

The Plant Doctor's LANDSCAPE TIPS

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CAN GLYPHOSATE STOP DUTCH ELM DISEASE?

INTRODUCTION

Like Oak Wilt (OW), Dutch Elm Disease (DED) is caused by an invasive, introduced fungus that has destroyed billions of American elm trees (*Ulmus americana*) for nearly a century. DED and OW exhibit many similarities. Both are vascular wilt diseases. Both are spread **overland** by insects and **underground** through root grafts. In fact, for many years the causal fungi were classified under the same genus name: *Ceratocystis ulmi* for DED and *Ceratocystis fagacearum* for OW. However, they were subsequently reclassified as *Ophiostoma ulmi* (DED) and *Bretziella fagacearum* (OW). Despite the destruction of billions of elms around the U.S. over many decades, there are a few survivors here and there (Photo 1). Many people assume these survivors are resistant to DED when, in fact, they are "escapes".



Photo 1

Photo 1: While billions of elm trees have been decimated by Dutch Elm Disease, there are a few survivors (escapes). The Grosse Pointe cities are home to a number of these survivors. Roberts, barely visible, stands just to the left of this large elm. (Photo Credit: Dr. David L. Roberts)

TRADITIONAL MANAGEMENT OF DUTCH ELM DISEASE

While Root Graft Disruption (RGD= trenching to sever root connections) was a primary management tool for DED management during the 1940s through the 1970s and later in Michigan, its use was expensive and destructive. Residential areas were especially challenging given utilities and infrastructure (roads, driveways, etc). In some of those early years, rather than dig deep trenches, roots of elm trees were sometimes killed with soil fumigants (chloropicrin, methyl bromide), which were so toxic to the environment that they were eventually outlawed. To make matters even worse, methoxychlor and other insecticides were broadcast sprayed throughout residential areas to kill the elm bark beetles, which were capable of transmitting the DED fungus from diseased trees to healthy trees. Subsequently, these toxic chemicals and physical methods were largely abandoned due to environmental concerns and difficulty of implementation. Sanitation measures involving prompt removal of diseased elms were also employed, but, as with Oak Wilt, prompt removal could result in faster underground spread.

POTENTIAL FOR GLYPHOSATE/STUMP CUP MANAGEMENT OF DUTCH ELM DISEASE

In 2008, Roberts designed and began testing a procedure he labeled the Glyphosate/Stump Cup technique for OW management. His goal was to create a more practical means of Oak Wilt management other than the rather crude DNR/Bruhn Root Graft Disruption (RGD) procedure, which is the most costly and destructive method utilized in Michigan. Rather than create six-foot-deep trenches with accompanying damage to nearby trees, landscapes, infrastructure, and utilities, plus the sacrifice of multiple tiers of healthy trees, Roberts reasoned, "Why not let the tree do the work for you?" A systemic herbicide, transmitted through the tree's own vascular system, might just be effective in inhibiting the underground spread of the Oak Wilt fungus. Roberts

concluded from years of experience that many herbicides would not be capable of killing roots to effectively stop underground transmission of the fungus through roots and root grafts. So, he concentrated on Glyphosate, which showed the greatest potential for killing roots of trees and, thus, inhibiting the transfer of the lethal Oak Wilt fungus.

When Roberts introduced his newly designed Glyphosate/Stump Cup procedure in 2008, testing of the procedure was slow to develop, because, it seems, people were frightened to use herbicides on trees or in the vicinity of trees. Apparently, people believed it was counterintuitive to use an herbicide to kill trees when our goal was to save them. His change in approach for Michiganders received a major boon when they were informed of the alternative options for Oak Wilt remediation, especially the costly and destructive DNR/Bruhn Model where dozens of healthy trees would potentially need to be sacrificed to remediate an Oak Wilt infection center. In the last 35+ years, not one Michigander with Oak Wilt-infected trees has accepted the DNR/Bruhn Model for remediation when Roberts proposed the far less costly and less destructive methods including his Glyphosate/Stump Cup or his Tier Tree Model for RGD. Roberts' Tier Tree Model, first developed in 1984, was another innovative procedure he designed, ironically, from his work on DED management at that time. The Glyphosate/Stump Cup procedure was an outgrowth of the Tier Tree Model, and with its 'Chaser' variant, only diseased trees are treated (no sacrifice of any healthy oak trees). Over the ensuing years the Glyphosate/Stump Cup procedure has shown its mettle as the most effective, least costly, and least destructive Oak Wilt management method in use under scientific research in Michigan (Photo 2). As initially designed, the Glyphosate treatment of infected OW-infected Oak Trees seems to infiltrate the entire root system of oak trees, killing those roots and, thus, preventing the

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spread of the deadly OW fungus through root grafts. In some trials where trees had been infected for over a year by the OW fungus (before treatment), Glyphosate "passed" the fungus in OW-plugged xylem elements and inhibited the transfer of the Oak Wilt fungus to nearby trees; minor Glyphosate symptoms were exhibited in nearby trees proving the systemic activity of Glyphosate, but no OW development occurred in those trees. Even OW-infected stumps treated with Glyphosate prevented root graft transmission of the OW fungus, provided the bark was still tight on the stump (Photo 2). With new research underway, wouldn't it be great if the Glyphosate/Stump Cup treatment provided similar relief from root graft transmission of Dutch Elm Disease (DED) as it does for Oak Wilt (OW)?



Photo 2

Photo 2: The Glyphosate/Stump Cup technique has stopped Oak Wilt "cold" at many locations throughout Michigan. For example, Kathy's large 39-inch oak near Ann Arbor died from Oak Wilt after being trimmed by a power company's contractor (top left Inset, and arrow bottom left Inset). The stump in the foreground was also infected by the Oak Wilt fungus (lower right Inset). The Glyphosate/Stump Cup treatment to the large tree and stump, both located on the left side of Kathy's driveway (Photo 2) was administered. For Kathy's peace of mind, but likely not necessary, a Tier Tree Model Root Graft Disruption (RGD) trench was established on one side (left) of her property (orange line, lower left Inset) to protect Kathy's neighbors' equally large oaks in this older community. For six years, there has been no further development of Oak Wilt on Kathy's property; the Glyphosate treatment has protected oaks on the right side of her driveway where RGD trenches could not be installed. No sacrifice of any healthy oak trees occurred here. (Photo Credit: Dr. David L. Roberts)

THE EDEL & ELEANOR FORD HOUSE

Edsel Ford, the only child of automotive pioneer Henry Ford, served as president of Ford Motor Company from 1919 until his death in 1943. In the early 1920's Edsel, and his wife Eleanor, sought to escape the city and create a country estate to raise their young family. At Gaukler Point in Grosse Pointe Shores, they created a family home through a collaboration with architect Albert Kahn and landscape architect Jens Jensen. Nestled on the shore of Lake St. Clair, the property featured the naturalistic prairie style landscape that made Jens Jensen famous. As a prominent feature of the landscape, Jensen planted mature American Elms around the house, outbuildings and throughout the property (Photo 3). Eleanor Ford lived in her home until her death in 1976, at that time she left the estate to create the Edsel & Eleanor Ford House. Today, Ford House is a National Historic Landmark and is open to the public as a cultural resource preserving an important period in American history.

Many of the original American Elm trees still play a prominent role in the historic landscape of Ford House. Through careful management and care, these trees offer a



Photo 3

Photo 3: A mature elm is being transplanted into the Ford House landscape during the winter circa 1928. (Photo Credit: Ford House Collection)

majestic image of the long-lost grace of the American Elm (Photo 4). Unfortunately, since the introduction of the deadly Dutch Elm Disease (DED) into North America in the 1930s, billions of American Elms have succumbed throughout the United States. The Elms at Ford House have gradually declined in numbers with many significant trees being lost in the last few years.



Photo 4

Photo 4: This American Elm survivor still graced the landscape at Ford House in 2016. With restoration projects underway, it is hoped that existing elms can be preserved while new elms are installed for future generations to experience the grand, stately nature of the American Elm. (Photo Credit: Dr. David Roberts)

Ford House remains one of the few properties where visitors can see mature Elms, Ash and many other species of trees. For many years, Ford House has hosted the Michigan Green Industry Association's educational tree walks. Roberts has led many of those tours, often accompanied by Karl Koto, Director of Landscapes and Project Executive at Ford House. In those tours, we witnessed the gradual demise of the stately Elms due to DED on the property. Koto is intimately involved with restoration of the historic landscape and the challenges of managing a mature landscape as new pests emerge, and the climate is changing. Each new restoration project involves difficult decisions about removing diseased historic trees and replanting the same species for historic integrity that results in increased disease pressure (Photo 5).



Photo 5

Photo 5: This large historic elm succumbed to Dutch Elm Disease near the gate house entrance in 2015. (Photo Credit: Karl Koto)

In 2024, a project was initiated at Ford House to try to remediate the deadly Dutch Elm Disease on the property. With implementation of the Glyphosate/Stump Cup procedure, it is hoped that the underground spread of the DED fungus can be mitigated (Photo 6). With the systemic action of Glyphosate, roots inhabited by the fungus in infected trees should be killed so that existing and new plantings of elms will not be impacted by DED.

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Photo 6

Photo 6: As part of the research into DED management at Ford House, Glyphosate is being administered to the Stump Cup of this diseased elm in 2024. It is anticipated that killing the root system with Glyphosate will prevent the Underground transmission of the DED fungus to the elm in the distance as well as other elms within root graft range. (Photo Credit: Karl Koto)



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OTHER DUTCH ELM DISEASE REMEDIATION LOCATIONS

Although there are some "Elm Escapes" in Michigan, the Grosse Pointe region is home to a rather large number of surviving elms (Photo 1). At another site, the large elm in Photo 7A contracted DED in 2023. In collaboration with various arborists, this large elm was subjected to the Glyphosate/Stump Cup treatment in 2023 in hopes of preventing the spread of the disease to nearby elms (Photo 7B). We have reached two conclusions about this site as of this date. First, nearby elms were not affected to any observable extent by Glyphosate herbicide transfer through root grafts to nearby elms (Photo 7C). Second, the DED fungus has not transmitted through root connections from the diseased elm to nearby healthy elms within the past two seasons (Photo 7C) since

the one large elm became infected (Photo 7A). This research shows promise for stopping DED with the systemic activity of Glyphosate, much like has been experienced with the successful control of Oak Wilt at many locations throughout Michigan (Photo 2). As with Oak Wilt, the DED sites will be monitored for at least four to five years to ensure long-term success.

It would be appreciated if arborists and landscapers in the green industry inform Roberts of DED outbreaks because other sites are needed to expand this research. 🌿

Note: Other than for experimental use by scientists, the Michigan Department of Agriculture and Rural Development considers off-label use of pesticides as violations of Michigan law.



Photo 7A



Photo 7B



Photo 7C

Photos 7A, 7B & 7C: At another location in the Grosse Pointes, a large elm became infected by the DED fungus in 2023, threatening many other nearby, large healthy elms (7A). Remediation by RGD trenching is virtually impossible due to driveways, streets, and utilities. In 7B, the Glyphosate/Stump Cup procedure was administered to this tree in hopes of preventing transmission to other nearby elms. After an assistant had created the 'Stump Cup', Todd Fleishans (Camelot Tree Service) administers the Glyphosate to the stump cup according to research protocol (7B Inset). In 2024, nearby elms within root graft range showed no evidence of Glyphosate phytotoxicity nor DED (7C). This site will be monitored for several years to ensure success . . . or failure. (Photos Credit: Dr. David L. Roberts)

Dr. David Roberts has retired from Michigan State University but remains active with the industry. He can be reached at 248-320-7124 or treedoctordave@gmail.com.