

Scorch and related problems in trees and shrubs

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Scorch, the browning of leaf edges, affects a wide range of deciduous and evergreen plants throughout Wisconsin. Species include ash, linden, maple, oak, pine, and spruce.

While scorch is easily recognizable, it's important to recognize that it is a symptom, not a cause. A number of problems cause symptoms that are generally classified as scorch. Affected plants should be examined further to determine the cause of scorch and whether that factor is causing serious damage to the plant.



Scorched leaves frequently have tan outer edges with a distinct yellow band separating the green inner portion.

Symptoms and effects

Margins of leaves showing scorch symptoms are typically tan to brown in color and often become necrotic (dead). Sometimes the brown area extends into the leaf between the veins. Occasionally the margins are yellow or chlorotic, and often the area between the discolored and remaining green tissue is separated by a distinct yellow band. On evergreens, especially spruce, affected needles turn reddish-purple and then brown. All foliage on an affected branch will usually display the same symptoms. However, the tree or shrub may not be uniformly affected.

Scorch, by itself, is not particularly harmful to the plant. However, if extensive damage occurs by mid-summer, the plant's ability to produce food is significantly reduced, making it more susceptible to winter injury.

When dry weather causes scorch on evergreens, the needles first turn reddish-purple and then brown.



Causes

The damaging agent is usually not associated with the leaves. That is, there is usually not a pathogen or insect doing direct damage to the foliage. Scorch usually results from one of these three factors:

1. Insufficient water to leaves caused by dry weather, compacted soil, or physical injury to the roots.
2. A response to an undesirable soil or atmospheric constituent.
3. A reaction to a vascular pathogen, either fungal or bacterial.

To help identify the specific cause of scorch, look at distribution of symptoms over the plant, time of season when they occur, type of growing season—both present and previous, and plant location.

Insufficient water

Dry weather, especially combined with warm temperatures, is the most common cause of scorch. This is because the margins of leaves have considerable moisture loss. They are also located the farthest from the source of water. When cells lose more water than they receive, they suffer permanent damage, and affected portions of the leaf turn tan or brown in response.

On sites with compacted soil or steep slopes, little water may soak into the soil. As a result, scorch symptoms may be more severe on plants growing on those sites.

Weather-related scorch symptoms typically appear sometime after mid-July when weather tends to turn hot and dry.

Some shrubs are particularly prone to physiological scorch. Alpine currant, for example, nearly always shows some scorch when planted in a bright sunny area.

If evergreens show scorch in late winter or early spring, it may be due to restricted flow of water to the needles. This occurs when needles transpire (breathe) during warmer weather while the soil in the root zone is still frozen. The needles lose moisture and are unable to replace it, resulting in scorch.

Impaired root systems

Other factors contributing to scorch can be roots restricted or covered with concrete, and root damage, such as from soil fill about them or physical loss of roots through construction activity within the last few years.

Salt accumulation

The primary soil toxin causing scorch is the salt applied to roads, driveways, sidewalks, or other areas for wintertime ice control. Boulevard trees are especially vulnerable because of their proximity to salt applications.

Plant roots growing in salty soils absorb toxic levels of sodium and chloride, the ions that make up common deicing salt. These ions accumulate in needles and leaves, causing dehydration and scorch.

Salt spray and runoff creates patterns of damage that help to distinguish it from those caused by other factors: most damage occurs within 30 feet of a road, the side of the plant facing the road is more severely damaged, and sheltered plants show no signs of injury.

To confirm a diagnosis of damage due to salt injury, a soil test or tissue test should be performed. For specific instructions on collecting and submitting a sample for testing, contact your county Extension office.

According to research conducted on sugar maple, plants are unlikely to show symptoms if chloride accumulation in foliage is below 0.6%; severe symptoms are likely above 1.0%. The specific level would probably differ for other species, but you could obtain a pretty good idea by submitting foliage from non-exposed and affected trees, and comparing chloride content.

You may be able to minimize future damage by directing salty runoff water away from the root zone. But when salt splashes on branches and twigs, very little can be done, except to choose less sensitive plants. For more information on salt injury as well as a list of salt-tolerant plants, consult Extension publication *Salt Injury to Landscape Plants* (A2970).

Atmospheric chemicals

Chemicals in the atmosphere, such as ozone, sulfur dioxide, or fluorides may cause scorch symptoms.

Evergreens growing near coal-burning power plants, or possibly paper mills, may exhibit scorch damage caused by sulfur dioxide. Scorch on evergreens typically appears rather suddenly during mid-summer to current season needles. White pines are probably the most sensitive of all evergreens, and individual plants vary in sensitivity among the species.

Ozone rarely injures trees and shrubs—herbaceous plants are much more likely to show scorch symptoms. If injury appears within a week or two of ozone warnings, ozone may be the culprit.

An infrequent cause of marginal scorch in Wisconsin is an accumulation of fluorides. It is rare in Wisconsin because we do not have many sources of fluoride contamination, such as aluminum, steel, ceramic, or phosphorus chemical manufacturing factories.

Plant leaves absorb fluorides from the atmosphere. The fluoride moves with the transpiration stream toward the leaf edges, where the concentration is at least several times more than the average concentration within the leaf as a whole. It can also be absorbed from the soil if present in sufficient quantities. High levels of phosphate fertilizers, and also perlite in containerized soil mixes contribute fluorides which can injure sensitive foliage plants such as several species of *Dracaena* and spider plant (*Chlorophytum*).

Verticillium wilt

Fungal diseases that affect the water-conducting vessels, such as oak wilt and Dutch elm disease, can sometimes cause scorch symptoms. However, such symptoms are usually very transitory, and are accompanied by more dramatic symptoms that would rarely be confused with other causes of scorch. By contrast, the soil-borne fungus *Verticillium* can cause confusing symptoms on occasion.

While fungal disease symptoms can be similar to those described above, there is often a less uniform distribution over the plant. Individual branches, sometimes on the side or near the top, are generally affected, while other parts of the tree show fewer, if any, symptoms. The affected tissue along the edge of the leaves is also more irregular, e.g., not as uniform along the margins, and leaf roll may occur, along with leaf drop. Leaf drop usually does not occur with other causes mentioned.

Although the fungus is somewhat difficult to isolate, the plant disease diagnostic laboratory can usually assist you in detecting this possibility. See Extension publication *Maple and Other Trees Disorder: Verticillium Wilt* (A2537).

Bacterial scorch

We include bacterial scorch in this publication even though the disease has not been confirmed in Wisconsin. It is caused by a bacterium tentatively named *Xylella fastidiosum*.

Hosts of this bacterium include Siberian and especially American elm; pin, red and scarlet oak; red maple; sycamore; and red mulberry. Leaf scorch usually appears on outer and upper branches initially, although individual lateral branches may show symptoms first.

Symptoms often begin rather early in the season, and may start out as a marginal chlorosis or yellowing before fading to a drab green or brown color. The affected tissue is less uniform and more undulating, similar to that described for *Verticillium* wilt. There is usually a yellow band separating brown and green tissue, though this is not diagnostic. On oaks this may be a reddish band, and on sycamore it is a brown band separating green and tan tissue. Presumably the symptoms develop because of water stress within the xylem (water-conducting vessels), though toxins may contribute to them.

When scorch symptoms develop rather early in the summer, before weather stress is a factor, a vascular pathogen may be the culprit. Symptoms usually worsen with hot, dry periods. Also, bacterial scorch-diseased branches may produce leaves more or less normally the next spring, but symptoms repeat in affected branches. Diseased trees lose vigor, and branches or entire trees may eventually die.

Bacterial scorch appears to be transmitted by leafhoppers and possibly spittlebugs. However, bacterial scorch does not appear to spread very rapidly. It is also transmitted vegetatively, such as through grafts and cuttings.

To date, bacterial scorch has been reported primarily in the eastern United States, and in the South. Since it has not been detected in Wisconsin, a field diagnosis should not be made without laboratory confirmation.

Control

Treatment depends upon which hidden trouble is responsible for the scorch symptoms. In general, practices that encourage root development and root function are recommended. Fertilize as needed, but avoid excesses that might contribute to problems. Although potassium deficiencies are not known in Wisconsin to cause tree symptoms, potassium deficiencies in several field and vegetable crops produce scorch symptoms. So pay special attention to the potassium level in soil tests.

Water deeply during periods of drought. Make sure that the water seeps into the soil. Compacted, sloping soils are very difficult to wet.

Heavy aphid attacks can increase scorch symptoms and should be controlled on trees already suffering severe stress. Other insect infestations should also be controlled if they are threatening the long-term health of the tree.



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