

Plant Clinic **REPORT**

Diagnosis and management recommendations

DISEASES • INSECTS • WEEDS



Spruce Problems (Pest and Cultural Issues)



Blue spruce

Jason Sharman, Vitalitree, Bugwood.org



Norway spruce

Richard Webb, Self-employed horticulturist, Bugwood.org

Several species of spruce are commonly planted in the Midwest for use as windbreaks, screens and specimen plantings. Norway spruce (*Picea abies*) and Blue Colorado Spruce (*P. pungens* var. *glauca*) are the most frequently planted in the landscape, while White spruce (*P. glauca*), Serbian spruce (*P. omorika*), Oriental spruce (*P. orientalis*) are much less common.

Spruce, as a genus (*Picea* spp.), is native to cooler regions of the northern hemisphere. They are adapted to cold conditions and prefer exposed (full sun) locations with, acidic, well drained soils. Locations with sandy soils, hilly, or mountainous terrain with good snow-

melt provide ideal growing conditions. Spruces are not well adapted to hot and dry locations and often suffer when planted in the warmer regions of the US. When exposed to unfavorable conditions or planted in an inadequate site, they become stressed and more susceptible to pests and diseases. Norway and Colorado Spruce, though considered adaptable, are the most problematic of the spruces in the Midwest.

Cultural Practices and Plant Health

The environmental conditions and cultural practices we provide to trees can influence their health and longevity in the landscape. Priority should first be given to selecting an adequate planting location, or more suitably, an adequate plant for a chosen site. Problems arise when

trees are planted in locations that the species is not well adapted to. For instance, spruce trees require full-sun exposures, and will grow poorly when planted in shade. Soil conditions within the planting site are often overlooked, but are critical to a plants health. Locations with poorly drained soils, such as those with a higher percentage of clay, are not ideal for spruce trees.



Deep planting or incorrect planting of spruce

University of Illinois Plant Clinic



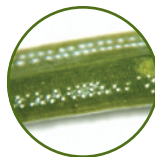
Spruce planted too deep, with root girdling

University of Illinois Plant Clinic



Trees planted out of place

University of Illinois, Nancy Pataky



White spruce needle (white stomata—natural plant openings)

Joseph O'Brien, USDA Forest Service, Bugwood.org

Purchasing, Planting, and Maintenance

When purchasing plants, one should select healthy, pest free trees. This will require a complete inspection of the plant from the canopy to the roots. Avoid trees that have physical injuries, especially to the trunk. Trees infested with pests or infected with disease should also be avoided. Roots should sufficiently developed and root tips should be creamy white in color.

If the tree is not planted properly—incorrect depth, burlap exposed, excessive mulch, not watered properly (one inch of water per week

until established); it may never thrive. Additionally, errors made during planting are difficult to impossible to correct at a later date. Care and attention should be given to proper planting procedures. The International Society of Arboriculture published a fact sheet with nine steps to follow when planting new trees. It can be accessed using the following web link: www.treesaregood.com/treecare/resources/New_TreePlanting.pdf

Climate

Spruces are very cold tolerant when fully dormant, but soft spring growth is vulnerable to sudden freezes. Likewise, a sudden temperature change from cold to hot in the growing season can also damage new growth on branch tips. The injured growth will eventually drop or dead tips can be pruned. Summer drought can stress and weaken trees; Blue Colorado and Norway spruce are particularly sensitive. Strong winds (often times worse on the west side of a landscape), where prevailing winds can also desiccate or injure needles. Promote tree vitality by watering in times of drought.



No signs of disease, insects, or mites on spruce branch

University of Illinois Plant Clinic



Cold injury of spruce branch tips
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Heat injury of spruce branch tips
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Herbicide injury

Herbicide drift or misapplication can be a problem, particularly with spruce planted close to farm fields or treated turf. If trees are exposed



Suspect herbicide injury of spruce
University of Illinois Plant Clinic



to a plant growth regulator herbicide (used to control broadleaf weeds), or if their shallow roots uptake the chemical, then twisted, distorted new growth, needle discoloration, and death may result. Some of the chemicals can be persistent and mobile in the soil. Read and follow all herbicide label directions very carefully to avoid injury to the landscape.

Nutrient stress

Symptoms of yellowing needles of spruce often indicate that there may be a nutrient deficiency. A soil nutrient or pH test may be needed to determine a nutrient deficiency in the soil near the tree. However, the problem may not be an actual lack of nutrients in the soil. Other factors such as root rot, soil compaction, flooding, drainage problems, deep



Suspect nutrient stress of spruce

University of Illinois, Nancy Pataky

planting, girdling roots, and transplant shock may limit the absorption of nutrients of the tree.

Rhizosphaera needle cast (*Rhizosphaera kalkhoffii*)

This fungal disease infects the needles of spruce. This disease is more likely to be found on Blue Colorado spruce. Needles become infected in the first summer, start to

Rhizosphaera needle cast on spruce

University of Illinois, Nancy Pataky



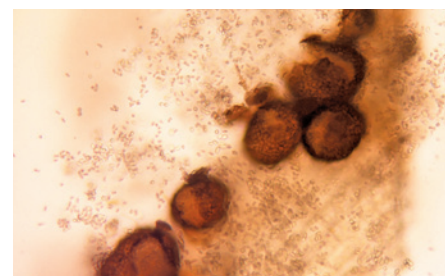
Nutrient deficiency

Jan Liska, Forestry and Game Management Research Institute, Bugwood.org



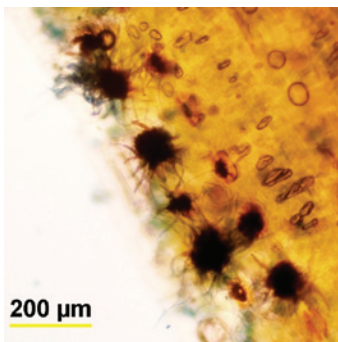
Nutrient deficiency

Petr Kapitola, State Phytosanitary Administration, Bugwood.org



yellow, turn brown, and eventually drop 12–15 months after infection. Infection will kill the first year needles; therefore, afflicted branches have tufts of new growth at the tips, but older needles, which should last for several years, are absent or dying. Damage from this disease can be scattered throughout the tree, but most often occurs on the bottom of the tree. Fungal fruiting bodies can be seen protruding from the pores, in perfectly aligned rows, on the underside of needles. Norway spruce has some resistance to this disease. *Rhizosphaera* can be controlled by improving tree vitality, removing fallen diseased needles, and applying fungicides at the appropriate times early in the spring to protect needles from infection.

Stigmina needle blight (*Stigmina lautii*)



200 μm

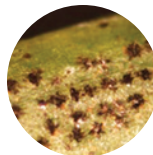
Stigmina needle blight,
Joseph O'Brien, USDA Forest Service,
Bugwood.org

However, a closer look will reveal that fruiting structures appear to have tendrils, in rows, on the undersides of needles. *Stigmina* has been found to infect a wide range of spruce species. Research had shown that fungicides may not control this needle blight.

It is not known if *Stigmina* is a disease pathogen, but we do know that this fungus is associated with needle blight symptoms that are very, similar to *Rhizosphaera* needle blight (see *Rhizosphaera* description above). In addition, the fungal fruiting bodies of *Stigmina* can also appear to be similar to that of *Rhizosphaera* needle cast.



Stigmina needle blight
Joseph O'Brien,
USDA Forest Service,
Bugwood.org



Stigmina needle blight of spruce
University of Illinois
Plant Clinic

Root and Butt Rot

Various root and butt rotting pathogens have been reported on spruce. In general, these pathogens can cause poor growth, dead branches within the tree, browning needles, large numbers of cones, and death.



Armillaria root rot
Andrej Kunca, National Forest Centre –
Slovakia, Bugwood.org



Armillaria root rot
Joseph O'Brien, USDA Forest Service,
Bugwood.org

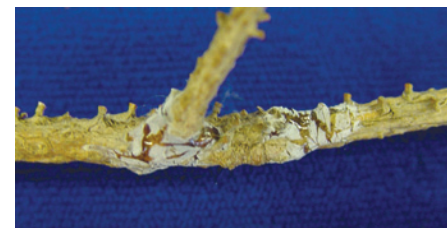


Spruce root rot
USDA Forest Service
– Forest Health
Protection – St.
Paul Archive, USDA
Forest Service,
Bugwood.org

Spruce infected with a butt rot may have mushrooms or resin at the base of the tree. Avoid wounding trees by mulching around the tree and water in times of drought. Infected trees should be inspected by a certified arborist to determine the structural stability. Hazardous trees should be removed.

Cytospora (*Leucostoma*) Canker

This stress-related fungal canker is found on spruce, notably Blue Colorado spruce and Norway spruce, grown outside of its native habitat. Trees that are between 10 to 20 years old are more likely to be affected. If the tree is infected, cankers can cause branch death usually first at the bottom of the tree and continue upward; however branch death can be scattered throughout the tree. It can be recognized by the presence of an exuded white resin within cankers on afflicted branches. *Cytospora* is best controlled by reducing stress, improving tree vitality by watering during drought, and removing dead branches during dry weather. It may also be helpful to apply an organic mulch under the full spread of the branches to help conserve moisture and maintain an even temperature zone near roots.



Cytospora canker on spruce
(white oozing sap can indicate cankers)
University of Illinois Plant Clinic



Cytospora canker on spruce
(white oozing sap can indicate cankers)
University of Illinois Plant Clinic



Cytospora canker on spruce
University of Illinois,
Jim Schuster

**SNEED or Sudden Needle Drop
(*Setomelanomma holmii*)**



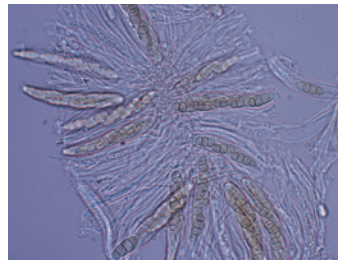
SNEED symptoms on spruce
University of Illinois Plant Clinic, Diane Plewa

This fungus has just, recently been discovered on spruce in Illinois. SNEED still has not been proven to be a pathogen; it may be a fungus taking advantage of stressed trees. Symptoms first appear as yellowing and later as premature browning of older needles. Usually, all of the needles on affected branches fall off, but the newest needles remain on the tips of the branches. Branches affected may be scattered throughout the tree or the entire

tree may be affected. Needles do not show signs of fungal infection, but the twigs will have numerous small black fruiting structures (pseudothecia). Many saprophytic fungi can cause similar fruiting structures on twigs. A diagnosis of SNEED requires a trained diagnostician to view characteristic ascospores of this fungus under a microscope early in the season.



SNEED ascomata (fruiting structures) on spruce
University of Illinois Plant Clinic, Diane Plewa



SNEED ascospores
University of Illinois Plant Clinic, Diane Plewa

**Weir's spruce cushion rust
(*Chrysinyxa weirii*)**

This disease is relatively new to the Midwestern states. It was first confirmed in 2002 on nursery trees in Wisconsin. The rust infection occurs in the spring, as new needles are emerging. Symptoms of the disease;



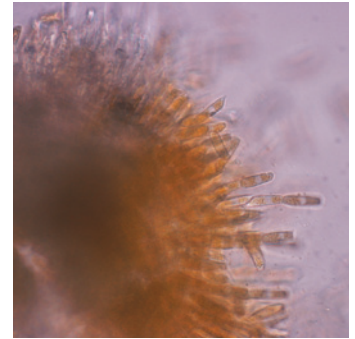
Spruce needle rust
University of Illinois, Travis Cleveland

however, are not seen until the following spring when the 1 year old needles develop yellow spots. As the infection progresses, the spots develop pustules that split open to reveal yellow-orange teliospores. In some cases, a heavily infected tree can have an abundance of pustules and teliospores, which results in a yellow-orange appearance to the



Spruce needle rust
University of Illinois, Travis Cleveland

tree when viewed from a distance. Diseased needles may drop, with repeated defoliations resulting in reduced growth. The pathogen is spread as the teliospores produce basidiospores, which are then blown or splashed onto newly emerging needles of the same tree or nearby spruce trees. New infections occur and the disease cycle then repeats in the same fashion. Weir's spruce cushion rust is a unique, spruce rust that is autoecious and does not require separate hosts to complete its life cycle. Other species of spruce rust are heteroecious and use evergreen ericaceous plants as alternate hosts. Control strategies differ between the heteroecious and autoecious spruce rust species. As a result, laboratory analysis of infected needles is critical for accurate diagnosis and subsequent control strategies.



Spruce needle rust
University of Illinois, Travis Cleveland

Spruce Spider Mite

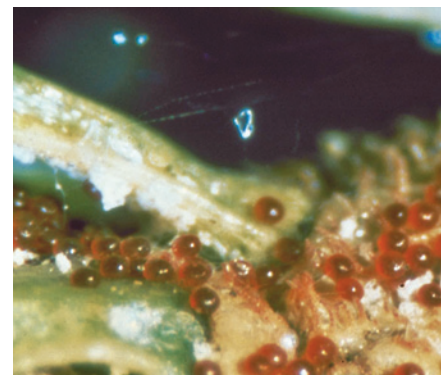
Spruce mites are active during cool weather in spring and autumn; they are dormant in hot dry weather. Feeding may be visible as yellow, speckled needles, often with a gritty surface, possibly with webbing and possibly with clear eggs on 1st and 2nd year needles. Tapping the branch over a sheet of white paper should knock loose a few mites, if they are present. If they are green when crushed, they have been eating leaves. If they smear red, they were helpful predators, and the infestation is under control. If spider mite populations appear high, pesticides may be warranted.



Spruce spider mite
US Forest Service, Forest Health Protection Unit, Bugwood.org



Spruce spider mite damage on spruce
urbanext.illinois.edu_ hortanswers



Spruce spider mite eggs
USDA Forest Service Archive, USDA Forest Service, Bugwood.org

Spruce galls

There are two problematic species of adelgids that can cause injury to branch tips of spruce. The feeding of these aphidlike insects in the spring will produce galls, which are first green in color, then turn brown in late spring. The Eastern Spruce Gall Adelgid forms galls on spruce similar to a spruce cone but is usually only ½ inch long and has short, scalelike, needle growth. The Cooley Spruce Gall Adelgid forms a gall similar to a spruce cone, but has 1 inch long needles growing out of it, and disfigures (primarily) Norway spruce. In the summer, holes open on the galls, near needles, and allow a way for way for adelgids to fly away. Both species lay eggs on spruce which hatch, overwinter as nymphs, and emerge as adults in the spring. Cooley spruce gall adelgid can also lay its eggs on Douglas Fir that hatch and spend the winter as white, pinhead-sized nymphs on the needles. Sprays should be applied to trees just before budbreak to kill the nymphs.



Cooley spruce gall adelgid
Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org



Cooley spruce gall adelgid
University of Illinois, Phil Nixon



Eastern spruce gall adelgid
University of Illinois, Phil Nixon

Bagworms

Bagworms are the larval stage of a moth; the female never emerges from her protective bag. Her eggs overwinter in the bag; larvae emerge in spring. Many will remain to feed on the host plant on which they emerged. This can lead to serious localized infestations. Bags can be handpicked (and destroyed) in winter, or sprayed when larvae are actively feeding.



Spruce bagworm
Pennsylvania Department of Conservation and Natural Resources – Forestry Archive, Bugwood.org



Spruce bagworm
William Fountain, University of Kentucky, Bugwood.org



Spruce bagworm
Jerry A. Payne, USDA Agricultural Research Service, Bugwood.org

Spruce Resources

University of Illinois Plant Clinic: 1102 S. Goodwin, 424 Turner Hall, Urbana, IL 61801, Open all year! (217) 333-0519

University of Illinois Plant Clinic website:

web.extension.illinois.edu/plantclinic/

Reports on Plant Diseases (RPDs): ipm.illinois.edu/diseases/

Pest Management for Home Landscape can be purchased at the following link: <https://pubsplus.illinois.edu/contact.html>

Spruce Problem Related Websites:

- ♦ **University of Illinois Focus on Plant Problems:** urbanext.illinois.edu/focus/spruce.cfm
- ♦ **University of Illinois hortanswers:** urbanext.illinois.edu/hortanswers/plantsearch2.cfm
- ♦ **Purdue Extension Purdue Plant and Pest Diagnostic Laboratory Conifer Dieback:** www.ppd.l.purdue.edu/PPDL/pubs/briefs/Conifer-Dieback.pdf
- ♦ **Spruce Diagnosis for Yard Trees**, by Jana Albers and Mike Albers, MN DNR-Forestry files.dnr.state.mn.us/assistance/backyard/treecare/forest_health/whitesprucedagnosis.pdf

Other University of Illinois Plant Clinic Social Media Resources:

- ♦ **Illini Plant and Pest Podcast**
web.extension.illinois.edu/podcasts/plantandpest/
- ♦ **U of I Plant Clinic Facebook page**
<https://www.facebook.com/UofIPlantClinic>
- ♦ **U of I Plant Clinic blog**
universityofillinoisplantclinic.blogspot.com/
- ♦ Follow Diagnostic Specialist Stephanie Porter on **Twitter**
<https://twitter.com/#!/skporter>

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