



The Plant Doctor's LANDSCAPE TIPS

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HERBICIDES AND OAK WILT - A REVIEW

INTRODUCTION

Oak Wilt, caused by the introduced/invasive fungus, *Bretziella fagacearum*, is the most serious disease of *Quercus sp.* in Michigan and beyond (Photo 1). In the author's (and many others) opinion, the disease is exploding in incidence in Michigan. Nearly 10 years ago, an Oak Wilt Qualifications (OWQ) was initiated with the intent to better train arborists and others about Oak Wilt matters. The OWQ is administered by a few individuals from the Michigan Department of Natural Resources (DNR) and the International Society of Arboriculture-Michigan Chapter (ISA-MI). An OWQ program was again offered in July, 2025; several participating arborists alerted me to what they viewed as deficiencies in the program.



Photo 1

Photo 1: Oak Wilt is reaching epidemic proportions in Michigan. This photo discloses an expanding Oak Wilt epicenter due to pruning at the wrong time of year.

GIRDLE/HERBICIDE AND THE OAK WILT QUALIFICATION (OWQ) PROGRAM

Knowing about my research on herbicide management of Oak Wilt, several arborist colleagues advanced to me "Required Reading" for the OWQ course. One of the required reading assignments was entitled, "*Herbicides and Oak Wilt - A Review*" (This and other documents are available from me upon request). Although I had seen this document previously, the concern expressed by arborists prompted me to examine it more carefully. The following are some examples of herbicide information summarized in the document.

1. Bruhn J.N. et.al. Survival of oak root systems following frill girdle herbicide treatment for oak wilt control, Pp. 544-550. In: 13th Central Hardwood Forest Conference, Urbana-Champaign, Illinois, USA, 1-3 April 2002. General Technical Report, North Central Research Station, USDA Forest Service. NC-234. (Bruhn et. al. 2003):

Yes, this is the same Dr. Johann Bruhn who originally developed the Bruhn Model for Root Graft Disruption (RGD=Trenching) in the early 1990s. A major research project that involved 600 trees, "three" treatments were applied to frill-girdled trees: 1) Garlon 3A (undiluted 44% triclopyr), 2) Garlon 3A (half strength) + 24mL Arsenal AC (53% Imazapyr) per liter of solution, 3) Various Control Groups consisting of Girdle Plus Water, Girdle Only, and No Girdle/No Herbicide treatment. All girdle treatments caused above ground (crown) dieback, as would be expected. Of particular interest was root sampling, which made this a monumental undertaking. The roots of 600 trees(!) were sampled for viability at various times after treatment. Only the #1 treatment, Garlon 3A, resulted in root death, but at 31.5 to 35 months after treatment. All other treatments failed. It needs to be noted that Bruhn et.al research was focused on killing roots and not on controlling Oak Wilt.

2. **Warren Dunes: Success or Failure? (reported by the DNR):** Outbreaks of Oak Wilt were treated in 2015 using the Bruhn Model design (but without trenching) by double girdling

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and drenches of Garlon 4 (Triclopyr) with penetrating oil to girdling cuts. These treatments were reported in the document, "Herbicides and Oak Wilt - A Review" as, "Containment of oak wilt has been successful at treated sites thus far." These results conflict with arborists' and my observations. In 2020, a group of arborists and I embarked upon an expedition into Warren Dunes to examine these Garlon 4 herbicide-treated sites. It was a grueling hike in steep loose sand dunes. For transparency, one of the leaders of this expedition had been hired by the DNR to implement these treatments. We observed that some trees had recovered from these treatments (Photo 2A). In addition, we documented that Oak Wilt had breached the Girdle-Herbicide Bruhn design where several tiers of healthy trees had been sacrificed in hopes of containing Oak Wilt (Photo 2B).



Photo 2A



Photo 2B

Photos 2A & 2B: As previously reported in *The Landsculptor*, trees subjected to the Garlon 4/Double Girdle procedure at Warren Dunes State Park sometimes recovered (2A); note recovering canopy and healing callus (arrow, 2A Inset). A narrow vista of the massive kill zone required by implementation of the procedure according to the Bruhn design (2B).

3. Other Field Treatments: Other treatments were reported from various entities in the "Herbicides and Oak Wilt - A Review" document presented to OWQ participants. For example, a DNR funded grant "Michigan Invasive Species Grant Program (MISGP) "Slowing and Preventing Oak Wilt";- was administered from 2016 to 2019 by the Manistee Conservation District. Some of the treatment sites were initiated in the last year or two of the grants, leaving little time for data collection. A rather vague report was generated at the grant's conclusion. Observations of the treatments were haphazard and largely anecdotal, insufficient time was allotted to glean any meaningful results from the wide array of treatments, and there were no "replications" or controls, which are required in scientific protocols. According to the report, the sites were supposed to be monitored in the coming years but there has been no follow-through, likely because the DNR grant was not renewed. Many other treatment sites were reported from various sources in "Herbicides and Oak Wilt - A Review", but like the Invasive Species Grant, there were no reports subjected to "Peer-Review", as I'll discuss forthwith. Interestingly, in the document, an alarming number of Girdle-Herbicide treatments were reported to require retreatment with Garlon 4, sometimes several times, because triclopyr (Garlon 4) did not suppress sprouting of stumps.

4. Evaluating Effectiveness of Girdle-Herbicide Containment of Below-Ground Spread of Oak Wilt (*Bretziella fagacearum*). Forest Ecology and Management. Volume 533, 1 April 2023, 120816.(Bronson et.al 2023):

Although I have previously presented a summary of this research, I think it again merits a brief review, because, it seems, the organizers of the OWQ program are heralding this "Peer Reviewed" and "Refereed" publication as the sine qua non of research on Girdle-Herbicide methodology. The results of the Bronson research are presented in Table 1. Please note that when four or less trees were affected by Oak Wilt, a success rate of 81% was reported. With five or more trees, successful control of Oak Wilt fell to 29%. An overall average of 55% control of Oak Wilt was reported. Several serious flaws were evident in this publication. For example, the experiment was only allowed to run for four years when we know that the Oak Wilt fungus could survive and spread in roots for longer than 4 years. Compared to the Bruhn study (summarized above) there were insufficient experimental controls. For example, there was no comparison between Double Girdle only and Double Girdle plus herbicide treatments; it is likely there would be no significant difference between the two treatments. Also, I'm suspicious of the statistical analysis where 81% control fell to 29% depending on number of infected trees (Table 1). The most glaring flaw in Bronson et.al. is its conclusion: "This study shows that the girdle and herbicide (GH) methodology is an efficient way to contain oak wilt", which is not supported by the data in Table 1. Of noteworthiness, on average around ten healthy trees were sacrificed for every diseased tree,

Table 1: Bronson et. al. Research Results using Garlon 4/ Double Girdle with the DNR/Bruhn Model*
(April 2023)

#Trees w Oak Wilt	% Oak Wilt Control
<4 Infected Trees	81%
≥ 5 Infected Trees	29%
Average	55%

*42 Independent Sites
2270 Treated Trees (248 Diseased, 2022 Healthy)
Monitored for 4 Years after Treatment

making the Garlon 4/Double Girdle impractical for most situations in Michigan. Nevertheless, the DNR and OWQ promoters are recommending this procedure for residential communities. In my opinion, because of the serious flaws, the Bronson et.al. research should never have passed Peer-Review and published in a Refereed scientific journal.

WHAT ABOUT GLYPHOSATE?

In "Herbicides and Oak Wilt - A Review", which was required reading for perspective OWQ participants, the following comments were made:

"There is no documented research indicating if glyphosate applied ACCORDING TO THE LABEL RATE is effective for oak wilt treatments. There are bulletins that contain information about applying glyphosate for oak wilt treatments, but Michigan Department of Agriculture and Rural Development (MDARD) considers the rates outlined in these bulletins a violation of the maximum application rate listed on the pesticide label. For example, it would be a violation of law, according to MDARD, to exceed 1mL (~0.04 ounces) of undiluted product per 2 to 3 inches of diameter at breast height if using a brand such as Farmworks (active ingredient ~41% glyphosate). Several professionals have reported anecdotal evidence of failures when high-concentrate glyphosate products are applied WITHIN LABEL RATES for oak wilt treatments, but this merits further investigation."

Note: These comments on Glyphosate in the "Herbicides and Oak Wilt - A Review" are aimed squarely at my Glyphosate research, which is summarized below.

SUMMARY BRIEFS OF ROBERTS' GLYPHOSATE RESEARCH FOR REMEDIATION OF OAK WILT

When I (Roberts) initiated research on Oak Wilt Remediation in 2008, I knew then that the most likely herbicide to succeed was Glyphosate. My experience with other chemical herbicides (Triclopyr, Imazapyr, 2,4-D, Picloram, etc.) indicated that they would not kill roots quickly enough to preclude Underground Transmission of the Oak Wilt fungus. Please note that, regrettably and contrary to scientific principles, the following replicated research is not recognized by the OWQ promoters or summarized in "Herbicides and Oak Wilt - A Review".

Tier Tree Model Glyphosate/Stump Cup: My initial design (2008) prescribed for the sacrifice of one tier of healthy trees around an Oak Wilt epicenter. This method has exhibited 100% success in the field and has never failed.

Glyphosate vs. Triclopyr (Garlon 4): In replicated field trials, I compared "Glyphosate/Stump Cup" with the "Garlon 4/ Double Girdle" method (my terminology). All treatments were performed to half-girdles, which should elucidate the impact

of the test herbicide upon tree health compared to complete girdling, which would kill trees without herbicide application. The Glyphosate treatment killed live oak trees 100% of the time while Garlon 4 herbicide applications exhibited no adverse impacts on the health of oak trees (Photos 3A & 3B)

Label Rates of Glyphosate vs. Garlon 4: Because I learned of complaints about my Off-Label rates of Glyphosate from certain promoters of the OWQ, I decided to compare label rates of Glyphosate with label rates of Triclopyr. The label for some commercially available Glyphosate products (ex. Farmworks 41% Glyphosate) prescribes 1mL per two to three inches trunk diameter, which approximates 1 teaspoon of Glyphosate concentrate per 12" tree trunk diameter (dbh). In replicated half-girdle trials using healthy oaks, the one-teaspoon rate of Glyphosate killed oak trees 100% of the time (a surprise to me, the reason we do research, right?) whereas, again, Garlon 4 exhibited no adverse impacts on the health of oak trees (Photos 3A & 3B).

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Photo 3A



Photo 3B

Photos 3A & 3B: Replicated field trials compared Garlon 4 and Glyphosate applied to half girdles according to standard protocols. In 3A, Garlon 4 treatment exhibited no adverse impacts to tree health the following year; note that foliage is healthy and not even distorted by the herbicide. In 3B, Glyphosate readily killed trees, even at the low Legal Label Rate of One Teaspoon per 12" dbh (Inset).

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One Teaspoon (label rate) Glyphosate and Oak Wilt: The next step in my research after I proved that the "One Teaspoon Rate" of concentrated Glyphosate was lethal to oak trees was to test whether the one teaspoon rate of Glyphosate would stop root graft transmission of Oak Wilt. In replicated field experiments, the one teaspoon rate of Glyphosate failed to stop Oak Wilt transmission through root grafts. This lack of control of Oak Wilt is the reason I use higher rates of Glyphosate.

Glyphosate/Stump Cup 'Chaser': Over many years, I have designed several variations of the Glyphosate/Stump Cup. One of the most innovative and successful procedures is the 'Chaser' variant. With 'Chaser', only diseased trees are treated with Glyphosate. The theory was to "encourage" the herbicide to 'Chase' the Oak Wilt fungus in Oak Wilt-diseased trees, pass it, and prevent the fungus from transmitting through root grafts to nearby healthy oaks. Subsequently, I have often witnessed the very rapid transfer of Glyphosate between oaks before the Oak Wilt fungus was transmitted. In some instances where trees have been affected by Oak Wilt for a full year, Glyphosate applications a year after infection appeared in nearby oaks, preventing the transmission of the disease through root grafts. With 'Chaser' no sacrifice of healthy trees is necessary. The 'Chaser' has become my go-to method and has been highly successful at many Oak Wilt sites throughout Michigan (Photos 4 & 5).

DISCUSSION

In the OWQ course, there is an emphasis on the most costly and destructive methods for Oak Wilt Management: the Bruhn Models for RGD (trenching), the Garlon 4/Double Girdle method applied according to the Bruhn design, and Tree Injections



Photo 4

Photo 4: A large 39-inch oak (upper left Inset) became infected from power line clearance activities. A stump also tested positive for Oak Wilt (lower left Inset, foreground). In deliberations with Kathy, the homeowner, she decided to have a (Roberts) Tier Tree Model RGD trench placed on the left side of her property to protect equally large neighbors' trees in this mature urban forest neighborhood (yellow line, lower left Inset). The stump and 39-inch oak were subjected to the Glyphosate/Stump Cup 'Chaser' procedure, which has protected oak trees on the right side of the drive for more than 5 years. No trench on the right side of the drive nor propiconazole injections were performed on this property.

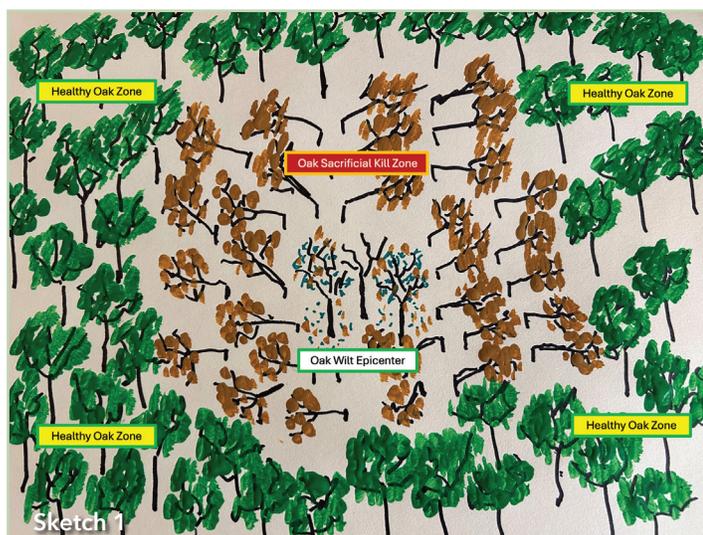


Photo 5

Photo 5: At this older HOA condominium location where all trees are considered valuable as an Arboretum by its residents, Oak Wilt became established over a significant area before someone finally figured out the culprit was Oak Wilt (background). An arborist who had recently completed the OWQ program, asked for my assistance because he and the HOA didn't want to sacrifice any healthy trees according to costly and destructive methods he learned in the OWQ. In the Right Inset, the arborist administers a Stump Cup to one of the many trees destined to receive Glyphosate. Even stumps left from previously removed trees were treated with Glyphosate (Left Inset). No further Oak Wilt has developed in three seasons since treatment. The HOA is elated with the results in which no trees were sacrificed.

applied according to the Bruhn design. Both the Bruhn RGD and Garlon 4/Double Girdle require sacrifice of many healthy trees (Sketch 1), and Tree Injections are also costly and sometimes ineffective due to applicator and application procedure. Most OWQ-recommended procedures are generally impractical in most Oak Wilt situations (ex. Residential) in Michigan.

There are several proffered reasons for the dismissal of my expertise and research on Oak Wilt, including my research on Glyphosate as summarized below.



Sketch #1: In this AI generated 2nd Grader Sketch of the Implementation of the Garlon 4/Double Girdle to an Oak Wilt site, note the epicenter comprised of three oak trees (center)-one tree became infected the previous year by Overland Spread followed by Underground Transmission to two trees this year. The large kill zone of sacrificed healthy trees according to protocol and the outer zone of healthy oak trees are depicted. I refer to this method as the Hopin' & Prayin' procedure because Garlon 4 apparently has no impact on the health of oak trees and no inhibition of Oak Wilt transmission through root grafts.

MDARD and Category 10: One of the erroneous reasons for rejection of my research on Glyphosate is clearly spelled out in the "Herbicides and Oak Wilt - A Review" document. The proponents of OWQ emphasize "ACCORDING TO LEGAL LABEL RATES", specifying violation of Michigan law *if used Off-Label*. But this is not a legitimate excuse for rejection of research and its free expression. Labels are created and/or altered through research, something the progenitors of the OWQ program apparently do not understand. That it is insinuated that any research must be performed at "LEGAL LABEL Rates" is misleading and distracting. The Michigan Department of Agriculture and Rural Development (MDARD) endorses my research on elevated rates of Glyphosate. MDARD has even recommended that arborists can work with me on my Glyphosate research by completing Category 10 of the Certified Pesticide Applicator program. Arborists only need to apply, there is no test, and CAT 10 is permanent (no renewal is necessary) provided Pesticide Applicators Certification is maintained.

"Peer Review" & Referee: Another illegitimate reason that OWQ associates use to dismiss my contributions to Oak Wilt research in the OWQ and in ISA-MI activities is the claim that I do not submit my research for Peer-Review as a Refereed Publication. This is a distortion of science. The right to pursue creative activity (research) and disseminate the results (free speech/freedom of the press) is enshrined in the First Amendment of the United

States Constitution. So, let me set the record straight: Publication in a Peer-Reviewed and Refereed Journal is not required for Scientists to pursue research and report their findings. Scientists routinely engage in research and present their findings (annual updates) at professional societies long before they would ever consider publication in a refereed scientific journal. Every time I write a publication or deliver a lecture on my ongoing research, I am subjecting my work to Peer-Review by Scientists, Arborists, Government Representatives, etc.; they can challenge it and perform their own research, but they should never inhibit my free expression. In the "Herbicides and Oak Wilt - A Review" document being utilized in the OWQ program, much of the information being disseminated is incomplete, anecdotal, flimsy, without adequate scientific methodology and has never undergone Peer-Review or publication in a Refereed Scientific Journal. It is my understanding, for example, that Bruhn et. al. (2002) is a technical report and not Peer-Reviewed. And as noted, Bronson et. al. (2023) is seriously flawed.

Garlon 4/Double Girdle (Hopin' & Prayin') vs. Glyphosate/Stump Cup: In the document, "Herbicides and Oak Wilt - A Review", the author was fixated on "LEGAL LABEL RATES", claiming that there "...is no documented evidence that glyphosate is effective for Oak Wilt treatments". As reviewed above, I proved through replicated research that Glyphosate at the label rate of 1 Teaspoon of 41% Glyphosate is capable of killing oak trees while triclopyr (Garlon 4) is not. Furthermore, I proved that Glyphosate at the label rate of One Teaspoon per 12" dbh is not capable of preventing

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root-graft transmission of Oak Wilt, the reason I use higher rates, which are quite effective. And as I have explained above, following LEGAL LABEL RATES are not required for research, the dissemination of research findings, and the development of new labels. Apparently, individuals who reject specific evidenced-based research misunderstand science. Furthermore, technically speaking, there is also no documented evidence that Triclopyr (Garlon 4) can control Oak Wilt at LEGAL LABEL RATES. When so many healthy oak trees (multiple tiers) are destroyed with the Garlon 4/Double Girdle method (Sketch 1), is it the girdling of so many sacrificial trees or the Garlon 4 that is suppressing Oak Wilt . . . if the procedure is effective? That's why I sometimes refer to the Garlon 4/Double Girdle procedure as Hopin' & Prayin' that the Oak Wilt fungus doesn't make it through the massive kill zone before the data is collected (Sketch 1). Most of these Garlon 4 treatments are truncated to 4 years or less, and we cannot be certain if they are effective in the long term. As further evidence, we have observed that Garlon 4 applied to stumps does not often suppress sprouting of stumps (Photos 6A & 6B), meaning the herbicide could never kill the massive network of roots associated

with treated trees. My research has shown that Glyphosate, even at a low LEGAL LABEL RATE, is far superior to Garlon 4 in killing of oak trees (Photo 3B). If Glyphosate at LEGAL LABEL RATES was used instead of Garlon 4 with the Bruhn Model design, results for Oak Wilt containment might be better. However, my Glyphosate treatments at elevated rates are consistently highly effective for controlling Oak Wilt, usually without the sacrifice of any healthy trees and without trenching (Sketch 2).

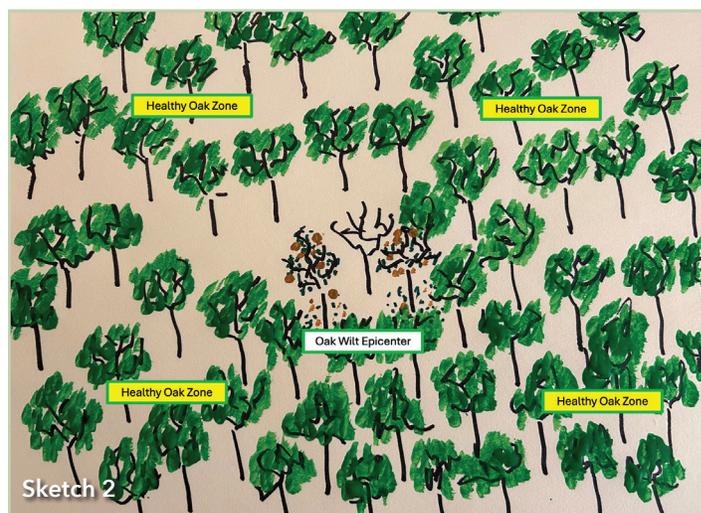


Photo 6A



Photo 6B

Photos 6A & 6B: In 2016 at an Oak Wilt site near Suttons Bay, Michigan, trenching failed to stop Oak Wilt from advancing from the landscape onto a critical dunes cliff (6A). I had recommended my Glyphosate/Stump Cup 'Chaser' procedure, but the Invasive Species Grant administrator nixed the Glyphosate proposal, recommending Garlon 4 instead. Stumps treated with Garlon 4 subsequently developed sprouts (6B), and the disease continued to spread on the dune's steep cliff.



Sketch 2

Sketch #2: In this AI generated 2nd Grader Sketch of the implementation of the Glyphosate/Stump Cup 'Chaser' procedure, only the diseased trees are treated with Glyphosate. With 'Chaser', no sacrifice of healthy trees is needed because the herbicide prohibits the transfer of the Oak Wilt fungus between diseased and healthy trees.

CONCLUSIONS

The Oak Wilt Qualifications (OWQ) program was developed with the intent to educate and better equip arborists to confront the expanding Oak Wilt epidemic in Michigan. Perhaps initially well intentioned, I believe the OWQ has not measured up to the expectations as evidenced by the numerous mistakes, omissions, and misinformation I have been documenting. Unfortunately, in my opinion, the program is failing in its mission because participants are not being given a complete picture of all the available information they need to be "Expert" in addressing the Oak Wilt crisis. The suppression of Glyphosate research is not consistent with the tenets of Science and free expression/free speech that Professional Societies should adhere to, including ISA-MI's Code of Conduct. Dismissal of the extraordinary findings in my Glyphosate research suggests censorship. Perhaps OWQ associates are embarrassed about my research revelations? If the OWQ program will not embrace a diversity of views and embrace valuable research, then arborists who desire thorough information about Oak Wilt need to consider participating in other professional societies where a diversity of experiences, research, and views can be expressed. The Michigan Green Industry Association (MGIA) welcomes all participants. 🌿

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