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Know how. Know now.
G1433

Environmental Stresses and Tree Health

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This NebGuide is intended to help tree owners identify tree health problems caused by environmental stresses and provide ways to prevent or reduce damage.

Environmental stresses cause many health problems in Nebraska trees. Hot and cold temperatures, drying winds, poor soil and root conditions and human activity can damage leaves, bark and roots, and can predispose trees to secondary insect and disease attack. Keeping a tree in good condition through proper maintenance can prevent many environmentally related health problems.

Water-Related Stresses

Scorch

Symptoms—A uniform yellowing or browning of the edges of leaves on broadleaf plants *(Figure 1)* or the tips of evergreen needles is a symptom of a condition called scorch. This problem occurs most commonly on linden, maple, ash and cottonwood. The problem usually is more severe on the south or southwest side of the tree or on the side nearest a source of radiated heat, such as a brick wall or street. Severe scorch can result in premature leaf or needle loss.

Cause—Prolonged dry periods accompanied by hot, dry winds, create an imbalance in trees in which moisture is lost through transpiration faster than the roots can supply it to the leaves. This results in the drying out and death of leaves and sometimes branch tips.

Figure 1. Scorched leaves.

Figure 2. Girdling root.

Scorch symptoms also can be caused by a girdling root. This is usually a shallow root that has grown tightly around another major root or the base of the trunk *(Figure 2)*. By pressing tightly against the other root or trunk, the girdling root restricts the upward flow of water in the tree.

Yellowing and browning symptoms in the leaves are similar to those caused by drought conditions, but the symptoms can occur even when soil moisture levels are high, and they may be more severe in one portion of the tree.

Trees with a root that girdles the lower trunk usually have little or no flare on one side of the tree at the ground line. Most girdling roots occur in the top 6 to 8 inches of the soil and can be discovered by removing the soil gently from around the base of the tree.

Treatment—Scorch problems can be reduced by regular watering during prolonged dry periods and by replacing competing grass or other vegetation around the base of the tree with an organic mulch. If scorch is caused by a girdling root, careful removal of the root will sometimes reduce the problem.

Winter Injury

Symptoms—Like scorch on evergreens, winter injury (also called winter desiccation) causes a yellowing and browning of the tips of needles *(Figure 3)*. Winter injury differs from scorch in that it appears during the late winter or very early spring, and the browning is usually greater on the side of the tree facing the wind or a source of radiated heat, such as a south- or west-facing wall or street. This problem is most common on arborvitae, spruce, yew and juniper.

Figure 3. Yew with winter injury.

Cause—Winter injury is caused by warm, windy conditions that occur when the ground is frozen. The frozen ground prevents the uptake of water, which is needed to offset the water lost from the needles because of dry winter winds. Evergreens that enter the winter stressed by drought are especially susceptible. Other factors that can predispose trees to winter injury include: (1) lava rock or white rock used around the base of the tree; (2) a poorly developed root system caused by improper planting; (3) damage caused by insects or disease; and (4) tree genetics, such as trees being more adapted to a more southern climate.

Treatment—Winter injury can be reduced by watering regularly during prolonged dry periods in mid-summer through fall, by mulching, and by protecting susceptible trees and shrubs from prevailing winter winds. Generally only needles are affected by the injury. Buds and branches are usually well enough protected. In most cases new needles emerge the following spring.

Figure 4. Thin foliage on fir stressed by overwatering.

Flooding

Symptoms—A uniform paling or yellowing of foliage and uniform thinning and dieback of a tree's crown can be caused by flooding or a highly saturated soil *(Figure 4)*. This is a common problem in landscapes with automatic sprinklers and heavy soils or in areas where large amounts of runoff water stand. Concolor fir is very susceptible to flooding injury.

Cause—During periods of heavy rains or in landscapes with heavy irrigation, the pore spaces between soil particles become filled with water. As these spaces fill with water, gas exchange between the soil and air is reduced. Roots require oxygen from the soil to survive, and when the oxygen is not available, roots die. As roots die they are no longer able to absorb the water and nutrients the rest of the tree needs.

Treatment—Improve the drainage around the tree if it is in an area where runoff water pools. If sprinkler irrigation is used regularly, be sure the soil is allowed to drain well between waterings.

Temperature Stresses

Figure 5. Elms with outer branches killed by freeze injury.

Freeze Injury

Symptoms—Cold weather injury in broadleaf trees can be recognized in the spring by reduced leaf area in the tree crown, branch tip dieback, clumped leaf growth at branch angles inside the crown *(Figure 5)*, or death of the main stem with new sprouts growing from the base of the tree. In evergreens, symptoms include brown foliage, the loss of terminal buds, drooping of branch shoots, lack of any new growth, or new growth originating from the middle of the branch shoot instead of the end.

Cause—Early, sudden, and extreme drops in temperature at the end of the growing season can kill leaves that are not yet adapted to colder temperatures. Leaves and needles killed by an early freeze turn brown and are more likely to occur near the ends of the branches. Very cold, sub-zero temperatures in the middle of winter can kill dormant trees not adapted to temperatures that low. This occurs most commonly in fruit and nut trees such as black walnut, pecan and hickory. Some trees that initiate growth very early in the spring are sometimes fooled by unusually warm late winter temperatures. After they begin to become active, buds, leaves, and shoots that had broken dormancy are killed as normal winter temperatures return. Freeze injury is especially common in species and varieties of trees that originate from southern sources.

Treatment—Most cold weather damage cannot be prevented except by selecting species adapted to the area.

Sunscald

Symptoms—Sunscald appears as long, vertical dead areas on the south or southwest side of young, thin-bark trees *(Figure 6)*. Maple, honeylocust, linden, Bradford pear, eastern white pine, all fruit trees, and other trees with thin, smooth bark are most susceptible. The dead area often is somewhat reddish and sunken in appearance and may have rough edges if the dead bark has begun to dry and crack.

Cause—During the daytime in winter, the bark on the south or southwest side of a tree can be warmed to above freezing by the sun, even though the air temperature may be below freezing. When the sun sets or moves behind clouds,

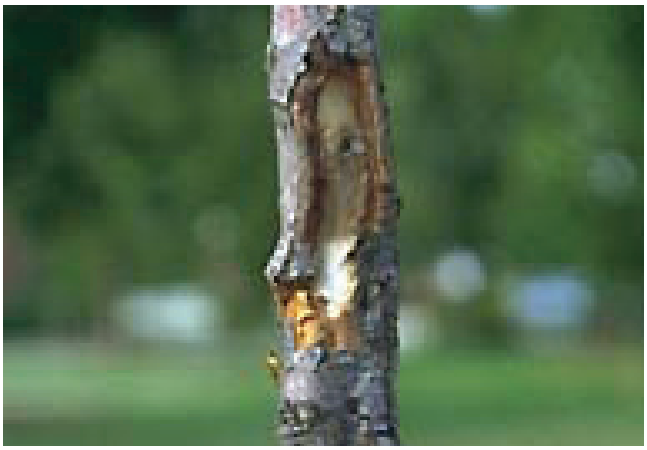

Figure 6. Hawthorn with sunscald injury.

Figure 7. Ailanthus showing decline symptoms.

the bark temperature drops below freezing and the area of warmed, active tissue is frozen and often killed. When this occurs a long, narrow dead area (canker) is formed.

Trees are more susceptible to sunscald if their roots have recently been severely injured, such as during transplanting. The localized dead area that forms on the trunk often provides a site for disease infection and insect attack during the next growing season.

Treatment—Care should be taken to minimize root injuries during transplanting. Large roots that have been cleanly cut during transplanting contribute less to sunscald than do roots that have been crushed. The trunks of recently transplanted trees that are especially susceptible to sunscald can be wrapped with a commercial tree wrap during the first winter to reduce the chance that sunscald will occur. The tree wrap must be removed at the beginning of the following spring to avoid damaging the tree during the growing season.

Stresses from Soil and Root Problems

Decline

Symptoms—Trees with sparse foliage, early leaf drop, very slow growth, and death of some of the outer branches have a condition called a decline *(Figure 7)*. This condition usually gets gradually worse over a three to 10-year period.

Cause—The decline in tree health often is caused by an injured or poorly developed root system that is unable to absorb moisture and nutrients at a rate needed to meet the growth requirements of the tree. Because of the inadequate root system, the tree slowly dries out or starves to death. An injured or reduced root system can be caused by improper planting techniques, girdling roots, drought, or the compaction, addition, or removal of soil.

Treatment—Proper planting methods and regular maintenance, such as mulching with wood chips or other organic material, can prevent or reduce many soil and root-related problems.

Iron Chlorosis

Symptoms—Trees with iron chlorosis have leaves that are partly or completely yellow. The network of veins in the leaves are the last to turn yellow, so they often appear darker green against a light green or yellow background *(Figure 8)*. As the condition worsens, leaves become smaller, fewer, and may have many dark brown spots or dark brown edges. In severe cases some branches fail to leaf out, although they may remain alive for several years. Ultimately the tree may die. This condition is most common in pin oak and silver maple but can occur in many other tree and shrub species.

Figure 8. Pin oak leaves with iron chlorosis.

Cause—Throughout much of Nebraska the pH of the soil exceeds 7.0 and is fairly alkaline. At these high pH levels iron, an essential tree nutrient, is tied up by the soil and is unavailable to trees. Lack of iron in the tree results in partial or complete yellowing of the leaves (chlorosis). In severe cases, browning and shedding of leaves, branch dieback, and tree death can occur.

Treatment—Iron deficiency problems can be corrected with soil treatments, foliar applications, or trunk injections. For more information on iron chlorosis, visit your local Extension office or the University of Nebraska–Lincoln Extension publications Web site.

Herbicide Injury

Symptoms—Trees damaged by herbicides usually have leaves that are curled or cupped *(Figure 9)*, or have turned yellow or brown along the edges *(Figure 10)*, depending on the kind of herbicide that caused the injury and the amount of

Figure 9. Redbud with 2,4-D injury.

Figure 10. Cotoneaster with prometon injury.

exposure the trees received. When exposure is severe, whole shoots can droop, twist, become deformed, or die.

Cause—Herbicides can drift through the air or move through the soil and injure trees some distance from where they were applied. Herbicide injury in trees most often is associated with the use of 2,4-D or dicamba (Banvel) for weed control. Herbicide exposure through the soil is longer lasting and usually more damaging than exposure through the air. Although trees can be stunted or completely defoliated by herbicide drift, they usually survive. Repeated exposure to herbicides, however, can kill trees.

Some strong herbicides, such as soil sterilants used in alleyways, around utility equipment, or along sidewalks, can be absorbed by roots and easily can kill trees. Trees that die within a relatively short period of time, and that may or may not show distorted foliage, may have come in contact with a soil sterilant.

Treatment—Understand the possible adverse effects on trees of any herbicide you use. Avoid applying herbicides on windy days, and avoid using herbicides that volatilize or move through the soil easily. Roots of trees can extend out from the trunk a distance equal to several times the height of the tree. Some strong herbicides, such as prometon (Pramitol), can be picked up by trees quite some distance away from where they were applied, and even small quantities can cause substantial tree injury or death. Avoid using strong herbicides in areas that have valuable trees, because even if a tree is not close by, a tree's roots may be present.

Mechanical Injury

Symptoms—Mechanical injuries usually occur on the trunk, branches, or roots. Bark may be broken off, exposing the wood of the tree, or it may be dead but still attached.

Cause—Mechanical injuries are usually wounds in the cambium, bark, or roots of trees caused by physical contact with an object. These wounds expose healthy living tissue to infection by disease organisms or attack by insects. The majority of mechanical injuries are caused by homeowners. Careless use of lawn mowers and weed whips around the base of trees destroys inner bark and girdles the stem. This reduces the flow of nutrients and moisture in the tree and eventually can lead to death through drying or starvation. Mechanical injuries also weaken trees and make them more susceptible to secondary insect or disease attack.

Treatment—Avoid hitting trees with lawn mowers, weed whips, or other damaging objects. Mulching around the base of a tree can prevent grass and other plants from growing in that area and can help prevent mower and weed whip damage.

Additional Information

For additional information contact the local Extension educator, Nebraska Forest Service district forester, or visit the Web site of the Nebraska Forest Service at *www.nfs.unl.edu*.

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