

# Winter's Impacts on Trees and Landscape Plants

## in the Spring and Summer

P1



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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:  
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### INTRODUCTION:

Trees and landscape plants are affected every winter by cold temperatures and associated climatic conditions (Photo 1). These wintery conditions may include snow, ice, and temperature extremes that may kill the entire plant, certain portions of trees, or certain tissues of the tree or landscape plants (Photo 2, see next page). The duration of low temperatures or sudden changes in temperatures may kill buds (flower or vegetative), stem tissues, and root tissues. There are also many stress factors such as excess/deficiency of water, excess/deficiency of nutrition, diseases and pests, etc. on plants that can tip the balance from surviving the winter to resulting in plant death (Photo 2). The winter of 2025 in Michigan seemed brutal in terms of duration; the warming periods we frequently refer to as January and February thaws did not seem to materialize. And cooler than normal temperatures have extended through the spring into early summer.

While we can see some of the conspicuous impacts of winter on trees (Photo 2), we may not always understand that winter injuries on trees may not be manifested until spring or even summer. We might call this latent or delayed impacts. In this article, I wanted to explore some examples of those latent causes of plant decline and/or death caused by winter.



P2



P3



P4

## Diagnosing Winter Injury in the Spring & Summer:

If winter conditions adversely impact trees and other landscape plants, various plant tissues will be affected: leaves/needles, buds (flower or vegetative), stem (branch or trunk), and roots. In some instances, multiple tissues may be affected. There are several easy diagnostic steps we can easily implement in the field that may tell us why plants are declining in the spring and summer and what plant tissue(s) is (are) affected. For example, buds are probably the common plant tissue affected by cold temperatures. Checking the viability of buds is relatively simple. Pulling buds from branch apices should inform us of their viability; dark bud bases mean bud death (Photo 3 Inset), while green bases imply there is still viability and that they may yet expand with time. Stem tissue can be examined any time of year; viable stem tissue will exhibit a greenish, succulent cambium beneath the bark on woody plants (Photo 4 Right), while dead cambium tissues will be brownish and dry (Photo 4 Left). A cross section of stem tissue affected by “winter kill” will be discolored due to winter kill (Photo 4 Inset Right), but will often appear white in cross section for viable branches and

**P1** This winter scene is beautiful. But it may hide potential problems such as heavy snow loads on branches and frigid temperatures that may be harmful to trees and other landscape plants. Snow provides some insulation from freezing temperatures. My philosophy has always been, if we must struggle through Michigan winters, we may as well have snow.

**P2** On a warm summer day in August, the author is sipping wine on a friend’s deck. It could not necessarily have been predicted that the large Red Oak (4+ feet dbh) in the background would topple in an ice storm the following winter (Top Inset). Evidence of Armillaria Root Rot (Inset Mushrooms), visible in the previous fall, undoubtedly contributed to the tree’s structural failure.

**P3 & 4** Diagnosing impacts of winter injury is frequently accomplished in the spring and summer when plants are not appearing thrifty. The climbing hydrangeas in Photo 3 exhibit abundant bud death (Photo 3 Inset - Note dark necrotic base of bud) and stem tissue discoloration which led to dead vines, poor growth, and yellowing foliage the following summer. Viable stem tissue on woody plants exhibit a green, succulent cambium beneath the bark (Photo 4 Right) when scraped with a pocketknife, while stem tissue affected by winter injury or other lethal maladies will appear dark and dry (Photo 4 Left). Cross sections of healthy stem tissue will appear light in color (Photo 4 Inset Left) while winter-injured tissue will be discolored (Photo 4 Inset Right).

stems (Photo 4 Inset Left). Roots killed by cold temperatures will appear discolored (darkish) internally when the cortex (“bark”) is scraped; viable/healthy roots will appear light in color internally. Roots of grafted plants with less hardy rootstocks or plants that have been installed outside of their hardiness zone are most susceptible (Figure 1).

### Examples of Winter Injury in Spring and Summer:

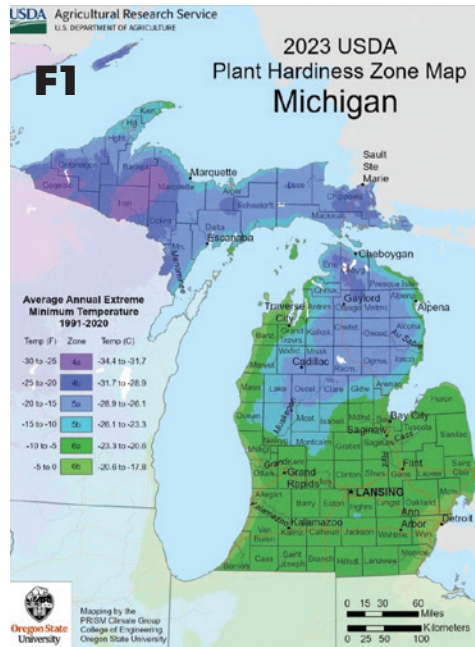
I encounter numerous examples of winter injury every year; many of the impacts of winter injury extend into spring and even summer. The following are a few but diverse examples of what I consider the lingering impacts of winter injury on plants.

**Established Plants** may be affected by winter injury. In Photo 3, a climbing hydrangea exhibits standard symptoms of winter injury. Some of the buds exhibited dark bases indicating they were dead, killed by cold temperatures (Photo 3 Inset). Many other buds on this hydrangea were green, predicting recovery with time. Of interest is that some of the shoots (vines) on the plant were stunted and exhibited yellow foliage; checking the stems revealed some discolored cambium. This example shows that multiple tissues (buds, stems) may be affected by winter injury but that the vine will eventually recover.

Another example of winter injury on established plants is represented in Photo 5. These trees on the University of Michigan campus showed sparse foliage in the spring after bud break and leaf-out. Apparently, many *Primary Buds* were killed by cold temperatures. As spring and summer wore on, *Secondary Buds* continued to open and expand. By mid-summer, these trees appeared normal and full-foliaged. This example shows the importance of *Secondary Buds* in the survival of trees and other woody plants.

**P5** Many primary buds were killed on these trees during the previous winter, resulting in sparse growth the following spring. Later, the emergence of leaves from secondary buds helped the trees recover.

**P6** This Ginkgo was planted at this business the year before. Unfortunately, after a harsh winter, the tree died. Enabling our diagnostic tests revealed why the buds had swelled and the leaves emerged, only to wilt and turn brown (Inset). The stem/branch/trunk cambium tissues were killed during the winter while the buds remained viable through the winter and into the spring.



**New Plantings** are more susceptible to cold temperatures than established plants, primarily because they tend to be under greater stress than established plants; stressed plants may not have stored the vital energy and nutrients that can ensure their survival. The Ginkgo in Photo 6 was planted the year before. After a harsh winter, leaves emerged from buds and promptly wilted. Examination of the branch tissue revealed discoloration typical of winter injury. We know from extensive experience that Ginkgos are

hardy and largely free of disease and pest problems. It is doubtful that the small planting space contributed to the tree's death that winter, however, the small planting area would eventually limit growth and create stress on the tree if it had survived.

**Stressed Plantings** are already predisposed to various threats to their health. Stress factors may include improper planting technique, improper care (water, nutrition), pests and diseases, environmental stressors (drought, heat,

frost injury), etc. The honey locust tree in Photo 7A is clearly challenged by its site. Trees that are under severe stress for whatever reason are more prone to suffer from winter injury. In the world of arboriculture, many of us would probably diagnose this tree's problem as dieback and decline due to restricted growing conditions. Another example of stressed trees are the ornamental pears on a street island in Photo 7B. While restricted growth from deicing salt and poor soil conditions are likely contributors, such trees are far more predisposed to winter injury than they would be in a better landscape situation.

**"Winter Burn"** is descriptive of symptoms normally associated with conifers. With Winter Burn, needles often become discolored; in some instances, needle loss occurs. These symptoms may be apparent even into the spring and early summer. Photos 8A and 8B disclose symptoms I would normally ascribe to this condition. In most cases, Winter Burn is a



**P7A**



**P7B**

**P7A & 7B** Trees in stressful conditions are far more prone to winter injury than healthy, vigorous trees. Stress from restricted growing conditions likely impacted this honey locust, causing dieback and decline (7A); winter injury undoubtedly contributed as well. These ornamental pears exhibit sparse foliage after a harsh winter (7B). Both bud and stem tissues were impacted by cold temperatures. While we might assume that deicing salt contributed to their lackluster appearance, similar plantings in other landscapes where no deicing salt was applied also had similar impacts from that winter's freezing temperatures.

**P8A & 8B** Winter Burn is usually described as changes in needle color and possibly needle loss due to cold temperatures and desiccation. A nursery sent two potted spruce trees to me, asking what disease had killed them (8A). Even though I diagnosed Winter Burn and that the spruces would recover, by the time I contacted the nursery (within 24 hours) they had already dumped hundreds of pots; it is wise to not act too hastily. Winter Burn (desiccation) on pines might appear to many lay people as trees in their death throes (8B); close examination revealed the trees were already in recovery by late spring as evidenced by emerging shoots (8B Inset).

**P9 & 10** Trees can suffer from physical damage during wintery environments. In Photo 9, the branches on this pine are almost bent to snapping position by ice accumulation; damaged cambium can result in stunted and poor growth the following spring and summer. Several years ago, large cracks (arrow) developed in the trunk of this and other nearby sycamores with an extremely loud bang during subzero temperatures (Photo 10); they recovered just fine but exhibited a thick healing callus in subsequent years. Southwest canker, aka Frost Crack, is a product of rapid winter temperature fluctuations on maples and other thin bark trees. (10 Inset).

cosmetic issue, and trees often recover and survive just fine.

**Physical Damage** can be a major component of Winter Injury by various means (see Ice Storm, next section). The extreme bending of branches (Photo 9) may injure cambium tissues, leading to substandard growth the following year; trees usually recover. Extremely cold temperatures for long periods may lead to trunk cracks, which are sometimes manifested by a sound like cannon fire (Photo 10). In other situations, a condition

I refer to as “Southwest Canker”, also called “Frost Crack” by many arborists, results in “cankers” on the south to southwest side of thin-bark trees such as young maple trees (Photo 10 Inset).

### Michigan’s 2025 Ice Storm & Oak Wilt:

A major Ice Storm occurred in Northern Michigan during the winter of 2025, resulting in one of Michigan’s most serious natural disasters in the state’s


history. The storm stretched across the northern lower peninsula in the vicinity of Petoskey to Gaylord to Alpena. It was so serious that the Michigan Governor sought disaster relief from the federal government at a time when FEMA was supposedly being dismantled. How does the Ice Storm of 2025 compare with previous weather disasters in Michigan? The Flint-Beecher Tornado on June 8, 1953 was rated an EF5 with wind speeds exceeding 200 mph. The tornado resulted in 116 human deaths and 844 injured people



and extensive property damage, making it one of the worst natural disasters in Michigan's and the United States' history. The tornado obliterated a swath 27 miles long through Genesee and Lapeer counties. While the 2025 Ice Storm can't compare to the 1953 tornado in human loss of life, it could very well exceed it in terms of economic damage. Millions of trees were toppled due to ice accumulation (Photos 11, 12, & 13); millions more were

injured. Climatologists have predicted for years more extremes in weather patterns and perhaps we are experiencing their predictions.

Immediately after the late March 28-30, 2025 Ice Storm, I received many queries and some photos from arborists, landscapers and the public affected by the storm. Their typical question, "Is there a possibility of Oak Wilt development from the millions of trees damaged?" In general, my answer

was "No, not likely." It is highly unlikely that Oak Wilt would develop from Overland Spread of the Oak Wilt fungus by sap beetles to wounds created by the storm, because the temperature remained cold (below 45 degrees F) for many days after the damage. But there is a potential disaster-in-waiting. During the cleanup operations at numerous properties in the ensuing months and years, extending through the spring and into the summer, there would be a great potential for Oak Wilt development as trees are trimmed and/or removed... and that is just locations where corrective measures are immediately implemented: landscapes, driveways, roads, two-tracks, etc. Another major predisposing factor for development of Oak Wilt are the millions of damaged trees in 100,000s of acres across Northern Michigan in the path of the 2025 Ice Storm. Trees that are leaning and trees with "hangers" (hanging broken branches) will continue to open new wounds in No-Where-Land during windy conditions and are likely to create many new Oak Wilt epicenters. Property owners in Northern Michigan would be well-advised to monitor their woodlands to ensure that Oak Wilt does not escape their attention and result in surprising expansions of this dreaded disease on their property and neighboring properties. 



**P11 & 12 & 13** Ice accumulation (11) on trees was so dense during the late March 2025 Ice Storm in Northern Michigan that millions of trees failed structurally and toppled onto buildings and other trees (12 & 13). Millions of other trees were injured. The cleanup operations and continuing exposure of wounds on oaks from windy conditions on leaning trees and trees with "hangers" could result in numerous outbreaks of Oak Wilt in the region affected by the storm. (Photos Credit: Dave Firman)

