

Northern Research Station

Rooted in Research

ISSUE 21 | DECEMBER 2023

Containing Oak Wilt with Girdling and Herbicide

Oak wilt is an aggressive vascular disease that typically kills infected trees within 3 to 8 months. It is particularly lethal for trees in the red oak group (section *Lobatae*). Oak wilt is caused by the fungus *Bretziella fagacearum* and transmitted over land by sap beetles (*Coleoptera: Nitidulidea*). Although the disease can be transmitted over land by sap beetles, the majority of oak wilt is spread by grafted roots from other nearby oaks with the infection.

Oak wilt is currently in many eastern and midwestern states. Projected to expand northward as the climate warms, the disease has the potential to profoundly impact oak and oak management in the decades to come.

Early detection and management are crucial for containing oak wilt. Traditional containment methods include using tractors pulling long blades and vibratory plows that dig into the soil and cut connected roots between trees. But such methods are not always feasible, especially in remote locations or places with rocky glaciated soils.

Girdle-Herbicide Study

Dustin Bronson, a plant physiologist with the Northern Research Station of the U.S. Department of Agriculture Forest Service, and three colleagues recently published the results of a study

on girdling and herbicide application, an alternative method to contain the spread of oak wilt.

“Girdle-herbicide is a method that foresters have been using but that hadn’t been examined systematically,” says Bronson. “To measure its effectiveness, we wanted to design a robust, thorough experiment. We developed the study with foresters who have been using this practice.”

In designing their study, the researchers drew on established knowledge about how oak tree roots graft together underground and how the distance between trees affects the chance of grafting. In a field experiment across 8 counties in central and northern Wisconsin, they selected 42 oak wilt infected sites within stands dominated by the northern red oak group.

At each test site, researchers sampled tissues of visibly infected trees. They confirmed the presence of the fungus with genetic testing, identified neighboring oak trees connected to infected trees via root grafts, and treated all infected and neighboring trees with a combination of girdling and herbicide applied to the girdled area.

KEY MANAGEMENT CONSIDERATIONS

- Once infected, oak wilt can kill an otherwise healthy red oak tree in 3 to 8 months.
- This study of the girdle-herbicide method reported an overall success rate of 55 percent in containing oak wilt spread. In clusters of four or fewer infected trees, the success rate was up to 81 percent effective.
- Early detection and rapid response are critical for containing oak wilt spread.
- In certain landscapes, the girdle-herbicide can serve as a viable, cost-effective alternative to traditional methods like the vibratory plow.



Girdle-herbicide treatment at the base of a red oak tree. Courtesy photo by Chad Keranen.

"The girdle-herbicide method kills infected trees as well as healthy trees around them to prevent the spread of spores," says Bronson. "If we only killed the visibly sick trees, the neighboring visibly healthy trees might have the spores in the root system and eventually show symptoms and die in the next season, continuing the spread of oak wilt, which is why we kill the neighboring healthy looking trees."

The researchers found the girdle-herbicide method had an overall success rate of 55 percent in containing oak wilt spread. The number of trees with visible symptoms in an infected cluster was the best predictor success:

- In clusters with four or fewer symptomatic trees, the success rate was 81 percent.
- In clusters with five or more symptomatic trees, the success rate was 29 percent.

These findings demonstrate the need for early detection and rapid response.

Benefits and Future Inquiries

The study findings can help managers assess whether girdle-herbicide may be an effective alternative to more expensive and cumbersome methods, such as the vibratory plow.

"Getting a plow to a site takes resources," Bronson says. "There may only be one per county or region. Maybe only certain people can operate it. Certain topography can make it hard to use." Rocky soil, for example, can damage a vibratory plow. "Foresters and land managers need another tool in the toolbox for when a vibratory plow is not available or possible to use. Using the girdle-herbicide method, 2 people can treat 50 to 100 trees in a single day."



Leaves from a red oak infected with oak wilt. USDA Forest Service photo by Joseph O'Brien.



Oak trees killed by oak wilt. Licensed photo by William M. Ciesla, Forest Health Management International/Bugwood.org.

The vibratory plow method has improved over time—the rate of effectiveness has increased from 54 percent to between 76 and 88 percent—and Bronson hopes further research into the girdle-herbicide method similarly improves its efficacy. Future research could help determine the optimal timing, improve the type and application of the selected herbicide, and examine the potential ecological and economic impacts of the method on oak forests and neighboring ecosystems.

In the meantime, Bronson says, "The girdle-herbicide method offers managers a solution to containing oak wilt that was not previously widely known."

"Using the girdle-herbicide method, 2 people can treat 50 to 100 trees in a single day." —Dustin Bronson

PROJECT LEAD

[Dustin Bronson](#) is a research plant physiologist with the Institute for Applied Ecosystem Studies in Rhinelander, Wisconsin.

FURTHER READING

Bronson, Dustin R.; Meunier, Jed; Pearson, Teresa R.; Scanlon, Kyoko. 2023. [Evaluating effectiveness of girdle-herbicide containment of below-ground spread of oak wilt \(*Bretziella Fagacearum*\)](#). Forest Ecology and Management. 533: 120816. <https://doi.org/10.1016/j.foreco.2023.120816>.

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