PURDUE EXTENSION

The Revealing Effects of Winter on Trees and Shrubs

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PURDUE UNIVERSITY FORESTRY AND NATURAL RESOURCES 100 YEARS OF EXCELLENCE

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It appears that spring is finally in the air. The familiar sights and smells of spring are creeping their way into your landscapes with the welcome sight of so many spring flowering trees and shrubs. As plants awakened from their winter slumber, you may have noticed some branches that exhibited dieback or plants that failed to flower or leaf out. It is very difficult to determine winter injury until bud break, so now is the time to evaluate your plants for damage that needs to be corrected.

This past winter held a long, cold grip on the Midwest and eastern parts of the country. Even southern states were not spared from prolonged cold temperatures. In January, the temperatures were -10's F, in Lafayette, IN, causing concern for the negative effect on landscape plants. Plants that are marginally winter hardy to your specific location could incur some damage, including complete plant death or die back to the ground of plants such as crape myrtle. In recent years, these marginally hardy plants survived the winter due to more moderate temperatures, but we are already seeing considerable damage this spring and can expect damage this summer. Plants that were already stressed due to other factors, such as disease or the extreme drought of 2012, will be especially vulnerable to the extremes of this past winter. Secondary fungal invaders will also take advantage of stressed plant tissue and contribute to dieback later.

Plant Physiology and Cold Injury

Plants that have evolved in temperate zone climates, such as the Midwest, use various methods to overcome freezing temperatures. The primary strategy utilized for temperate plants is the process of dormancy. Plants begin preparing for winter's cold temperatures during the short days and cooler temperatures in fall. Once the plant becomes dormant, a specific number of chilling hours must occur before the plant will begin growth in the spring. It is during this endo-dormancy period that a plant is the most cold hardy of the season. Most of the very cold temperatures the Midwest experienced were during this period of maximum cold hardiness, so little damage is expected to normally hardy, 'healthy' plants.

Plants have innate mechanical and chemical processes that contribute to cold tolerance. Mechanical processes, such as evacuating water from inside to outside the cell to prevent cell-damaging ice formation, are a part of what is regarded as super-cooling. This process, in turn, will increase the amount of solutes, including salts, within the cell. This decreases the freezing point within the cell, thus limiting the amount of intracellular freezing and the amount of damage to the plant as a whole. Plants produce chemicals, such as

phenolic compounds that contribute to cold hardiness via the production of suberin, tannins, and other products. Also, some hormones help regulate both mechanical and chemical changes in the plant that contribute to cold protection.

Most plants exhibit maximum cold hardiness in the buds, which is where the actively dividing cells will begin to grow in the spring (Fig. 1). In cold hardy plants, the buds can survive through extremely low temperatures. Due to the plants being at maximum cold hardiness, the damage is minimized. As buds grow out of dormancy in spring, they become more vulnerable to cold injury. Above-ground portions of the plant are much more cold hardy than roots. For some plants, there may be significant root damage, which will become evident as a plant breaks bud this spring and subsequently dies in the following weeks.

Generally, flower buds are more sensitive to cold than leaf buds, and some species are more tender than others. Flower buds on susceptible fruit trees such as peaches, nectarines and sweet cherries could have been completely killed, while some flowers may have survived on apples and pears. Blackberries, raspberries, blueberries and grapes may also have significant bud loss, particularly on more tender cultivars. Species that are marginally hardy will likely suffer dieback, or if by now they have not leafed out, the plant may be dead.

Desiccation:

Although plants are dormant durning the winter they still loose too much water-a condition called desiccation. This is challenging for all woody plants but notably for evergreens and especially broadleaved evergreens which have greater leaf surface through which to lose water. Phododendron, rhododendron (Fig. 2),mahonia (Fig. 3), holly (Fig. 4) and boxwood (Fig. 5) are the most susceptible. Evergreens that have suffered from winter desiccation typically have beige to brown leaf edges that are curled (Fig. 6), or they may show red or purple discoloration. Japanese maple and some species of dogwood have also experienced damage in many parts of the state. Severe desiccation will be obvious with dead twigs and leaf buds. Some twigs will leaf out in the spring only to die back later in summer when additional stress such as heat or drought apply greater pressure.

Salt Damage

The cold weather could indirectly cause notable damage due to the copious amounts of salt and other chemical treatments applied to roadways, sidewalks, and parking lots. Since the temperatures stayed cold enough for several snowfall events

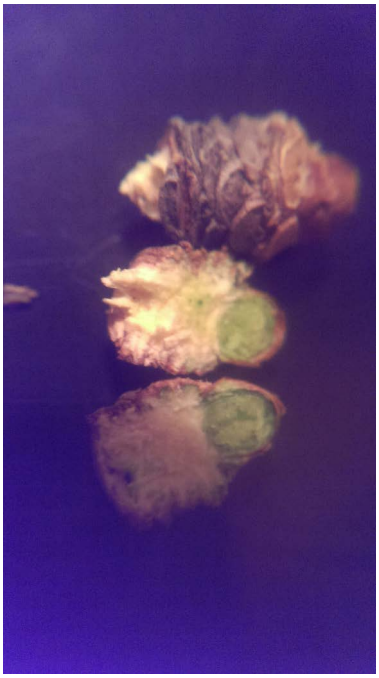

Figure 1: Two buds from Gingko taken in late January 2014. Notice the green tissue of the vertically dissected sample in the apical end of the buds, which illustrates the lack of cold injury, as opposed to the maple. Photos by Kyle Daniel.

Figure 2. Broadleaved evergreens, such as rhododendron, are suseptible to desiccation during the winter. Photo by Rosie Lerner

Figure 3. Broadleaved evergreens, such as mahonia, are susceptible to desiccation during the winter. Photo by Rosie Lerner

on these areas, de-icing chemicals were piled into landscapes and parking islands (Fig. 7). Plants that are sensitive to de-icing salts, for example yew (Fig. 8) and white pine, will most likely sustain some amount of damage in 2014. Salt damage resembles drought symptoms or root damage.

Rainfall or irrigation has been shown to be able to leach (wash away) some of these products to minimize their effects on plants. If you suspect a salt buildup, additional watering to leach these salts out of the root zone can help reduce these toxic concentrations and improve growing conditions. For more information on salt damage please see Purdue Extension bulletin ID-412-W (https://www.extension.purdue.edu/extmedia/id/id-412-w.pdf).

Figure 4. Hollies have experienced dieback due to cold injury and desiccation. Photo by Gail Ruhl.

Figure 5. Boxwood have experienced dieback due to cold injury and desiccation. Photo by Gail Ruhl.

Recommendations

Additionally, we recommend delaying pruning until Memorial Day so that the toll of winter injury can be accurately assessed. Dead plant material can be removed anytime, but cutting into live, green, tissue during this time of evaluation could cause further damage and remove new shoots and leaves critical for recovery.

Many people love their trees and shrubas and want to help them with lots of additional care. However, too much can be detrimental to their health. It requires a lot of energy for the plant to process nutritional additives and healing pruning wounds, which can further stress the plant and further delay recovery.

Be sure to implement good cultural practices this spring to help injured plants recover and provide good growing conditions going into the summer. The best way to reduce damage from the environment or from pests is a healthy, vigorous plant.

Figure 6: Yews with brown and curled apical portions due to desiccation and cold weather in 2014. Photo by Kyle Daniel.

Figure 7: Snow piled up in landscapes and parking lot islands this winter most likely contained salt or other ice melting chemicals. This could affect plants in 2014. Photo by Kyle Daniel.

Figure 8. Yews are extremely susceptible to salt damage, causing a burn injury similar to winter injury.