

Minnesota Spruce Trees and Their Diseases

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Norway spruce (*Picea abies*) is native to Europe; however, it has been planted widely in North America. The tree matures early and its height seldom exceeds 60 feet. Many cultivated varieties, exhibiting a wide range of form and foliar characteristics, have been developed in the United States. Norway spruce grows well and maintains good form on a wide range of soil types so has value as an ornamental tree.



NORWAY SPRUCE

White spruce (*P. glauca*) is native to North America and spans the entire northern region of the continent extending from Alaska to Maine and south to Minnesota. This species is one of Minnesota's hardiest conifers and grows well under a variety of climatic conditions and soil types; however, it will not grow well on very wet, or dry soils. White spruce grows best on loamy soils, but will grow well on sands and clays with adequate drainage. White spruce is a medium-sized tree with blue-green foliage. The foliage has a disagreeable rank or catty odor when crushed. White spruce is usually shallow rooted and tends to leaf out early so may be injured by late spring frosts.



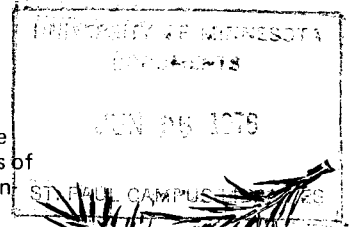
WHITE SPRUCE

Black spruce (*P. mariana*) is also a North American species; however, its native range doesn't extend quite as far north as that of white spruce. Black spruce grows well on mineral or organic soil and commonly occurs in bogs or peat swamps in northern Minnesota. This species grows best on deep, moist, well-drained mineral soils, but will not compete well with associated species growing faster on these sites. Black spruce is a small to medium-sized tree, usually shallow rooted.



BLACK SPRUCE

Blue spruce (*P. pungens*) is native to the middle and upper slopes of the Central Rocky Mountains of North America and commonly found on moist, fertile soils along banks of streams. Blue spruce has a moderately deep root system and is decidedly windfirm with the crowns of open grown trees usually extending to the ground. Young trees usually have a very distinctive silver-blue foliage. Trees having the bluest and longest needles are widely propagated as horticultural varieties; however, they may lose this color with age. Blue spruce is subject to winter drying (moisture loss in needles causing a brown appearance) and is not adapted to sandy, droughty soils, and/or sites exposed to winter wind and sun.



BLUE SPRUCE

Diseases

Cytospora canker or spruce canker is caused by the fungus *Cytospora chrysosperma*. This organism has a wide host range and a worldwide distribution on many woody plant species. The fungus is considered a weak parasite and usually invades weakened trees that are growing under stress conditions. Stress results from growing in sandy, nonfertile soil in exposed dry sites. Stressed trees are very vulnerable to this fungus. Blue spruce in our area is an example of a tree, growing out of its native range, and usually not well adapted to Minnesota conditions. It is readily invaded by *Cytospora*. The fungus is usually not a problem on young trees; however, the lower branches of older trees are readily invaded and killed. When this happens the trees appear to be dying from the bottom up.



SPRUCE CANKER causing needle drop

Pitch oozing from the tree is generally present on cankered branches or stems. Usually needle color change is the first symptom noticed. Needles on infected branches turn reddish-brown and contrast dramatically with the normal silver-blue foliage of healthy trees. The dead needles may remain on infected branches for nearly a year or may drop soon after the branch dies. The remaining bare twigs and branches also contrast with healthy branches.



OOZING PITCH

Cytospora usually enters the tree through wounds or dead branch stubs and grows through the bark into the first few layers of sapwood tissue. As twig tissue is parasitized by the fungus, calus tissue (host tissue) may form near the canker margin. The canker then appears as a dead, discolored, and sunken area that may extend several feet along the branch or main stem of the tree. The fungus eventually kills the branches by girdling. Infected branches cannot be saved. *Cytospora* can also invade dead branches killed in other ways. The presence of this fungus on dead woody tissue does not always mean that the fungus was responsible for killing the tissue. Spores of *Cytospora* are produced in pycnidia and are very abundant on dead bark. During moist weather the spores are exuded from the pycnidia in long threads (cirrhi) and are spread by wind, rain, birds, insects, and man.

Infected branches should be pruned off several inches below the infected tissue or at the main stem of the tree, but never when trees are wet since the fungus is spread during moist conditions.

In Minnesota, blue spruce should be grown in moist, well-drained, fertile soils on protected sites. Blue spruce grown under these conditions will have less stress and cytospora canker development will be retarded. Blue spruce generally is free of this disease during the first 5-15 years depending on the planting site and the care given.

Spruce Needle Rust

Spruce needle rust is caused by several species of *Chrysomyxa* and is commonly found on black, white, and blue spruce in Minnesota. These rust fungi cause premature needle defoliation and are usually only important in nurseries and Christmas tree production areas.

All spruce needle rusts require an alternate host for completion of their life cycles. The most important alternate host for spruce needle rust in Minnesota is Labrador-Tea (*Ledum groenlandicum*). Spruce needles that become infected during the spring first develop the pycnial and then the aecial stage of the rust during early summer. The aecial stage appears as a yellow-white pustule on the spruce needle and contains yellow-orange aeciospores. The aeciospores



SPRUCE NEEDLE RUST

are wind-disseminated to the alternate host where the fungus will form urediospores. These spores are capable of intensifying the rust on the alternate host. During late summer teliospores are formed and the fungus will overwinter in this stage. In the spring the teliospores germinate and produce basidiospores which are then wind-disseminated to the spruce. These needle rusts are not perennial on spruce; however, they can perpetuate themselves on the various alternate host.

Spruce needle rust is rarely a problem on ornamental trees; however, nursery and plantation grown trees can be heavily infected when grown near an alternate host species. The eradication of alternate hosts in the vicinity of nurseries or plantations will reduce the incidence of spruce needle rust.

Dwarf Mistletoe

Dwarf mistletoe is a parasitic flowering plant represented by the genus *Arceuthobium*. Members of this genus only attack conifers and are responsible for growth reduction, poor quality, and host mortality. *Arceuthobium pusillum* is the only species of dwarf mistletoe occurring in Minnesota. It has been reported on about 11 percent of the state's black spruce; it is only occasionally reported on white spruce. Occasionally tamarack (*Larix laricina*) will become infected if it is growing among diseased black spruce. Dwarf mistletoe can be identified by the formation of witches-broom and by the small light-green aerial shoots protruding from the spruce branches of witches-broom.



WITCHES-BROOM

Dwarf mistletoe is not a problem on ornamental or nursery grown trees, but is commonly found in natural stands of black spruce in northern Minnesota. Dwarf mistletoe can be controlled by destroying all infected trees and any adjacent trees (within about 60 feet) that may harbor latent infections.



DWARF MISTLETOE

