

Purdue Plant & Pest Diagnostic Laboratory

Stress-related Conifer Dieback



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Spruce trees and other conifers (including pine, arborvitae, and juniper,) often have discolored needles or they drop needles when the plant has no readily discernable disease or mite/insect problem. Some of these conifer dieback symptoms appear in well-established trees. Other reports of dieback are on trees planted within the last six years, which suggests that transplant shock, due to lack of root development, may be a contributing factor.

This publication explains the most common causes of dieback in conifers that are not due to infectious disease, insects, or mites and that are difficult to diagnose with certainty.

This publication also describes management practices to help alleviate root stress.

Delayed Expression of Symptoms

Discolored needles or loss of foliage in stressed evergreens is often not immediately apparent, sometimes showing up a season or two following severe stress to the tree. Roots may be dead while foliage still appears to be green.

This is because symptoms of needle discoloration are delayed by the waxy coating on needles. Such delays between the appearance of symptoms and their causes may hinder a precise diagnosis.

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Figure 1. A malfunction in a trickle irrigation system on this berm caused lack of adequate moisture resulting in root stress and dieback to several spruce trees.



Figure 2. *Arborvitae* dieback due to root stress caused by a combination of a less than favorable site, plus environmental and cultural factors.

Possible Causes

Typically, foliar discoloration and branch dieback can be attributed to one or more factors related to the site where the tree is planted:

- **There is excessive moisture in the root zone.** This can come from too much rain or irrigation water. It can also occur when a tree is in a low spot where water collects due to heavy clay and poor drainage.
- **There are compacted soils around the tree's roots.** This results in poor aeration and excess moisture.
- **There is excessive dryness in the root zone.** This can be due to the soil type, drought, and other factors.
- **There are extremes in the soil pH.** The soil may be too alkaline or too acidic for the tree species.

Other cultural problems that can cause conifer dieback include:

- Girdling roots that grow around the tree's main stem and cut off the flow of water and other nutrients.
- Herbicide damage from drift or root uptake.
- Planting too deeply so as to cause smothering of roots due to a lack of oxygen.

- Excessive mulch that can cause trunk rot, reduce oxygen in the root zone, and prevent water penetration to the roots.
- Trunk injuries from mower or string trimmers.
- Root-zone disruption from construction and other digging activities
- Salt damage from exposure to de-icing salts and salt uptake near roads and sidewalks.



Figure 3. This spruce branch shows dieback symptoms typical of root zone stresses caused by moisture extremes (drought, excess water) and other unfavorable site-related factors.



Figure 4. The irregular browning of needles present on this branch, can be caused by root stress.



Figure 5. Spruce dieback caused by root uptake of the herbicide *Imprelis*® (aminocyclopyrachlor), a growth-regulator-type herbicide. Photo by Andrew Roth, Office of Indiana State Chemist.

Remediation

Once you observe browning conifer needles, there is not much you can do. New needles will not grow back to replace those that have fallen off.

To determine if a browning evergreen will produce new growth, check the buds at the tips of the branches. If buds are green inside, terminal growth is likely to develop in the spring as long as the buds survive the winter.

In general, spruces have shallow roots and require fertile, well-drained soil to thrive. When treating struggling trees, it is important to provide affected trees a chance to produce new feeder roots.

If trees are growing in a low, poorly drained area, you may need to improve drainage by installing a subsoil drain tile or some other means to reduce waterlogging in the tree root zone. Feeder roots can “drown” in the anaerobic conditions present in saturated soils caused by prolonged wet periods. Deep-core aeration may help improve the soil and the percolation of water into the soil.

It's also important to remember that wet soils encourage root rot disease. Soil-borne fungi cause two of

the most common root rot diseases: Pythium and Phytophthora. In dry, well-drained areas, these diseases have little or no effect; but in poorly drained soils, they easily infect the roots of susceptible species. There is no chemical cure for these diseases. Prevention is possible if you improve site drainage.

If lack of soil water is a factor, soaking the ground around the tree and several feet beyond the tree's drip line may help. Provide 1 inch of water every two weeks. An extended dry period, especially one right before winter can be especially damaging, so don't forget to water late into the fall season.

For recommendations about fertilizing conifers, refer to *Fertilizing Woody Plants* (Purdue Extension publication HO-140-W), available from the Purdue Extension Education Store, www.the-education-store.com.

Finally, always remove dead trees quickly before they attract bark beetles and borers to the area. More information about these pests is available in *Borers of Pines and Other Needle Bearing Evergreen in Landscapes* (Purdue Extension publication E-256-W), available from the Education Store www.the-education-store.com.

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