

# Oak Wilt Management & Ethics

## Research and Experiences from the Field *plus* “One Teaspoon Does It!!”



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Dr. Roberts retired from Michigan State University in 2018 after committing four decades to advancing MSU's Land Grant Mission, originally signed into law by President Abraham Lincoln during the midst of the American Civil War. He has published hundreds of articles and has taught hundreds of lectures and workshops.

Dr. Roberts has researched many issues in Michigan's plant industry, including Oak Wilt, Dutch Elm Disease, Diplodia Tip Blight of Pines, along with a variety of cultural problems such as plant nutrition and herbicide toxicity. During his career, he has discovered a variety of new diseases and pests such as Phomopsis Canker of Spruce and the first bacterial wilt disease of turfgrasses in North America.

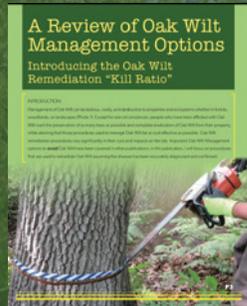
In the early 2000s, his research on Ash Decline in Southeast Michigan led to the discovery of the invasive Emerald Ash Borer in North America.

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### INTRODUCTION

Oak Wilt is gaining ground in Michigan as confusion and misunderstandings about the disease is quite prevalent among arborists and the public alike (Photo 1). In the March/April 2022 issue of *The Michigan Landscape*™ (Pages 42-49), I published an article entitled, “A Review of Oak Wilt Management Options” (Photo 2). In this article, I discussed the major management techniques currently in use in Michigan.

The widely varying impacts of the various management options upon landscapes, woodlands and forests plus extremes in costs for implementation of these techniques prompted me to develop the “Oak Wilt Kill Ratio”, which is summarized in Table 1 in that article and in this one.



**P2**

**P1**

Table 1: The Oak Wilt Kill Ratio and Rating According to Specific Oak Wilt Management Techniques

## Kill Ratio

# Trees Killed by Remediation vs. # Trees Killed by Oak Wilt

Technique	Kill Ratio*	Rating
Glyphosate/Stump Cup 'Chaser'	0:1	Excellent
Tier Tree Model Glyphosate/Stump Cup 'Half Moon'	Untested	???
Tier Tree Model Root Graft Disruption	0:1	Excellent
Tree Injections w Propiconazole	~0:1 ?	Good/Excellent**
Tier Tree Model Glyphosate/Stump Cup	6-8:1	Good
Bruhn Model Root Graft Disruption	>20-30:1	Unacceptable
Bruhn Model Garlon 4//Double Girdle	>20-30:1	Unacceptable

\*Typical but Variable according to situation  
 \*\* Tree Injections exhibit variable efficacy



T1

- P1** Oak Wilt continues to spread in Michigan and has been reported in 61 of Michigan's 82 counties. At this woodland location near Traverse City, Oak Wilt became established and spread via root graft transmission from right to left. Arborists are often conflicted about what to recommend to their clients to arrest the disease. In this case, a Physician's woodland, the author's Glyphosate/Stump Cup used by a local arborist and the property owner eradicated the disease.
- P2** A good summary of Oak Wilt Management Options was published in MNLA's *The Michigan Landscape*™. The article is available by electronic copy from me or the MNLA office (Jen Dwyer, jen@mnl.org).
- T1** The Oak Wilt Kill Ratio describes the number of trees killed by human remediation methods compared to the number of trees killed by the lethal disease, Oak Wilt. It is important that arborists and Michigan property owners understand the differences in costs, number of trees sacrificed, and environmental impacts when the various management options are considered. It seems to me that not providing all information to arborists and Michiganders is unethical.
- P3** One of many Glyphosate products available on the market is 41% Glyphosate from FarmWorks. Because Monsanto's patent on Glyphosate (Roundup®) expired in 2000, many companies are now manufacturing generic products of the chemical. However, Roundup® is still manufactured by Monsanto's new owner, Bayer Crop Science. Oak trees are on the label of 41% Glyphosate.
- P4** Gordon's Stump Killer has been on the market for decades, available in farm stores and from forestry suppliers. The label, only two pages long, prescribes for a continuous frill cut (= Roberts' Stump Cup) followed by adding volumes of Glyphosate to the frill cup. This product and rate were specifically designed to kill root systems of trees to prevent regeneration. The product aligns nicely with the Glyphosate/Stump Cup technique and my goal of killing the roots of oak trees to stop the transmission of Oak Wilt.

In the article, "A Review of Oak Wilt Management Options", I also disclosed field research comparing Glyphosate with Triclopyr when used with the Glyphosate/Stump Cup Technique (after Roberts) and the Garlon 4/Double Girdle used in conjunction with the Bruhn Model (in lieu of RDG), respectively. As discussed in previous articles, Glyphosate proved not only to be superior to Triclopyr (Garlon 4) when our goal is to kill oak trees to stop the spread of the deadly Oak Wilt disease, but the Triclopyr herbicide exhibited no visible impact upon the health of oak trees when the 'Half Moon' (Half Girdle) double girdle was used.

In the present publication, I want to share the results of further studies on herbicide remediation of Oak Wilt and expand upon actual field implementation of the various remediation techniques, with a discussion about ethics in Arboriculture associated with some of my research and experiences.

### Further Comparisons of Glyphosate and Triclopyr for the Management of Oak Wilt

Practically speaking, it is our desire to be able to kill oak trees to stop the spread of Oak Wilt; herbicides are an effective, efficient way to accomplish that task. However, concern was expressed by some individuals that my exhibit of a photo of a

41% Glyphosate product in one of my articles was an endorsement or misuse of that product for Oak Wilt control (Photo 3). Not so. Ill-informed individuals may not realize that scientists routinely test chemicals: on-label, off-label, without labels, and emergency (24C) labels, etc., and the results of such research are presented at professional society meetings to inform arborists (and the public) of research that might lead to possible label changes and/or new, upcoming labels and products. Scientists do this routinely; I have been testing chemicals and reporting on them for more than 40 years.

Although there have been products available that support my rates of Glyphosate with my Stump Cup technique (Photo 4), because of fixation on 41% Glyphosate by a few individuals, I decided it might be interesting to test 41% Glyphosate according to its label rate and compare it to Triclopyr (Garlon 4) as it is being used with the Bruhn Model in lieu of Root Graft Disruption (RGD).

**Materials and Methods:** The 41% Glyphosate label rate prescribes for 1mL of the product to be applied per 2-3 inches DBH (Diameter at Breast Height = 4.5 feet). That rate translates to approximately 1 teaspoon 41% Glyphosate per 12 inches DBH of the target oak tree. To be forthright, I did not believe 2 or 3 teaspoons would harm, let alone kill, a 24" DBH oak or

36" DBH oak, respectively. In addition, conversations with Michigan Department of Agriculture and Rural Development (MDARD) representatives indicated they believed the 41% Glyphosate label rate for trees might be a misprint because the rate was so low. Again, as in previous experiments, the 'Half Moon' (=Half Girdle) technique was utilized to show the impact of the herbicides upon the health of treated trees (Half Girdles by themselves do not adversely impact the health of oak trees, at least initially). This replicated experiment was initiated in December 2021; data was collected in June 2022.

**Experimental Results: One Teaspoon**

**Does It!** Half-girdled oak trees treated with the **One Teaspoon Rate** of 41% Glyphosate were killed (Photo 5A); there was no sign of life in any of the treated trees... no bud swell, no live foliage, and no viable cambium. Conversely, trees treated with the Garlon 4/Double Girdle again exhibited normal health with no evidence of any herbicide toxicity (Photo 5B). This experiment proved once again the superiority of Glyphosate over Triclopyr (Garlon 4) even though the Glyphosate rate used in this experiment was a slight fraction of that used in my previously reported experiments. Furthermore, and in contrast, Garlon 4 was applied at dozens of teaspoons to each tree without any visible signs of impact upon the health of oak trees (Photo 5B & Inset).

**New Hypotheses for Oak Wilt**

**Management with Glyphosate:** My reason for using elevated rates of Glyphosate is to kill all roots of treated oak trees so that roots and root grafts will not transmit the deadly Oak Wilt fungus to nearby trees. To be clear, I am not trying to just suppress sprouting of stumps, which would be relatively simple with many herbicides. Because Glyphosate is capable of killing oak trees at such a low rate, it would be prudent for me to test the management of Oak Wilt with 41% Glyphosate and/or other similar products at their low label rates.

**Hypothesis #1:** It is possible that Glyphosate at the **One Teaspoon Rate** will arrest Oak Wilt in oak trees that contracted the disease from



**P5A**



**P5B**

Overland Spread if diseased trees are treated by the Glyphosate/Stump Cup 'Chaser' within a few months or the same season of infection.

**Hypothesis #2:** Although it is doubtful that the **One Teaspoon Rate** will arrest Oak Wilt transmitted by Underground Spread through root grafts, it would nevertheless be worth testing if the opportunities arise.

Testing these two hypotheses can be rather challenging. I generally perform

**P5A & 5B**

In Photo 5A (Inset), the **One Teaspoon Rate** of 41% Glyphosate is being applied to the 'Half Moon' girdle in the fall; the subsequent death of the tree is verified the following June (Photo 5A background). In Photo 5B (Inset), Garlon 4 has been applied to the double 'Half Moon' girdle, and the background picture shows the foliage the following June; as with prior research, no impact of Triclopyr (Garlon 4) was observed on the health of the tree, not even herbicide toxicity symptoms on the foliage. This research indicates the clear superiority of Glyphosate, even at the **One Teaspoon Rate**, over Triclopyr (Garlon 4) for Oak Wilt remediation.



**P6A**

my experimental work with arborists' participation at real-life Oak Wilt outbreak locations (Photos 6A & 6B). Typically, property owners do not want to experiment with their oaks; they want Oak Wilt *gone*. Nevertheless, experiments for these two hypotheses are underway. If any arborists or property owners have Oak Wilt situations that might lend themselves to testing these two Hypotheses, I would love to hear from you to increase my experimental replications.

### Ethics and Oak Wilt Management Options

It has become increasingly evident that there are some serious disconnects within Michigan Arboriculture regarding possible management options available to arborists and Michigander property owners. In many/most Oak Wilt cases, I suspect Michiganders are not even provided with the gamut of Oak Wilt Management options; according to arborists completing the Oak Wilt Qualifications (OWQ) program, the destructive Bruhn Model is presented as the primary and "Official"

**P6A & 6B** Every Oak Wilt site is unique. In working with an arborist to remediate an Oak Wilt site, we often need to design a program specific for the site. At this lake view home, the tree in Photo 6A is afflicted with Oak Wilt but also resides in a clump of healthy oak trees (Photo 6B). The OWQ arborist ruled out the Bruhn Model as unfeasible. In this case, the Glyphosate/Stump Cup 'Chaser' was used but *after* a 5-6' trench was dug in close proximity to the infected tree. The trench would ensure that nearby healthy trees would not be collaterally damaged by Glyphosate, and the Glyphosate would ensure that the Oak Wilt fungus would not transfer through any root grafts missed by trenching. Win Win.



**P6B**

recommendation. For many years, I had always regarded the Bruhn Model as a method that should only be used in forest situations, frequently referring to it as the Forest Management Model (FMM). I have subsequently changed my view of this model because it is, in reality, the most costly and destructive method among all of our management tools. In comparison, I developed the Tier Tree Model for Root Graft Disruption (RGD) beginning in 1984, almost a decade before the Bruhn Model was developed. I have never used nor recommended the Bruhn Model because the Tier Tree Model has always provided efficacious results, if we understand its nuances, but without the destruction and costs of the Bruhn Model. Subsequently, beginning in 2008, I designed and began testing the Glyphosate/Stump Cup method. My goal was to find better ways than the rather crude, old fashioned, and destructive 5-6 feet deep trenching methods: "Why not let the tree do the work for you?" The Glyphosate/Stump Cup ultimately morphed into three variations: 1) Glyphosate/Stump Cup 'Tier Tree' Model where one or two tiers of healthy trees around an Oak Wilt epicenter are sacrificed, 2) Glyphosate/Stump Cup 'Half Moon' Model where trees are treated by half girdles in the direction of the advancing Oak Wilt front (not tested in actual Oak Wilt situations but used in experiments comparing the efficacy of Glyphosate and Triclopyr), and

3) Glyphosate/Stump Cup 'Chaser' Model where only infected trees are treated with Glyphosate. The Glyphosate/Stump Cup Tier Tree Model has been used at many locations around Michigan by many arborists and property owners. To my knowledge there has never been a failure to contain and eradicate Oak Wilt by this method. The 'Chaser' has been used at many locations as well but is a newer creation; again, I am not aware of any failures. The 'Chaser' provides the potential for the least invasive, least costly, and most environmentally friendly technique, among other positive attributes.

Because the Bruhn Model is so destructive and costly, I thought it might be valuable for me to compare the Bruhn Model (either RGD or Triclopyr=Garlon 4/Double Girdle) with the Roberts Tier Tree Model, whether RGD and/or Glyphosate herbicide are utilized, or combinations thereof. Follow along as I discuss several locations where my involvement using my methods resulted in highly effective management of Oak Wilt but without all of the destruction, environmental impacts, and costs imposed by the Bruhn Model.

#### Example #1 (Photos 7A & 7B): Connie's

Oak Wilt situation was described in my article, "A Review of Oak Wilt Management Options" (Photo 2). This is a residential location in an urban forest cul-de-sac. One of Connie's trees became infected after a storm broke a limb in the Spring of 2021. Three

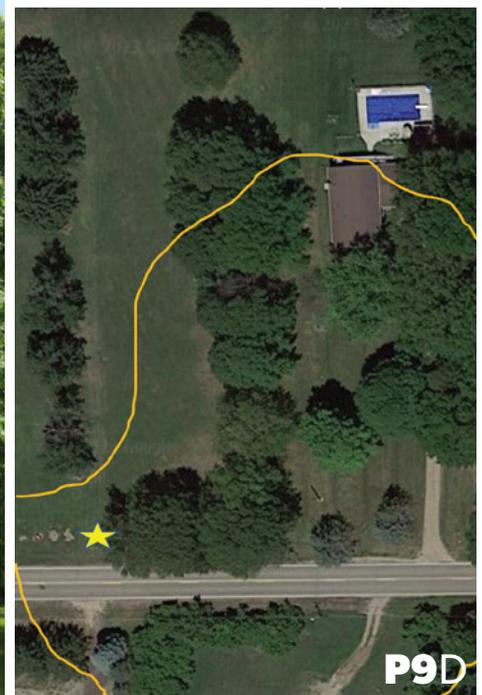


different arborists provided advice on this situation; all were Oak Wilt Qualified (OWQ). The preferential treatment offered by the first arborist was the Bruhn Model as outlined in the two white circles (Photo 7A). This method would have resulted in the sacrifice of all healthy oak trees within the white RGD circles, at least 32 large healthy trees. In Photo 7A, the smaller orange circle represents the Glyphosate/Stump Cup Tier Tree Model where 6-8 healthy trees would be sacrificed, a substantial conservation over the Bruhn Model. The small incomplete yellow circle shows where a single Tier Tree RGD trench would be installed, using Connie's home foundation as a root barrier, without sacrifice of any healthy trees. The Kill Ratio (Table 1) was primarily developed based upon this location because the differences in the Oak Wilt management options as presented to Connie were so stark. When presented with all of the options, Connie decided on the Glyphosate/Stump Cup 'Chaser' treatment of the lone infected tree (Photo 7A, yellow arrow), which also did not require sacrifice of any healthy trees. Thus far, there has been no further Oak Wilt activity on this property, but the site will be monitored to ensure success over the next several years. Because OWQ arborists and I presented all options to Connie and she chose the least destructive and least invasive option, Connie's urban forest neighborhood did not change appreciably in appearance as a result of the 'Chaser' implementation (Photo 7B); if the Bruhn Model had been used, all of the trees in this photo plus many more visible in Photo 7A would have been destroyed in this urban forest neighborhood.





**Example #2 (Photos 8A-8E):** Remy had authorized the pruning of the oaks in her front yard, but like many Michigan residents had never heard of Oak Wilt before. The arborist who pruned her trees had not warned her about the potential for Oak Wilt during the high-risk period for Overland Spread in the Spring of 2015. One to two months later, many of her trees began wilting and dropping leaves (Photo 8A); two trees somehow escaped infection as evidenced in the center of the photo. An arborist contacted me for help. I recommended a Tier Tree Model RGD trench on either side of the property with propiconazole injections of the two oak escapes. As of 2022, there has been no further development of Oak Wilt on this property, indicating 100% success and *no* sacrifice of healthy trees and minimal expense to Remy and her family (Photo 8B). This location might appear to be a home in a woodland in

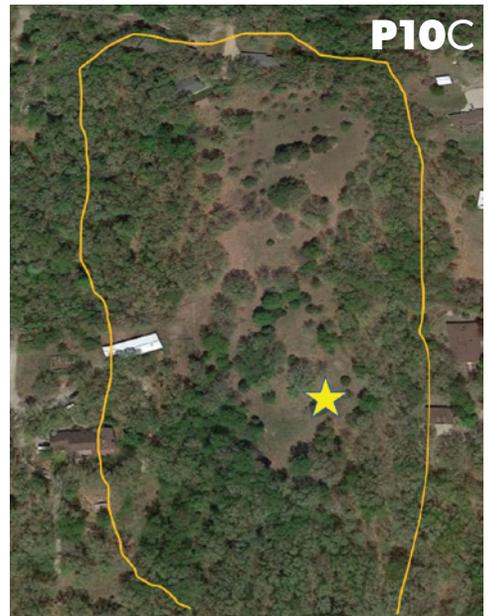




**P10A**



**P10B**



**P10C**

the country, but it is a residential area in a densely oak-populated woodland. Photo 8C shows a satellite image of the property. Photo 8D shows an elevated satellite image of Remy's home (yellow arrow) and her immediate neighbors. Photo 8E shows Remy's home (yellow arrow) and her neighborhood by satellite imaging. The yellow circle represents an approximate outline of the Bruhn Model, which designates that all oak trees, healthy or not, would have needed to be sacrificed if this method was used. A major challenge with the Bruhn Model, in addition to its destruction and ancillary detrimental impacts, is that it would be virtually impossible to convince six or seven property owners to sacrifice their oak trees by implementation of the Bruhn Model when they do not have Oak Wilt on their properties.

**Example #3 (Photos 9A-9D): Lowell**

lives in the country and has some nice acreage and trees on his extensive property. Lowell had planted many of the oak trees on his property 40 years ago. Unfortunately, Oak Wilt had moved down a row of oak trees along a road delineating his front yard. The disease had already killed at least 8 trees to the left in Photo 9A and threatened 25-30 more to the right. An arborist and I decided to treat Lowell's infected tree in 2019 (Photo 9A) with the 'Chaser' as part of my research. Photos 9A (2019), 9B (2020, different angle from Photo

9A), and 9C (2021, note felled diseased tree) show that Oak Wilt was halted from root-graft transmission over more than a three-year period (including 2022). The orange circle in Satellite Photo 9D shows where trees within the Bruhn Model would likely need to be sacrificed if this technique had been used. The yellow star in Photo 9D shows where the 'Chaser'-treated tree was located in Photos 9A & 9B. Note that we can barely make out the stumps to the left of the star where Oak Wilt had marched from left to right killing oak trees over several years. I also extended the Bruhn Model (orange circle, bottom of Photo 9D) across the road, although not nearly far enough, because I have documented Oak Wilt moving through root grafts under country roads, even paved ones. At this site, Tier Tree Model RGD trenches would also have saved most trees on Lowell's property from destruction by Oak Wilt or the Bruhn Model.

**Example #4 (Photos 10A-10C):**

**Catherine** contracted with a company to remove brush and invasive plants from about 15 acres of her extended property so she could mow her rolling pasture and woodland, ride her horses, hike, and enjoy her property as she desired. Unfortunately, the company she hired carelessly used a Fecon "Forest Mulcher" and damaged many of her trees (Photo 10A). Even more regrettable, as the result of the damage

to many of her trees, at least **six** Oak Wilt epicenters developed on her property. Equally regrettable, the six Oak Wilt epicenters that developed were "strategically scattered" across her property and, if unchecked, would inflict maximum damage not only to her trees but neighbors' trees as well. One of the Oak Wilt epicenters that developed is shown in Photo 10B, where four oaks (stumps with blue paint) had already been removed by the company that did the damage (the company also charged her for these removals). Oak Wilt-experienced arborists (Tim and Laurie) were contacted for advice. Subsequently, Tim contacted members of the Oak Wilt



reality, my orange circle delineation of the Bruhn Model in Photo 10C is significantly restricted principally to Catherine's property; it should be extended across property lines encompassing even more sacrificial healthy oak victims. If the Bruhn Model had been used on Catherine's property, virtually all of her healthy oak trees would need to be destroyed. The yellow star in Photo 10C shows the approximate location of one Oak Wilt epicenter as revealed in Photo 10B.

**Example #5 (Photos 11A & 11B):** Emily discovered by lab tests that she had Oak Wilt in a woodland where she and her husband were building a new home. The discovery of Oak Wilt was a huge disappointment because Emily had hoped to restore her woodland back to its natural ecosystem. The Oak Wilt Epicenter is pinpointed in Satellite Photo 11A by the yellow arrow. She contacted a company with OWQ employees about remediating the Oak Wilt. A Bruhn Model RGD (trench) line was installed, costing about \$4,000 (Photo 11A, orange circle). As another added measure, some of the trees outside the Bruhn Model RGD trench (orange circle) were to receive propiconazole tree injections, which would cost many more \$1000s. Upon thinking about the matter more carefully, especially after learning that at least 70 oak trees would have to be destroyed (plus collateral damage to other species, plus the expense of tree injections), she wondered if there were alternative methods that would not be so destructive. Thankfully, the OWQ arborists who were advising her recommended me for additional information. While visiting the site, I discussed several options with her and her land restoration crew; these recommendations would not require the removal of any healthy trees, at least initially if the remediation efforts I recommended were effective. Photo 11B exhibits a portion of the trees in Emily's woodland that would need to be destroyed with implementation of the Bruhn Model; Emily's new home under construction can barely be seen in the distance. The flat side of the RGD circle near the top and upper right in Photo 11A represents a wetland; if Oak Wilt



Coalition who advised him to refer Catherine to an OWQ arborist (Tim and Laurie were not OWQ). Tim declined to do so because he feared that Catherine would be pressured to adopt draconian measures (i.e. Bruhn) promoted by the OWQ program. Instead, Tim and Laurie contacted me. By the time of my involvement, Tim had already micro-injected many of Catherine's oak trees with the fungicide propiconazole, which, by the way, the Oak Wilt Coalition and OWQ had recently decided was not an effective treatment. Tim and Laurie, many other arborists, and I have had

excellent results over decades with this fungicide in protecting Oak trees from root graft transmission (see Remy Example #2, earlier). I recommended further remediation methods involving limited Tier Tree RGD trenching and Glyphosate herbicide because neighbors' properties are threatened by Oak Wilt (Underground Transmission) from the six Oak Wilt epicenters in three directions. Photo 10C is a satellite image showing approximate locations of implementation of the Bruhn Model (orange circle), within which all oak trees would need to be sacrificed. In

had been found in the middle of the woodland, many more trees than the planned 70+ oak trees would need to be destroyed according to the Bruhn Model. Because the site is two years old, my remediation recommendations will be closely monitored over the next several years and adjusted as necessary to ensure success.

**Example #6 (Photos 12A & 12B):** Kathy had the unenviable experience of having one of her oaks removed and another one pruned by a power company’s subcontractor during the spring when there was high risk for Overland Spread of Oak Wilt. Both the exposed stump and her large, pruned tree (Photo 12A) contracted Oak Wilt, confirmed by lab tests. In this instance, working with an OWQ arborist, I recommended a RGD trench be installed on one side of the afflicted trees; a complete RGD trench could not be installed on the other side due to Kathy’s home, driveway, and the proximity of her healthy oaks so close to the driveway, making trenching ill-advised due to serious damage to the healthy trees’ root systems.



**P12A**



**P12B**

Subsequently, the infected stump and the large oak tree were subjected to the Glyphosate/Stump Cup ‘Chaser’ as part of my research. No spread of Oak Wilt has been detected on Kathy’s property or her neighboring properties in the last three years. What is notable about this example is that the trees in Kathy’s neighborhood are exceptionally large, and “Old Growth”. Typical Red oak trees in the neighborhood measure more than 35-40 inches. Kathy’s afflicted Oak measured 39” (Photos 12A and 12B,

yellow arrow). Because of the size of trees in the neighborhood, the implementation of a very expansive Bruhn Model RGD trench would have destroyed so many trees across so many properties that the ensuing destruction would have been “apocalyptic” as exhibited in satellite Photo 12B. The destruction would have been so severe that I didn’t bother to measure and count the potential victims. Incidentally, Kathy contacted the power company and their subcontractor for reimbursement of her

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## A Brief Discussion about Ethics and Oak Wilt

Oak Wilt is a devastating disease that continues to spread in Michigan. There is a marked difference in what methods we use to contain and eradicate Oak Wilt. Table 1 shows the Oak Wilt Kill Ratio which I devised to emphasize the number of trees killed by Oak Wilt compared to the number of trees we as professionals kill to stop the disease. Is it ethical to ignore procedures of remediation that save as many trees as possible? Is it ethical for arborists and their businesses to promote methods that secure the most lucrative and profitable contracts even if they needlessly destroy trees, property values, and ecosystems while draining our clients' bank accounts? Most arborists I know are hardworking, intelligent, and moral individuals. However, our clients, who are property owners, are in a real dilemma. It is astonishing that what happens to them and their property in their Oak Wilt crisis totally depends on who in this industry they happen to contact, lucky or not.

Is it ethical for professionals to dismiss relevant research such as my comparison of Glyphosate with Triclopyr? Is it ethical to restrict information that could be pertinent if not valuable to arborists and the public? Is it ethical to continue to discharge Triclopyr by the gallons to pollute the environment in the application of the Bruhn Model in lieu of RGD even though we now know Triclopyr is not impacting the health of oak trees nor likely inhibiting the advancement of Oak Wilt? Even the DNR acknowledges mixed results with Triclopyr use with the Bruhn Model in lieu of RGD trenching and in the suppression of sprouting of treated stumps. Is it ethical to recommend and use the Bruhn Model when other less destructive and less costly options are available? What about collateral destruction to diverse stands of trees? What about endangered species, wildlife habitat, and ecosystems? If the broad ranging Bruhn Model is used with its destruction of so many healthy oak trees and other species of trees, should Environmental Impact studies be performed? In my opinion, these and other matters involve ethics and should be considered and discussed in our industry.

expenses due to their negligence; they have not responded but are members of the Oak Wilt Coalition.

**Example #7 (Photo 13):** Oaks on a Nature Preserve became infected by Oak Wilt. I learned recently that the plan for remediation was to utilize the Bruhn Model. The RGD trenches would be so large in diameter that over 300-400 trees would need to be destroyed (Satellite image, Photo 13). Because I

have not yet visited this site, I have no idea if the orange circle in Photo 13 is even close to the infected area; I plan to visit the site in the spring. Believe it or not, the remediation efforts are being implemented by a "conservation organization". Like many other people and organizations, the conservationists in this organization are not likely aware of management option alternatives to the Bruhn Model because that method is only what they have been told.

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