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Jon S. Wilson
University of Nebraska - Lincoln

Mark O. Harrell
University of Nebraska - Lincoln

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Environmental Stresses and Tree Health

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

Jon S. Wilson, District and Extension Forester
Mark O. Harrell, Forest Pest Specialist

- Water-Related Stresses
- Temperature Stresses
- Stresses from Soil and Root Problems
- Herbicide Injury
- Mechanical Injury

Environmental stresses cause many health problems of Nebraska trees. Hot and cold temperatures, drying winds, poor soil and root conditions and man's activities can cause direct damage to leaves, bark and roots, and can predispose trees to secondary insect and disease attack. Maintaining 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.

Figure 1. Scorched leaves. (38K JPG)

Cause. Prolonged dry periods accompanied by warm, 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.

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.

Figure 2. Girdling root. (38K JPG)

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 six to eight 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 causes a yellowing and browning of the tips of needles *(Figure 3)*. Winter injury differs from scorch in that it usually appears during late winter, 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 brick wall or street. In many cases the uniform browning or reddening of the foliage does not become apparent until early spring. Winter injury is common on arborvitae, spruce, yew and juniper.

Figure 3. Yew with winter injury (40K JPG)

Cause. Winter injury is caused by dry conditions that occur during the winter months. Evergreens that enter the winter stressed by drought are especially susceptible. The injury occurs most often when frozen soil prevents the uptake of water by the roots needed to offset the moisture lost from needles because of dry winter winds.

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.

Flooding

Figure 4. Thin foliage on fir stressed by overwatering. (27K JPG)

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 and in areas where large amounts of runoff water pass through. 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

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 are 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.

Figure 5. Elms with outer branches killed by freeze injury. (26K JPG)

Cause. Very cold, sub-zero temperatures can kill dormant or inactive living trees. This occurs most commonly in fruit and nut trees such as black walnut, pecan and hickory. Some trees that initiate growth early in the spring are sometimes fooled by unusually warm late winter temperatures, and after they begin to become active, the new growth (buds, leaves, branch shoots) that had broken dormancy are killed as normal winter temperatures return. These trees also are highly susceptible to late spring frosts. 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 the planting of 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 is often somewhat reddish and sunken in appearance and may have rough edges if the dead bark has begun to dry and crack.

Figure 6. Hawthorn with sunscald injury. (18K JPG)

Cause. During daytime hours 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, 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 should be wrapped with a commercial tree wrap during the first two to three winters. Tree wrap should be removed each spring and replaced in the fall.

Stresses from Soil and Root Problems

Decline

Symptoms. Trees with sparse foliage that often drops early, 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.

Figure 7. Ailanthus showing decline symptoms. (33K JPG)

Cause. The decline in tree health often is caused by an injured or poorly developed root system that is not able 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, compacted soil, soil removal and soil fill.

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.

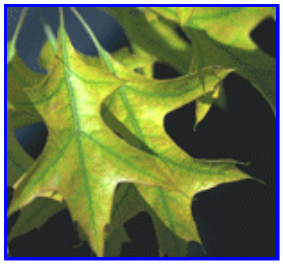

Figure 8. Pin oak leaves with iron chlorosis. (17K JPG)

Cause. Throughout much of Nebraska the pH of the soil exceeds 7.0, and so 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. *See NebGuide G1218, Iron Chlorosis of Trees and Shrubs*, for more information.

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

Figure 9. Redbud with 2,4-D injury. (21K JPG)

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 that may or may not show distorted foliage may have come in contact with a soil sterilant.

Figure 10. Cotoneaster with prometon injury. (21K JPG)

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 are 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 man. 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 your extension agent, Nebraska Forest Service district forester, or visit the website of University of Nebraska's Department of Forestry, Fisheries and Wildlife.

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