RESEARCH LABORATORY TECHNICAL REPORT

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Winter Injuries
On Landscape Plants

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Low temperatures, heavy snows and ice storms can result in a variety of plant damage. Droughts that weaken landscape plants can increase the severity of winter injury, especially on marginally hardy species and varieties. Common winter injuries affecting plants include:

- plant tissue death from extremely low temperatures
- desiccation of plant tissue ("winter drying")
- stem splitting ("frost cracks")
- breakage from snow and ice accumulation
- de-icing salt injury
- browsing injury (deer and rodents)

Low Temperature Injuries

Root systems of plants are very sensitive to low temperature injury. During winter, at times with no snow cover, root damage can occur on plants during prolonged cold periods. Shallow-rooted plants, container plantings and marginally hardy, introduced species are generally most susceptible. Symptoms of root mortality are often not evident until late winter or spring (Figure 1). Foliage turns brown, buds die and the entire crown may wilt and die suddenly. Low temperatures can also kill above-ground portions of plants. This injury generally affects non-native, marginally hardy plant material. When low temperatures occur following heavy snowfall, only the branches above the snow line might be affected due to the insulating properties of snow.

Figure 1: Low temperature injury evident in spring

Desiccation of Plant Tissue or "Winter Drying"

Winter drying generally affects evergreens, usually broadleaf evergreens such as mountain laurel, rhododendron, azalea and holly (Figure 2). Taxus, arborvitae and Chamaecyparis also are commonly affected. This injury results from transpirational water loss during warm days in winter when the soil is frozen. Water lost through foliage is not replaced from the frozen soil, which results in desiccation of the foliage.

The incidence of winter injury is most severe on poorly drained sites and in open, unprotected areas, which are subject to full sun and drying winds. The south and

Figure 2: Rhododendron exhibiting winter drying symptoms

southwest portions of the plants are usually affected most severely because of their exposure to wind and sun. Recent transplants and plants with root damage from drought or disease also are prone to winter drying. Winter drying generally becomes evident in late winter or spring as foliage browning, often accompanied by bud mortality.

Stem Splitting or "Frost Cracks"

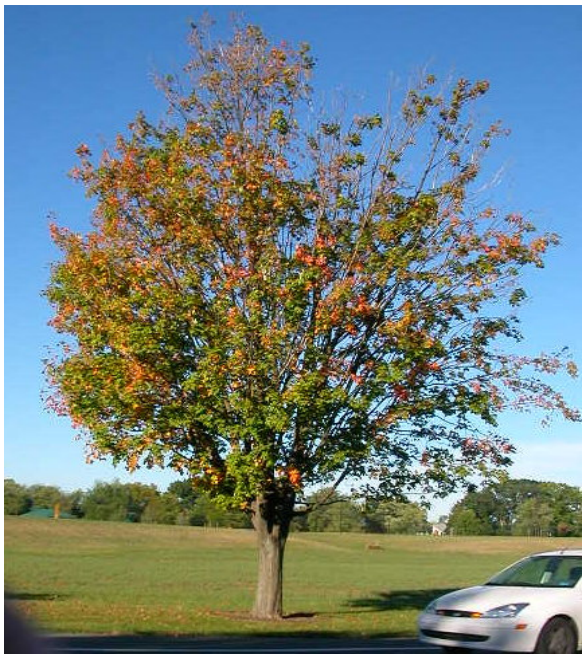
Frost cracks generally occur on young, thin-barked trees such as maple, sycamore, zelkova and linden. This injury generally results from sudden drop in temperatures from a sunny, daytime high to very low, nighttime temperatures. This can cause sudden shrinkage of stem tissues. It is believed that this sudden shrinkage results from water moving out of cells and freezing during sudden drops in temperature. The wood closest to the surface shrinks as water is lost quickly while the inner wood is not affected. The sudden change creates pressure between these two zones resulting in the wood cracking.

This damage is evident as a vertical seam or crack that is most evident on the south-southwest portion of the trunk. In severe instances, cracks can extend well into the heartwood but usually, it is restricted to the outer few inches of wood. Frost cracks can create hazardous conditions leading to decay on certain species by exposing wood tissue to infection by decay organisms in the future.

Breakage from Snow and Ice Accumulation

Trees and shrubs with poor crown structure, such as co-dominant (double) leaders, weak branch attachments and heavy or long limbs are prone to breakage due to the added weight of ice and snow (Figure 3). Wood decay can also predispose branches and leaders to failure from ice and snow loads. Evergreens that have a large surface area to "hold" snow are especially prone to breakage. Foundation plants near overhanging structures also tend to accumulate heavier snow and ice loads.

Figure 3: Maple with weak branch attachments exhibiting breakage in the crown



De-icing Salt Injuries

The salt (sodium chloride) commonly used as a de-icing agent on roads and walkways in winter can cause serious injury to plants. High levels of salt in the soil from pavement runoff can desiccate and kill plant roots. Sodium can be toxic to plants and can also destroy soil structure, leading to compaction and elevated soil pH. Salt spray can desiccate foliage and buds on plants adjacent to roadways.

Figure 4: Salt injury

Symptoms of salt injury are visible as a progressive decline in plant vigor. Leaves become dwarfed and chlorotic or brown, shoot growth is reduced, leaves become tufted on branch tips and the crown appears thin (Figure 4). In severe cases, twig and branch dieback occurs and plants eventually die.

Miscellaneous Winter Injuries

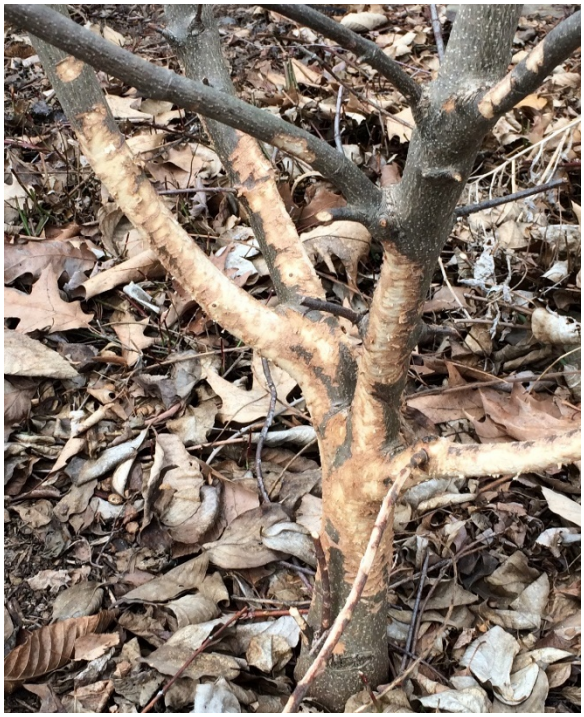
A frost early in autumn can kill late growth that did not harden off. This damage is common on many plants during fall when they resume growth as rains follow a summer drought. Late spring frosts also can damage new growth following budbreak. Plants generally recover quickly from these injuries, especially if recently fertilized.

Animal Injuries

Deer browse can cause severe injury to foliage and twigs of landscape plants, especially in snowy winters. Exposed stems of small-diameter trees can be damaged or destroyed by "buck rub," the scraping of antlers against the trunk.

The lower stem and root collar of plants can be damaged and even girdled by rabbits and rodents that eat the bark tissues in winters (Figure 5). Plants that have stems girdled by animals often wilt and die suddenly in late spring or early summer after new growth begins.

Figure 5: Chewing damage



Treatments

Judicious selection of plant species and planting sites is essential in preventing winter injury. Susceptible evergreens should not be planted on poorly drained sites or on open, windswept areas.

Maintaining the vigor of ornamentals through prescription fertilization, pruning and watering during dry periods is helpful in preventing this disorder. Ensuring that evergreens are well watered in late fall is particularly important. Heavy mulches placed around susceptible species retard soil moisture loss and restrict soil freezing.

Windbreaks, either temporarily constructed with burlap or permanently supplied by living trees and shrubs, will reduce the effects of drying winds. Netting or deer repellent applications can help prevent browsing. Fencing might be required to prevent buck rubbing of small trees.

Plants should be inspected in late winter or early spring for symptoms of winter injuries. Large trees should be inspected carefully for broken and cracked branches, frost cracks in the stem and other potentially damaging or hazardous conditions. Plants stressed by winter injuries are more susceptible to secondary insect and disease pests. Continued monitoring through the spring and summer months is also recommended to detect and treat pests.

Avoid heavy pruning on limbs exhibiting brown foliage in late winter. In some instances, these plants will push out new growth from limbs showing winter injuries. Prune out dead twigs and branches after the plant has resumed growth in spring.

Broken, cracked and hanging branches must be removed. Remove damaged portions of the limb at the junction of a large lateral branch. The crown might require structural pruning to provide balance and symmetry following extensive storm damage. Steel cables might be necessary in the crown to support cracked or weakened limbs.

To reduce injury from de-icing salt, remove salt-laden snow from around the trunk prior to the spring thaw. To determine actual salt levels, soil should be analyzed as soon as it thaws. If high salt levels are anticipated, pelletized gypsum can be applied prior to winter. If heavy spring rains do not occur, the affected area should be irrigated heavily to leach the salt. If irrigation water runs off rather than soaking in, reduce the time of each irrigation period and check soil drainage. If drainage is inadequate, modification might be necessary.

Cracks in stems and branches usually close without any intervention. Monitor frost cracks closely during the early spring to determine if the cracks close.

Plants should be monitored closely for pests that can cause leaf injury and defoliation. Foliage injuries reduce energy production and further stress plants. Monitor plants frequently for borers, bark beetles, canker and root diseases that affect trees stressed by winter injuries. Apply appropriate treatments to prevent further damage.

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