there are viable spores and eDNA testing does **not** distinguish between live and dead samples. What it **does** mean is that it is possible for the fungus to get to these areas and potentially infect trees, and that the beetles that were collected have likely come into contact with the oak wilt fungus. Nitidulid beetles are sap feeders and are attracted to fresh wounds on trees; when feeding, these beetles can transport oak wilt fungal spores from a diseased tree to a fresh wound of a healthy tree. One of the most likely pathways of oak wilt spread into Canada is via nitidulid beetles as vectors. Firewood movement is also another high-risk pathway for oak wilt spread. Firewood should be bought and burned locally.

Q. What additional evidence would be needed to determine if oak wilt disease is present in Canada?

A. For the oak wilt disease to be present in Canada, the fungus needs to infect a tree. Additional evidence for the presence of oak wilt would include trees exhibiting symptoms. Trees infected with oak wilt will have leaves bronzing from the top of the canopy, moving down as the disease progresses. Early leaf drop will also occur during the summer months. Red oaks may also develop pressure pads in the fall, emitting a fruity odour. Symptoms can be seen in red oaks very quickly after the time of infection and mortality can occur in as little as one year. It is critical that if your oak is developing any symptoms that may be oak wilt, you report your findings to the Canadian Food Inspection Agency (CFIA). CFIA staff will then collect a sample from your tree and receive confirmation from a lab on whether your tree tests positive for oak wilt.

Q. What can we do now?

A. The Ontario Ministry of Natural Resources and Forestry and the CFIA will continue to monitor for oak wilt throughout the province, especially targeting areas where oak wilt eDNA has been detected.

As a community member, it is important to be aware of the signs and symptoms of oak wilt. Look for any fresh wounds during high-risk periods and seal them with a pruning paint or a latex-based paint as soon as possible. This will protect the wounds during the most high-risk times from those beetles that could potentially be carrying active spores.

If you think you've seen oak wilt, report your sighting to www.eddmaps.org/Ontario, 1-800-563-7711, or directly to the Canadian Food Inspection Agency at cfia.surveillance-surveillance.acia@canada.ca.

Invasive Species Centre