

Oak Wilt Management: *Girdle-Herbicide Research & Other Important Revelations*



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Dr. Roberts retired from Michigan State University in 2018 after committing over 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 received his B.S. (1975) and M.S. (1977) from The Ohio State University and his Ph.D. from Michigan State University. Over the decades, Dr. Roberts has published hundreds of articles and has taught hundreds of lectures and workshops. He has re-searched many issues in Michigan's plant industry including Dutch Elm Disease, *Diplodia* Tip Blight of Pines, along with variety of cultural problems such as plant nutrition and herbicide toxicity. Dr. Roberts has worked on Oak Wilt for 40 years, inventing several new and innovative remediation techniques. 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. His discovery of a bacterial biological herbicide for weed grasses resulted in several patents with MSU. His research on greenhouse and nursery crops disclosed the first fungicide-resistant strains of the *Pythium*, a root rot fungus, altering management methods for crop preservation. 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. In his retirement, Dr. Roberts intends to remain active with the Arboriculture/Landscape/Nursery Industries while hoping to have more time for his hobbies. Dr. Roberts is President, CEO and CBW (Chief Bottle Washer) of The Plant Doctor, LLC... aka The Tree Doctor. Contact information: **Phone (248) 320-7124;** **Email treedoctordave@gmail.com**

INTRODUCTION:

Oak Wilt is a significant threat to Oak trees in Urban and Natural Forests in Michigan (Photo 1).

Many of the methods used by certain entities to contain and eradicate Oak Wilt are often more destructive than the disease. In Michigan, for example, the Bruhn Model has been advanced as the “Official Recommendation” through the “Oak Wilt Qualification” (OWQ) program, promoted by the Michigan DNR, the Oak Wilt Coalition (OWC), and the International Society of Arboriculture, Michigan Chapter (ISA-MI). The Bruhn Model, originally designed for Root Graft Disruption (RGD) (Sketch #1), has evolved into other variations including tree injections and girdle-herbicide (GH) applications as options in lieu of RGD, the reason I have often referred to the Bruhn Model as the DNR/Bruhn Model. There have been several recent revelations that I thought might be important for Michigan arborists and the Michigan Public to understand.

April Fools’ Day: Oak Wilt Remediation and the AMC Gremlin:

April Fools’ Day (April 1st) is significant in American Culture for a variety of reasons. For example, it is the only day we can knowingly fib and get away with it in a lighthearted manner. As a young lad, I recall that the AMC Gremlin was introduced by the American Motors Corporation,

perhaps in jest, on April 1, 1970 (Photo 2). The Gremlin was America’s answer to the growing number of small, economical imports. It also predated the domestic subcompacts, the Ford Pinto and Chevy Vega. Contrary to popular press reports and despite its controversial styling, the Gremlin proved to be a reliable, durable, economical and long-lived popular car, selling almost 700,000 units in eight years of production. What do the Gremlin, April Fools’ Day, and Oak Wilt have in common? Please read on.

The Wisconsin Study:

Fast forward to April 1, 2023 (April Fools’ Day). On that day, a peer-reviewed research paper was published by a group in Wisconsin that specifically examined the effectiveness of the Garlon 4/Double Girdle Technique (my terminology) and its application to Oak Wilt sites in Wisconsin. The reference to this study is

as follows: *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*. To my knowledge, other than my own limited research, this paper is the only extensive study designed to test the effectiveness of the Garlon 4/Double Girdle technique for Oak Wilt Management.

P1 Oak Wilt is one of the most serious tree diseases in Michigan, especially when disinformation about management is widespread.

P2 This 1972 AMC Gremlin was factory-ordered by the author’s parents to serve as economical transportation during Dave’s college days. The car was driven in Midwestern winters for 12 years and 140,000 miles, after which it was relegated to the barn for several decades. In a “barn find” (in his own barn), the car now attends car shows and serves in parade duty as this Memorial Day 2012 photo demonstrates. Dave’s high school buddy owns the DeLorean (background). This Gremlin has never been rebuilt, restored, or repainted; it has served its owner very well.



P2



1). The difference in control of Oak Wilt (82% vs. 29%) based on whether four or five diseased Oaks are involved is inconceivable if met with some skepticism by the author of the present publication.

Discussion of the Wisconsin Study: The field research by the Wisconsin group was sorely needed. Or was it? The published Wisconsin research regarding the use of Triclopyr products for application to girdled Oak trees partly reinforced my own research results from several years ago. Recalling prior research that I published in *The Michigan Landscape*, I found that Triclopyr, sold as Garlon 4, etc., had no verifiable impact on the health of Oak trees when used with my “patented” Half Moon (=half girdle) method and when compared to the application of Glyphosate to my Stump Cup method (Photos 4A & 4B). Our goal in using herbicide on Oak trees is to stop the spread of Oak Wilt via root grafts by killing those roots. Where I think we can readily disagree with the Wisconsin researchers is in their **Conclusions**, which, in my view, are overly optimistic and, perhaps, an April Fools’ Day moment: **“This study shows that the Girdle and Herbicide (GH) methodology is an efficient way to contain Oak Wilt.”**

Because the Wisconsin study was “Peer-Reviewed” and published, I cannot understand how the “Conclusion” presented in the Wisconsin Study passed muster in the Peer Review process. I do not consider 29% control or an overall average of 55% control an “efficient way to contain Oak Wilt”. I do not even consider 82% an efficient way to control Oak Wilt (with four diseased trees or less). We need to remember that with the application of the GH method via the Bruhn Model (DNR/Bruhn Model) template, many healthy trees are sacrificed (Sketch #1). The costs and destruction

P3 Like the technique used in the Wisconsin Study, the Michigan DNR applied Triclopyr to the double girdle of this healthy Oak tree in 2015. By 2020, the tree had (partly) recovered; note callus (yellow arrow) and surviving tree crown (inset). This failure in the Girdle-Herbicide led the author to question the effectiveness of Triclopyr in Oak Wilt management even though certain Michigan people and entities continue to promote this method as official and effective.

Table 1 – Wisconsin Study using Garlon 4/Double Girdle Results with Bruhn Model* (April 1, 2023)

#Trees w Oak Wilt	% Oak Wilt Control
≤ 4 Infected Trees	82%
≥ 5 Infected Trees	29%
Average	55%

*42 Independent Sites
2,270 Treated Trees (248 Diseased, 2,022 Healthy)
Monitored 4 Years after Treatment

Materials & Methods of the Wisconsin Study: Referred to as the Girdle-Herbicide (GH) method by the Wisconsin researchers, Oak trees at 42 independent Oak Wilt sites in an eight-county region in central and northern Wisconsin were subjected to the GH treatment using the Bruhn Model as the template (in lieu of RGD). Horizontal double girdles on tree trunks were spaced approximately six inches apart and drenched with a mixture of 25% Element 4 (Triclopyr 4) and 75% Diesel Fuel by a handheld sprayer (Photo 3). The GH treatments were applied in 2015 and 2016 to a total of 2,270 Red Oaks; 248 treated trees were newly Oak Wilt-symptomatic trees while the remainder, 2,022, were apparently healthy trees surrounding diseased trees (according to the Bruhn Model). For each of the succeeding four years following treatment, trees within 200 meters of the treatment/containment sites

were monitored for the development of Oak Wilt. Other matters such as soil texture were also considered in this study. Extensive statistical analysis was performed on this research by the Wisconsin researchers.

Results of the Wisconsin Study: As recorded in Table 1, the Wisconsin researchers reported that sites with four or less Oak Wilt-infected trees (<4), the GH (=Girdle-Herbicide=Triclopyr/Double Girdle) method was 82% effective at containing Oak Wilt. With sites where five or more Oak trees were infected by Oak Wilt, 29% control of Oak Wilt was achieved. Four to five symptomatic trees appeared to be a “breakover point” according to the researchers. An overall average of 55% control of Oak Wilt was reported in the Wisconsin Study, which is likely not a “weighted average” but simply an average control of 29% and 82% (Table

from destroying so many healthy trees, even at an 82% success rate, is certainly not very impressive. We also need to consider that in the Wisconsin Study, 2,022 healthy trees were destroyed because of 248 Oak Wilt diseased trees, representing a kill ratio of approximately 10 healthy trees sacrificed for every diseased Oak tree. Depending on other real-life situations, regarding the size and density of woodland Oaks, it is not unusual for that kill ratio to reach 20:1 or even 30:1 (20 or 30 healthy trees destroyed for every Oak Wilt-diseased tree).

For many tree diseases other than Oak Wilt, we can tolerate less than 100% control without serious consequences to tree health and for property owners' concerns (Photos 5A & 5B). But for a lethal disease such as Oak Wilt, we must strive for 100% control or as close to 100% disease control as possible, especially when we consider that so many healthy trees are being sacrificed with the use of the Bruhn Model as the Michigan DNR and its colluders are recommending. I have never utilized the Bruhn Model because my innovative methods result in 100% control (or

nearly 100%) of Oak Wilt often without the sacrifice of any healthy Oak trees. My methods involving the Tier Tree Model for RGD, Tree Injections, or variations of my Glyphosate/Stump Cup method (Tier Tree Glyphosate/Stump Cup, 'Chaser', 'Half Moon' and 'Whack-A-Mole') have proven far superior to other methods reported herein and elsewhere. These methods are described in *The Michigan Landscape* articles available on my websites: www.plantdoctorllc.com and www.oakwilt.info.



S1 This depiction shows how the DNR/Bruhn Model is implemented. According to measurements derived from Table 2, two Root Graft Disruption trenches (RGD in blue) are placed at distances from Oak Wilt-infected trees. To the promoters of the DNR/Bruhn Model, it makes no difference if the location is a forest, woodland or residential area. After the trench lines are installed, all healthy Oaks delineated by the RGD trenches are sacrificed.

P4 A&B The author's research designed to assess the effectiveness of Triclopyr in killing Oak trees and also compare it to glyphosate (the author's preferred herbicide) was implemented using his "patented" Half Moon technique, which should reveal an herbicide's impact on the health of an Oak tree. In Photo 4A, double half girdles were treated with Triclopyr (Garlon 4, Inset); the following year the foliage on the tree emerged as if the tree was as healthy as could be. In contrast, a half girdle "Stump Cup" treated with Glyphosate, even at only a one-teaspoon/per 12" dbh rate (inset), killed the treated trees (Photo 4B). We want to kill Oak trees and their roots quickly to stop the transmission of the Oak Wilt fungus through root grafts. The author's research showed that Triclopyr had little to no impact on the health of Oak trees, while glyphosate was highly effective at killing Oak trees. This information is groundbreaking for our Oak Wilt containment efforts and helps to explain why the Wisconsin Study reported herein resulted in many failures.



Missed Opportunities?

The Wisconsin Study was a monumental undertaking; kudos to the exhaustive efforts performed by the researchers. However, careful examination and critique of the Wisconsin Study reveals several potential flaws and/or missed opportunities. First, as already detailed, the results **did not** support the GH method with Triclopyr as **an efficient way to contain Oak Wilt**. Referencing the number of healthy trees killed (>2,000) and the large number of sites (42), there were several other important opportunities for research. For example, other herbicides could have easily been included, tested, and compared to Triclopyr. Killing >2,000 healthy trees with girdling and one herbicide will not yield any greater benefits than killing 200 healthy trees or even fewer with girdling and one herbicide. And because other researchers and I have found Triclopyr to be ineffective at killing Oak trees' roots in a timely manner to stop Oak Wilt, why was a Girdle treatment **alone** not implemented as comparison with the Girdle/Triclopyr treatment? Referencing the results of the Wisconsin Study (Table 1), it is possible that a girdle treatment alone, serving as an untreated control, might have provided similar results to the Triclopyr/Girdle treatment. Another concern is that the Wisconsin Study was only permitted to run for four years. We know that Oak roots and the Oak Wilt fungus may remain viable for at least 4-5 years after a tree is killed by girdling and/or the Oak Wilt fungus. There may have been more failures in Oak Wilt containment if the study had been monitored for, say, 5-6 years. With so many Oak Wilt sites and so many healthy Oak trees sacrificed, there were many opportunities for testing other variables that might be important for Oak Wilt research.

The Triclopyr Addiction:

The Michigan DNR began using the GH (=Triclopyr/Double Girdle=Garlon 4/ Double Girdle) method with the Bruhn Model around 2015. Subsequently, the OWC and ISA-MI adopted the GH method (using Triclopyr) as a viable alternative to RGD, even though there was no vetting or research declaring the effectiveness of the procedure. My research, comparing Glyphosate and



Triclopyr, has been ignored by this group even though they claim to be supportive of science. The Wisconsin Study published on April Fools' Day in 2023, despite the April Fools' Day conclusion, proved supportive of my research results which demonstrated Glyphosate is far superior to Triclopyr. Other researchers in

P5
A&B
Oak Wilt is a lethal and costly disease. It needs to be taken seriously and not subjected to research disinformation to foster certain agendas. Many other diseases and pests in our forests, woodlands, and landscapes are not lethal or that serious. Even though many apples/crabapples are defoliated every year by the fungal disease, Scab (*Venturia inaequalis*) (Photo 5A), they usually begin each new season refreshed and healthy (Photo 5B; Photo credit: Sandy Allen)

Table 2 – Suggested buffer distance (feet) from wilting or dead Oaks

Combined DBH (inches)	Any time the herbicide methods are used	Stump extraction, vibratory plowing, or trenching on sandy soils	Larger pocket on loamy sands, loams, or clays with stump extraction, vibratory plowing, or trenching	Smaller pockets (very few oaks killed in prior years) on loams or clays with stump extraction, vibratory plowing, or trenching
10	26	19	15	11
12	31	23	19	13
14	36	27	22	16
16	41	31	25	18
18	46	35	28	20
20	51	39	31	22
22	56	43	34	25
24	61*	47	37	27
26	66*	50	40	29
28	72*	54	43	31
30	77*	58	46	34
32	82*	62*	49	36
34	87*	66*	53	38
36	92*	70*	56	40
38	97*	74*	59	42
40	102*	78*	62*	45
42	107*	81*	65*	47
44	113*	85*	68*	49
46	118*	89*	71*	51
48	123*	93*	74*	54
50	128*	97*	77*	56
52	133*	101*	80*	58
54	138*	105*	83*	60
56	143*	109*	87*	60
58	148*	113*	90*	60
60	153*	116*	93*	60

Wisconsin (Jane Cummings Carlson, Wisconsin DNR, et.al., University of Wisconsin Extension Publication G3590) warned back in 2010 that Garlon 3 (Triclopyr), Garlon 4 (Triclopyr), Arsenal AC, Stalker, and Tordon RTU were not effective at stopping Oak Wilt. In fact, this Wisconsin group advised against the use of these herbicides because none were effective at killing the roots of Oak trees quickly enough to prevent the spread of

Oak Wilt through root graft transmission. Hence, none of these herbicides are likely to stop Oak Wilt transmission via root grafts! Undoubtedly, Triclopyr herbicide products are highly effective for some uses such as invasive plant control where rapid kill is not required. The effectiveness of Triclopyr in certain situations may be why Triclopyr is often the “go to” herbicide in forestry. But why do some scientists, foresters, and government

T2 A Bruhn Table shows distances required between Oak Wilt-diseased trees and healthy trees based on trunk diameters at dbh trunk height (=4.5 feet). These distances determine where Root Graft Disruption trenches need to be placed (see Sketch 1) and how many healthy trees need to be sacrificed. Minnesota DNR and University folks slightly modified the table based on their observation that they have not witnessed the Oak Wilt fungus transmitting Underground through roots more than 60 feet per year. The asterisks denote the 60-foot distances beyond which no further destruction of healthy Oaks theoretically needs to be taken, hence saving many trees.



representatives continue to use and believe in Triclopyr for Oak Wilt management when its efficacy has not been proven to be reliable? Among the scientific community, some scientists joke that the definition of insanity is doing the same thing over and over again, but expecting different results.

The Minnesotan Observation:

Because we're discussing Oak Wilt management by herbicides and the Bruhn Model in this article, I thought it might be useful to divulge an adjustment in the Bruhn Model by certain Minnesotans. Table 2 shows the standard Bruhn Model recommendations for RGD... and more lately GH methods, but with some slight modifications. The slight modifications to Table 2 are the asterisks next to some numbers. These asterisks were added due to observation that Underground Spread of the Oak Wilt fungus has never been observed to exceed more than 60 feet in any given year. Flaws with the Bruhn Model include the supposition that the Oak Wilt fungus transmits through roots the entire distance that roots extend to root grafts in a short period of time according to Table 2 and Sketch #1. This simply doesn't happen. In fact, I have often witnessed that the Oak Wilt fungus *does not* even spread 5 or 10 feet from a diseased Oak to a healthy Oak in a year's

time. What the Minnesotans are trying to convey is that in Oak Wilt sites, especially new ones, we do not need to put RGD lines out farther than the 60-foot distance from the most recently infected/killed Oak trees. Please bear in mind that this appears to be an "observation" and not based on any replicated scientific research, which would likely disclose significantly diminished spread, on average. However, it is good to see other Oak Wilt scientists at least begin to partly align with my Tier Tree Model and realistic spread of the Oak Wilt fungus through roots. Adjustments such as this may lead to fewer Oak trees being sacrificed during Oak Wilt remediation protocols.

Overall Conclusions:

There is extensive disinformation in the American society. Two examples are presented herein. The AMC Gremlin garnered an unenviable reputation because of its styling, which many people thought was downright ugly. In past decades, the Gremlin was frequently listed among the top 10 worst cars of all time. While its styling may have been controversial, as noted by many automobile aficionados in recent years, its performance, durability, reliability, and economy were among the top-rated inexpensive autos of the period. Priced competitively with the influx of Volkswagen Beetles and other imports

flooding our shores, the Gremlin succeeded mightily for tiny AMC, which lightheartedly introduced the car on April Fools' Day 1970.

Another introduction on April Fools' Day (2023) was scientifically, peer-reviewed research, labeled the Wisconsin Study herein, regarding management of Oak Wilt with Triclopyr and the Bruhn Model. The Study's conclusion that Girdle-Herbicide treatments resulting in 59% control of Oak Wilt on average *"is an efficient way to contain Oak Wilt"* does not seem rational. Hopefully, fair-minded individuals who can engage in critical thinking will agree that the conclusions reached are not as accurate as presented, as other Wisconsin scientists warned well over a decade ago. I am optimistic that so-called experts and entities in Michigan will realize the failings of the GH method using Triclopyr, which has been imposed on arborists and the public for nearly a decade without adequate vetting.

The Take Home message is, "Don't let gremlins cause you to veer away from the highway to facts and truth for Oak Wilt Remediation, even if it is littered with potholes." 