HOW TO Identify and Control Noninfectious Diseases of Trees

United States Department of Agriculture

PREPARED BY Forest Service

North Central Forest Experiment Station

Noninfectious tree diseases are those caused by nonliving agents. This type of disease is not transmitted from one plant to another. Extremes in temperature and water supply are the most common causes of this type of disease. Other causes are chemical substances in the soil, water, and air; transplant shock; and mechanical injuries. These nonliving disease agents are a major cause of loss in forest and landscape trees. Often they weaken the tree, enabling living agents such as fungi, bacteria, viruses, nematodes, and insects to attack and further injure or kill the tree. These living agents may build up on trees weakened by noninfectious agents and threaten the health of nearby trees.

Superficially, the symptoms of noninfectious diseases may resemble those produced by insects or fungi. If no signs of these organisms are present, the tree may have been affected by one of the agents described here. Even if signs of fungi or insects are present, a nonliving agent may be the underlying cause of your tree's problems. In most cases, prevention is the key to minimizing injury.

HIGH TEMPERATURE DISEASE

Heat Defoliation and Leaf Scorch

High temperature and drying winds cause rapid loss of water, specially in maple leaves. Leaf margins turn yellow or brown and leaves fall prematurely.

- Water during periods of hot weather to prevent injury to smaller trees.
- Plant trees in locations protected from prolonged exposure to sun and wind.

LOW TEMPERATURE DISEASE

Frost Injury

An early fall or late spring frost when trees are actively growing can injure or kill succulent stem tissue, leaves, and buds. Most trees can survive this injury, but their growth rates are reduced.

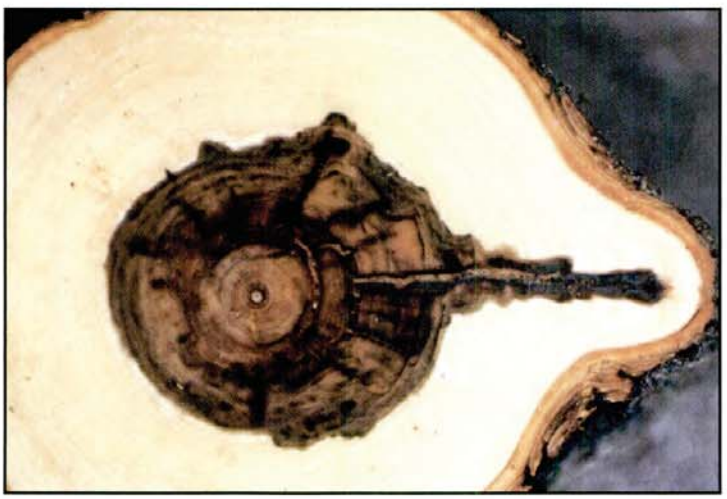
- Plant tree species adapted to local conditions.
- Cover young trees if frost is expected.
- Avoid planting in low lying areas subject to frost.
- Do not use high nitrogen fertilizer late in the growing season.

Frost Crack

Long vertical bulges or cracks on trunks indicate a recurring stress. The common term "frost crack" is misleading because frost or cold does not initiate a seam or crack. It is, however, responsible for the continuation of the vertical crack.

Cracks or seams start at wounds or branch stubs. Serious damage can result from seemingly minor wounds. A sudden, sharp drop in winter temperature causes the outer layer of wood to contract more rapidly than the inner layer, which can result in a long vertical crack at weak points in the trunk.

"Frost cracking" can occur repeatedly in the same place, causing a buildup of tissues and the formation of frost ribs or seams. Depending on the tree species, the tissues at the margins of the injury may grow so rapidly that they curl in on themselves, preventing complete closure of a wound.



- Avoid wounds to the trunk and properly prune branches to prevent the formation of frost cracks.

MOISTURE EXTREMES

Drought

Drought symptoms are produced when loss of water through the leaves exceeds uptake of water by the roots. This is caused by inadequate soil moisture during extended periods of abnormally low rainfall. Symptoms include wilting, off-color foliage, twig and branch dieback in the crown, and the death of fine roots. The death of fine roots can cause tree mortality by preventing the uptake of water even if moisture is restored to the soil. Crowns of drought-stricken trees usually die from the top down and from the outside in. Trees in this condition are more readily attacked by fungi and insects. Shallow-rooted trees, and trees planted on light, sandy soils with poor moisture-holding capacity are most susceptible to drought.

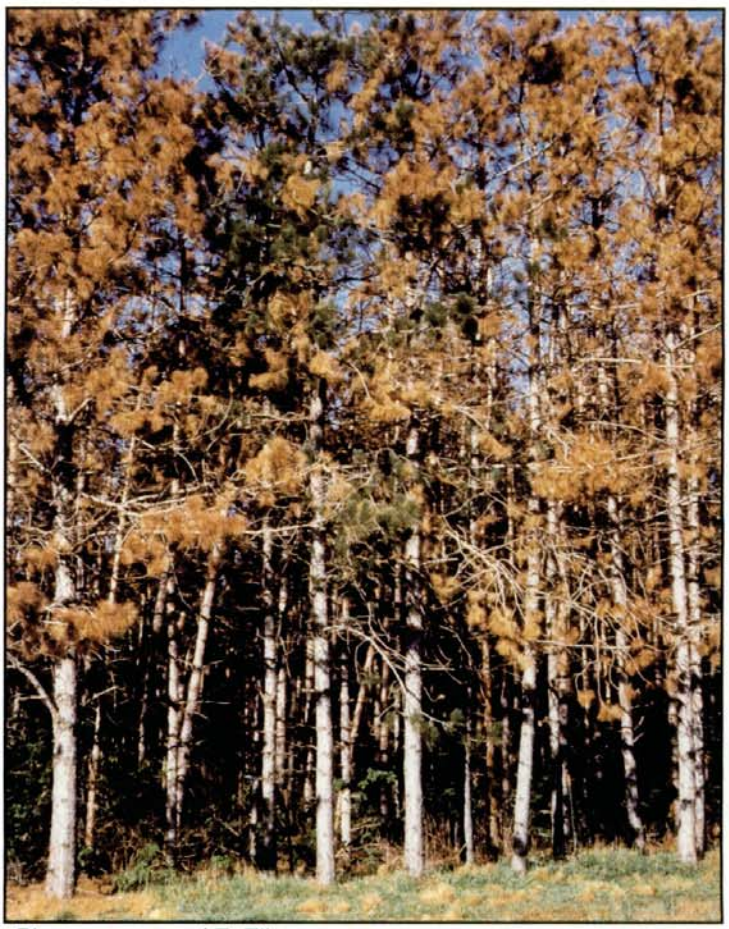


Photo courtesy of T. Eiber

- Do not plant shallow-rooted species in areas of low moisture or on sandy soils.

- Put mulch around the base of the tree. In addition to helping retain soil moisture, mulch helps to control weeds, preventing lawnmower and weed whip injury.

Conifers growing over high water tables for long periods may die quickly after the water table drops. The foliage turns red and drops off soon after death.

- Water ornamental trees about once a week to moisten soil 6 to 12 inches deep into the root zone.

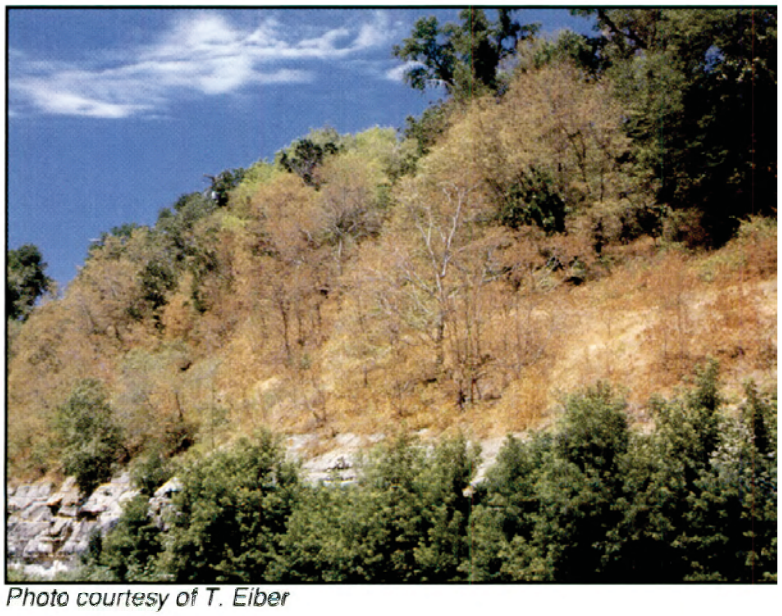


Photo courtesy of T. Eiber

Excess Moisture or Flooding

Roots in flooded or waterlogged soils are killed by a lack of oxygen. This can occur not only to trees on obviously wet sites but also to ornamental trees planted in heavy clay soils that have poor drainage. Symptoms of oxygen deficiency closely resemble those of drought injury: reduced growth, small leaves and thin crowns, twig and branch dieback, and tree death. Trees with root damage from waterlogged soils may be affected by drought stress if the excess moisture is drained off and roots are unable to meet the demands of tree tops. Roots in waterlogged soils are susceptible to a variety of soil-borne fungal pathogens.

Photo courtesy of R.L. Anderson

- Plant species that are adapted to the conditions in areas subject to periodic flooding.
- Prepare planting sites to allow for adequate drainage and root growth.

WINTER INJURY

Winter Burn and Winter Drying

These are common problems on conifers. Winter burn is the browning of needles caused by a rapid temperature change in winter, particularly on the south side of trees where there is more exposure to the sun. Rapid temperature changes often occur at sunset and sunrise or when sunlight is suddenly blocked by other trees, hills, or buildings.

Winter drying is caused by the desiccation of foliage and twigs by warm dry winds, when water conduction is restricted by frozen plant tissues or frozen ground. Reddening, browning, and, in some cases, drooping of foliage become apparent in late winter and early spring.

Often a combination of winter burn and winter drying will occur, occasionally complicated by drought. If severe enough, buds and later the affected branches may be killed. Sometimes the entire tree may die. Usually only a few buds are killed and trees produce new foliage. Some conifer species are more resistant than others and should be planted where these conditions are common.

- Avoid planting ornamental conifers where sudden temperature changes may occur.
- Water and mulch around the trees in the fall to help prevent the soil from completely freezing in the rooting zone.
- Wrap susceptible trees in burlap during winter to reduce loss of water from the foliage.
- Plant seed sources that are hardy to conditions in the local area.

Winter Sunscald

This disease occurs during late winter or early spring when the temperature is above freezing during the day and below freezing at night. During the day the tree tissues, warmed by the sun, become active. Freezing at night kills this tissue, resulting in an elongated canker usually on the southwest side of the tree. Thin barked trees such as maples are most susceptible to this type of injury.

- Shade the tree or use tree wrap on younger, susceptible trees to reduce the warming of tree bark during the day.
- Plant susceptible tree species at closer spacing.

INJURY CAUSED BY CHEMICAL SUBSTANCES

Various chemicals are used on or near forests and landscape trees, or are transported long distances to trees through the air or water. Household and industrial cleaners fertilizers, pesticides, road salts, and exhaust fumes are examples of potentially injurious substances. Symptoms of chemical injury are extremely variable and difficult to diagnose. Some materials are beneficial when applied in proper doses, and others are toxic at small concentrations. Carefully review recent chemical applications in the vicinity of the affected tree to identify possible causes.

Nutrient Deficiency

Trees need certain nutrients for proper growth. Nitrogen, phosphorous, and potassium are the most important. Many other major and minor nutrients are essential to tree growth. Symptoms of nutrient deficiency mimic many other diseases and vary greatly depending upon which nutrient is lacking. The most common symptoms of nutrient deficiency are: reduced growth, leaf chlorosis, yellowing, and necrosis.

- Have soil and foliage analyzed. Apply the deficient elements.

Herbicide Injury

Improperly applied herbicides can injure trees. Leaves of deciduous trees will become distorted, curled, and brown on the margins. Conifer needles will turn yellow or brown, and succulent shoots will curl or become deformed. Trees will usually survive, but their growth will be stunted.

- Use herbicides and other pesticides carefully and according to label instructions.
- Apply herbicide sprays when wind conditions are calm to minimize drift.

Salt Injury

Road deicing salt that is splashed onto the foliage or is absorbed through the roots will cause a browning of the tree, especially on the side facing the roadway. Trees growing where salt accumulates because of drainage patterns will also be affected. The affected foliage will fall off in the spring, thinning the crown, although new growth will make the tree appear otherwise healthy. However, these trees will grow more slowly and remain stunted, and may eventually be killed by prolonged exposure.

- Plant tree species resistant to salt injury.
- Plant trees as far from roadways as possible.

Air Pollution

Chemical pollutants emitted into the air from various manufacturing and power-generating plants and automobiles can injure trees under certain conditions. Because toxic compounds emitted and formed by chemical reactions in the atmosphere can injure vegetation miles away from the source, it is not always possible to determine their exact origin. Different species of plants differ in their susceptibility to various air pollutants, and symptoms characteristic of specific chemical compounds may develop. Because of the complex nature of this type of injury, it takes an experienced person skilled in identifying symptoms of air pollution to make an accurate diagnosis. Controls for these types of injuries will depend upon the cause.

Photo courtesy of R.L. Anderson

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- Plant trees resistant to the specific pollutants.

ADDITIONAL HELP

The causes of noninfectious diseases are often complex and difficult to identify. If you need additional help, contact your State's county, forestry, or plant pathology extension personnel. Federal land managers can contact Forest Pest Management staff for assistance.

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Revised 1990

HT-26