The Plant Doctor's LANDSCAPE TIPS

By Dr. David L. Roberts, The Plant Doctor LLC a.k.a. The Tree Doctor

OAK WILT MYTHS AND MISCONCEPTIONS PART 2: ROOT & ROOT GRAFT DEPTH

INTRODUCTION

Oak Wilt may be distributed in two ways: 1) **Overland** by insects from pressure pads (fungal reproductive structures) to recently injured Oaks, and 2) **Underground** via root grafts between nearby trees (Photo 1A & 1B). Oak trees like many other species of trees may form root grafts between trees that are within root graft range. Tree roots may extend laterally (horizontally) in soil 1 ½ to 2 times the height of the tree. Red Oaks, the most susceptible family of Quercus sp. (Oak) to Oak Wily, tend to form root grafts more commonly than White Oak family members. It is believed that over 90% of the spread of Oak Wilt occurs by **Underground** means. Hence, preventing **Underground** transmission of Oak Wilt is vital in our battle to minimize the spread of Oak Wilt in Michigan.

Oak Wilt Remediation is accomplished by a variety of methods, ranging from root/root graft severing between nearby trees, tree injections with fungicides, and herbicide treatments. Root Severing between infected and healthy trees is among the oldest and established techniques to stop the **Underground** transmission of Oak Wilt and is often referred to as Root Graft Disruption (RGD). Two major RGD models are in use in Michigan. The Tier Tree Model for RGD was created by the author in the mid-1980s and is based on severing roots (RGD) between "Tiers" of trees. The Tier Tree Model is designed to save as many trees as possible. The Bruhn Model was created in the 1990s and, in the opinion of the author, is unnecessarily destructive and sacrificial of many healthy trees to attempt to stop Oak Wilt. These RGD models were covered in prior The Landsculptor publications: "Oak Wilt Part 3: Management Strategies". *The Landsculptor,* February 2016. Pages 23-26; "Oak Wilt Management by Tier Tree: Part 1 Root Graft Disruption". *The Landsculptor,* November 2019, Pages 9-13.

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PHOTO 1A

PHOTO 1B

Photos 1A & 1B: The declining oak trees at this landscape in western Michigan contracted Oak Wilt when an "arborist" trimmed the trees in the spring (Photo 1A). Remediation consisted of Tier Tree Model Root Graft Disruption (RGD) on both sides of the property, directly adjacent to neighbors' oaks, and tree injections with Propiconazole to the two Oak escapees in the center of the photo (no RGD between the healthy and diseased oaks). The remediation effort was 100% successful as Photo 1B shows seven years after the initial infection.

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Mechanical Equipment for RGD

In past decades, notably the 1950's and 1960's, broad spectrum biocides (killers of life) commonly known as fumigants were utilized to kill roots and root grafts between trees to try to stop Oak Wilt spread. Because fumigants such as chloropicrin (also the active ingredient in Tear Gas but at a tiny fraction of the dose) and methyl bromide were so toxic to people and the environment, they were eventually outlawed. Applicators were sometimes severely harmed or killed by these fumigant/biocides, not to mention the adverse impacts on the environment. Subsequently, mechanical equipment became the primary tools of RGD.

A variety of equipment can be employed to accomplish RGD. The equipment ranges among Vibratory Plows, Backhoes, Mini-Excavators (and Excavators), Chain Trenchers, and yes, in rare occasions, shovels for hand-digging, etc. (Photos 2A, 2B, & 2C). There are advantages and disadvantages to each of these mechanical devices. The Vibratory Plow's advantages include that it moves rather quickly and leaves soil and landscape surfaces relatively undisturbed compared to other methods. The Vibratory Plow's primary disadvantages include that Oak Wilt remediators cannot see what is happening below ground level (i.e. where roots are located and how deep), and the unit will slice through buried utilities such as water lines, gas lines, and electrical services with abandon,…and hence, has the potential to be destructive and dangerous. Furthermore, the vibratory plow's limit with the current equipment used in Michigan is 5 feet (=5') of depth, which as I will show may be insufficient depth in some situations. With the other mechanical devices, the soil profile can usually be observed to determine depth of roots and accompanying root grafts…. and make adjustments as necessary. Plus, these other mechanical devices tend to hook onto buried utilities, alerting the operator of potential dangers. And except for chain trenchers, other equipment can sever roots at much greater soil depth than the 5' Vibratory Plow if necessary. Primary disadvantages of digging equipment (backhoes, excavators, etc.) include conspicuous disruption of the soil surface and slow operation.

Root Depth of Michigan Trees

The depth that roots of Michigan trees penetrate soil is widely variable. Many of us have witnessed when digging in soils that the bulk of tree roots often appear within the top 2-3 feet of the soil surface. Even in such situations, other roots may penetrate much deeper. Root depth is not only variable from site to site but even within the same site (Photos 3A, 3B, and 3C).

PHOTO 2A

PHOTO 2B

PHOTO 2C

Photos 2A, 2B & 2C: Enacting Root Graft Disruption (RGD) may involve employment of mechanical devices such as Vibratory Plows (2A), Trenchers (2B), Backhoes, and Excavators (2C). This Vibratory Plow (2A) was the Michigan DNR's unit rated for 6' depth before switching to a 5' unit. This Chain Trencher (2B) is rated for 5' depth. Some arborists utilize backhoes and mini excavators (2C) to ensure sufficient RGD depth for success in Oak Wilt remediation. This mini excavator will sever roots to over 8' deep.

Photos 3A, 3B, & 3C: Root depth between sites and even within the same property are widely variable. At this location near Brighton, Michigan, an administrator for the University of Michigan hired students to prune trees on his property. Two oak trees (yellow arrows) died from Overland transmission of Oak Wilt. When I was asked to provide remediation advice, I recommended two simple RGD trenches (white lines) to protect the oak trees in the surrounding woodland. A backhoe trench reveals rather shallow roots (3B) when the RGD trench was dug to the right of the home in 3A. Digging the other trench along the drive (3A, left) revealed numerous roots at a depth of 4-5′ and deeper. Remediation was successful with these two RGD trench lines alone.

As discussed below, a 5′ maximum depth for Michigan tree roots is being mandated by a small group of folks who appear to have an agenda. I have documented tree roots and root grafts substantially deeper than 5′ on many occasions (Photo 4). Please bear in mind that because the Oak Wilt fungus is a living organism, only one root the size of a pinkie finger may be necessary to transmit the disease under a RGD trench, regardless of depth of the trench. Table 1 presents locations where tree roots are likely to penetrate Michigan soils deeper than 5′ (Photo 5).

The Politics of Root and Root Graft Depth

For years and years, I advocated that mechanical equipment should penetrate soil at least 4-5 feet in heavy clay soils and at least 5-6 feet in lighter sandy soils for remediation of Oak Wilt by RGD. For decades, the Michigan Department of Natural Resources (DNR) operated a vibratory plow that was rated to penetrate soil 6 feet to sever roots between oak trees to manage Oak Wilt (Photo 2A). Several years ago, however, the DNR switched to a 5′ vibratory

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Photo 4: This root graft between an Oak Wilt-infected tree and a healthy oak tree was pulled from over 8′ deep, about the limit of the mini excavator used in this sandy soil situation. Similar root grafts have occasionally been found at around 7′ deep in clay soil at other sites.

TABLE 1: It is a basic scientific fact backed by in vivo observations that roots and root grafts of Michigan trees, including oaks, may penetrate soils deeper than 5'. This table lists some of the sites/situations where deep roots may be found according to the authors experience.

- Light Sandy Soils
- Sandy Loam Soils
- Occasional Heavier (Clay) Soils
- Landscape Sites with "Fill Dirt"
- Residential & Natural Dune Scapes
- Sites with Older, Larger Trees

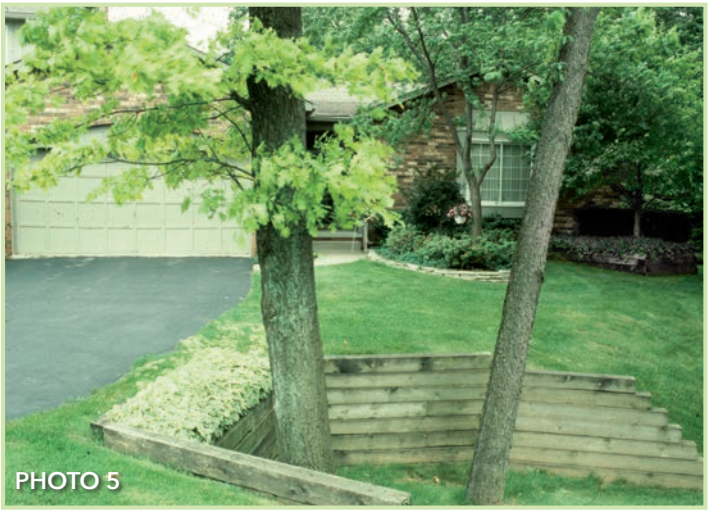

Photo 5: There are many situations in Michigan where oak trees and their roots/root grafts may be found deeper than 5′. Sandy soils, dune areas, and landscapes with topography grade changes are a few examples.

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plow. When I asked DNR personnel why they abandoned the 6′ unit in favor of the 5′ unit, I was told that the 5′ vibratory plow was much easier to load and transport than the larger, heavier 6′ unit. Hence, the adoption of the 5′ vibratory plow over the 6′ unit was one of convenience and not because Michigan tree roots suddenly became 1′ shallower. Enter the political problem: the DNR essentially mandated to arborists, to the public, to scientists, and even to Michigan trees that tree roots shall not be found deeper than 5′. To my knowledge, no one has presented any evidence that tree roots root grafts are only found within the top 5′ of the soil profile. Unfortunately, an arboriculture society in Michigan also adopted this 5′ mandate and initiated their own 5′ vibratory plow program, which, in my view, appears to be a conflict of interest with Michigan arborists (a society operating a business in competition with its own members). To demonstrate how serious the politics have become, I presented an Oak Wilt program at a conference in 2020 where I mentioned that tree roots sometimes penetrate soils deeper than 5′; leaders within this arborist society accused me of disparaging the society and banned me from ever speaking again at their events. When a scientist or arborist cannot present the truth, facts, and science to help arborists and the public make informed decisions, our industry is a serious trouble. The faction that is promoting the 5′ vibratory plow program will not acknowledge that their edict and practices have sometimes failed (Photo 6). Our failure to properly contain and eradicate Oak Wilt from specific sites may further harm Michigan's Urban and Natural Forests and the affected property owners.

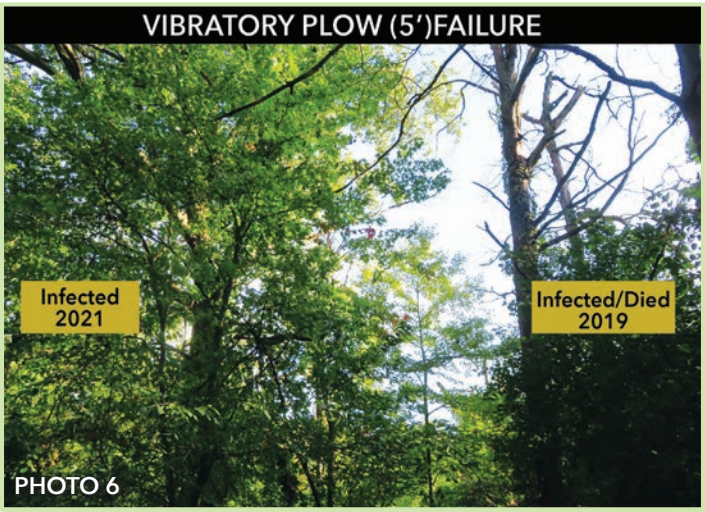

Photo 6: The 5′ Vibratory Plow Program was employed by an arborist with the Tier Tree Model at this public site. The Root Graft Disruption (RGD) technique failed two years after its implementation when the Oak Wilt fungus moved from the infected tree (right) to the healthy tree (left). Although other reasons may be envisioned for this Oak Wilt remediation failure, the most rational explanation was that the fungus transmitted under the 5′ RGD depth in the two years following the RGD implementation. Other failures were also noted at this sandy soil site where the 5′ vibratory plow was used. Failures in Oak Wilt remediation have also been documented with chain-drive trenchers at various locations.

Epilogue

Part of the reason for my writing a series for *The Landsculptor* on "Oak Wilt Myths and Misconceptions" is that there is a small faction of individuals in our industry who are trying to dictate their own agenda and policy to all of us . . . and if we do not acquiesce to their demands and dicta, there will be consequences for anyone who questions or disagrees with them. Arborists and landscapers in our industry would be well advised to avoid patronizing and participating with such unprofessional behavior, which could very well steer us in the wrong direction. There are societies in Michigan that are committed to focusing first and foremost on the industry and their members. Having worked with the Michigan Green Industry Association (M.G.I.A., formerly Metro-Detroit Landscape Association) for well over 30 years, I can attest that all views from scientists, arborists, landscapers, and nurserypersons are welcome, as any professional, ethical society should encourage.

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