



## Winter Injury



**Fig. 1.** Necrotic leaf tip and leaf margin symptoms on a pachysandra border caused by winter injury. This photograph was taken on April 24, 2007. *Note the newly forming white flowers indicating the symptoms are being observed in early spring.* (Photograph by Thomas Kowalsick, Cornell Cooperative Extension – Suffolk County)

There are several ways in which the winter environment can adversely affect trees and shrubs. Included are: direct low temperature injury and frost injury; desiccation injury; winter sunscald; frost cracks; frost heaving; and snow and ice breakage.

### Direct Low Temperature and Frost Injury

Plants frequently injured by low winter temperatures are those which are planted in areas north of their appropriate hardiness zone. Such species cannot harden off at an appropriate rate or to an extent sufficient to withstand prevailing winter temperatures. However, even hardy plants can be injured during unusually cold periods or when temperatures drop rapidly or oscillate frequently. If hardy plants are not managed properly (not properly fertilized, pruned, watered, etc.) they may also suffer. Flower buds,

vegetative buds, branches, stems, crowns, bark, roots, or even whole plants may be injured. Containerized plantings are particularly vulnerable to low winter temperatures since their roots are not protected by being below ground.

Late spring and early autumn frosts can injure metabolically active tissues that are insufficiently "hardened" to withstand the cold temperatures. This type of injury may occur on native or exotic plants although the latter are usually more valuable. A result of late spring frosts can be the death of dormant but, particularly, expanding flower buds on species such as magnolia or lilac, or the death of young, succulent, actively growing shoots. Cold temperature injury that occurs during winter may not be evident until injured tissues fail to grow the following spring.

**Management:** Avoid planting exotic species north of their plant hardiness zones unless unique microclimates in the landscape are present to guarantee winter survival. Containerized plants should be placed in protected areas, sunk into the ground, grouped together, or heavily mulched to avoid low temperature injury to roots. To allow proper hardening of plant tissues, avoid heavy applications of nitrogen fertilizers in late summer to in-ground plants. Mulch around the base of root-tender plants (such as roses) to help protect their crowns and roots from freezing temperatures. Even with good management, injury to young growth or insufficiently hardened tissues may still occur as a result of unusual weather patterns. Little can be done to prevent injury in these instances.

Injured and dead tissues should be pruned and discarded or destroyed to discourage invasion of the plants by disease organisms. Replace plants which are completely killed with species adapted for the appropriate plant hardiness zone.



R. Mulrooney, U of DE  
**Fig. 2.** Classic necrotic leaf margin symptoms on rhododendron caused by winter injury (Photo courtesy R. Mulrooney, University of Delaware)

### Desiccation Injury

This type of injury, called "winter drying" or "winter burn", is usually observed in late winter or early spring (**Fig. 1**) on evergreen plants. Broadleaved evergreens such as rhododendron exhibit browning (**Fig. 2**) or even total necrosis of their leaf margins (leaf scorch) depending on the extent of injury. Narrow leaved evergreens, such as white pine, exhibit slight browning of needle tips when injury is slight. Extensive injury may result in browning and premature abscission of entire needles. The injury occurs during sunny and/or windy winter weather when plants lose water from their leaves through transpiration faster than it can be replaced by roots which are in frozen soil.

**Management:** Plants which are properly watered during dry periods in late autumn are better equipped to withstand this type of injury. Thoroughly watering the soil around plants once every two weeks (once per week for new transplants) during extended dry periods throughout the growing season will also prove helpful. Placing a protective barrier of burlap over or around plants to protect them from winter winds and sun will help to reduce the incidence of this injury. Antidesiccant sprays applied once in late autumn and again in mid-winter may also prove helpful.

### Winter Sunscald

This type of injury occurs when the sun warms tree bark during the day and then the bark rapidly cools after sunset. These abrupt fluctuations are most common on south or southwest

sides of trunks and branches, and they may kill the inner bark in those areas. Young and/or thin-barked trees are most susceptible to winter sunscald.

**Management:** Wrapping trunks of susceptible trees with protective "tree wrap" is the most effective way to minimize this type of winter injury.

### Frost Cracks

Frost cracks are splits in bark and wood of a tree that result from rapid drops in temperature. They may be associated with internal defects resulting from previous injury to the trunk years prior to splitting. Defective wood does not contract as readily as the outer layers of healthy wood do when winter temperatures plunge rapidly. The strain between the outer, contracting layers of wood and the inner defect causes the outer layers of wood to crack. The initial crack is often accompanied by a loud snap. In winter, the crack may become wider or narrower during colder or warmer periods. Such frost cracks often close and callus over during the summer only to open again in subsequent winters. This callusing and re-cracking may lead to the formation of large "frost ribs" on the sides of affected trees.

**Management:** Avoid wounding the bark of trees when they are young. Be particularly careful not to bump trees when mowing near them. Mulch around young trees to eliminate the need for close mowing and to help prevent lawnmower injury. Large frost ribs can be braced to prevent reopening during the winter, thus enhancing callusing and healing. Frost cracks in trees are ideal sites for the entrance of wood decay organisms. Affected trees should be checked regularly to insure they are free from serious decay and, therefore, not a hazard to surrounding buildings and living things.

### Frost Heaving

Frost heaving of new transplants and small shrubs during the winter will expose plant roots to severe above-ground winter conditions which include cold temperatures and drying wind and sun. Freezing and drying injury to roots, if extensive enough, can result in the death of the heaved plants.

**Management:** Proper mulching around the base and entirely over the root zone of plants will help prevent the soil from frequent freezing and thawing conditions which are most responsible for heaving. Replant heaved plants quickly if possible and mulch around them. Wait until spring to determine the extent of injury and need for replacement.



**Fig. 3.** Heavy snow bending and separating branches on a sheared boxwood (Photo courtesy HGIC, University of Maryland)

### Snow and Ice Breakage/Injury

Heavy snow or ice on weak limbs with foliage (as in the case of evergreens) can result in breakage. Even strong healthy limbs of deciduous trees and shrubs can be broken if the weight of ice or snow is extremely heavy. If the ground is saturated prior to a heavy snow or ice storm, and enough weight is placed on the upper portion of a tree, it can lift the root system right out of the ground.

**Management:** Prune trees and shrubs to reduce the amount of snow and ice they will collect and/or to eliminate those branches which will be inherently weak. Branches with a wide angle to the main stem are generally stronger and can support more snow and ice than those with a narrow or acute angle. Cabling and bracing of weak limbs on specimen trees by commercial arborists may be helpful. However, removal of such limbs may be the only truly safe measure in many instances. Plant trees and shrubs away

from places where snowmelt from roofs will drip on them. Otherwise, the dripping water may freeze on the plants and accumulate sufficiently to break branches. Wooden barriers may be built over small shrubs to allow snow and ice to slide off rather than accumulate.

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