

# EXTENSION NOTES



## WHITE SPRUCE

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White spruce is one of Canada's widest ranging and most commercially important tree species.

This Extension Note provides information on how to identify and grow white spruce, the uses of white spruce

and methods for managing this species for wood products and wildlife habitat.

### INTRODUCTION

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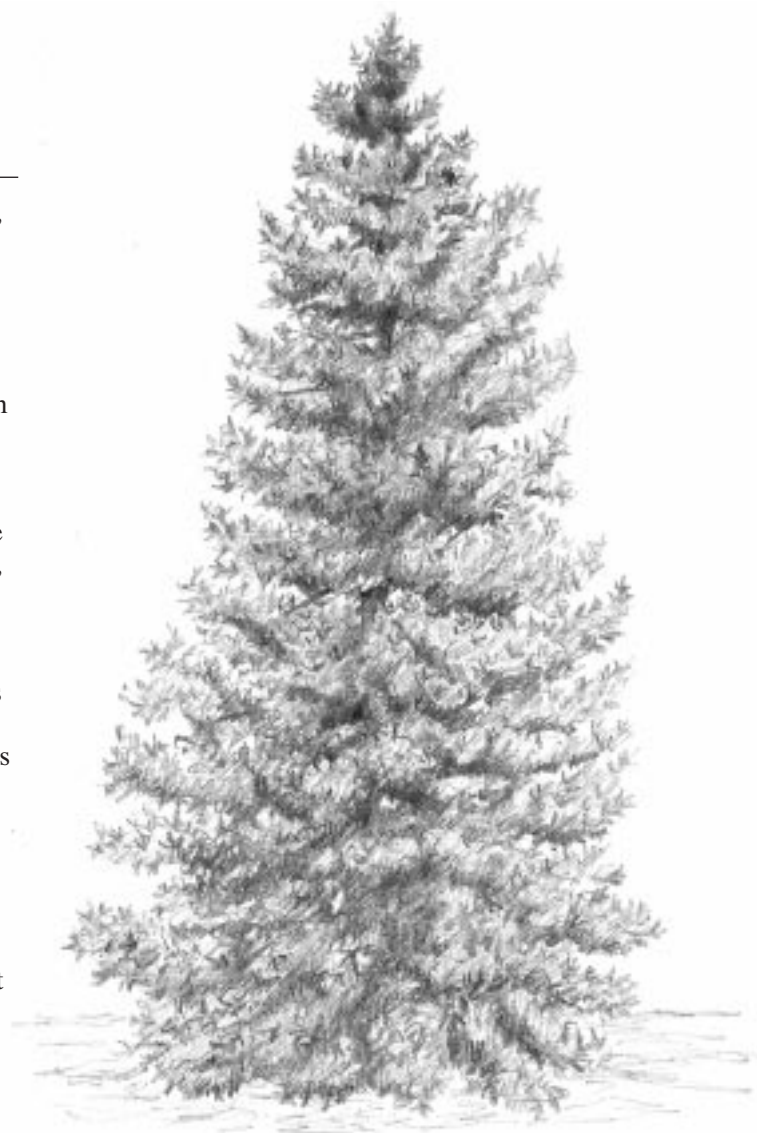
White spruce is a characteristic tree of the Boreal Forest, although it can be found almost everywhere in Canada.

Aboriginal people in North America used white spruce's strong pliable roots to make lacings for birch bark canoes. They also used the gum (a sticky substance that leaks through wounded bark) for waterproofing the birch bark seams.

White spruce is a main source of pulpwood and construction grade lumber. Its long, tough fibres produce superior pulp, which is made into a wide range of papers, fibre moulded products, insulating boards and particle board.

The wood is lightweight, soft and moderately strong. It is used for boards, planks and joists for construction, boxes and crates, doors, roof decking and paneling. The wood is also prized for use in piano sounding boards, violins, paddles and oars.

White spruce provides food and shelter for many species of wildlife. The tree's abundant seeds are an important food source for birds and small mammals. Every two to six years, white spruce trees bear massive cone crops that produce more seeds than the seed eaters can consume. This helps the tree to reproduce successfully. White spruce also provides good winter cover for martens, fishers, voles and snowshoe hares.



## HOW TO IDENTIFY WHITE SPRUCE

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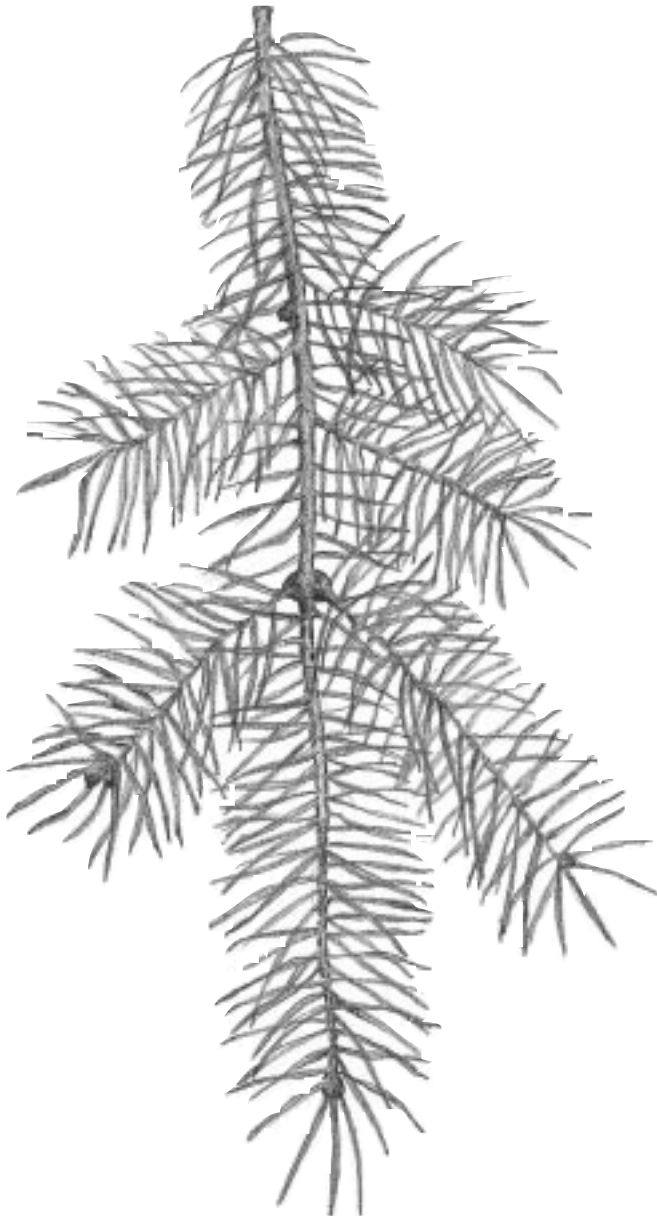
### TREE SHAPE

White spruce are medium-sized trees with single, straight trunks that end in thick, uniform, conical crowns. The lower branches droop or extend to the ground. In dense forests, the lower branches are gradually lost as the trees compete for light.

White spruce can live 300 years and reach heights of 25 to 30 metres and diameters of 60 to 90 centimetres.

### LEAVES

White spruce needles stand out from all sides of a twig in a spiral arrangement. They are 0.5 to two centimetres long. They are stiff, four-sided, bluish-green and produce a pungent odor when bruised.



### TWIGS

The hairless twigs are whitish-grey to yellow. The small, woody bases, which remain when the needles fall off, leave the twig roughly studded with small bumps.

### BUDS

The outer bud scales are pointed and do not extend beyond the tip of the bud.



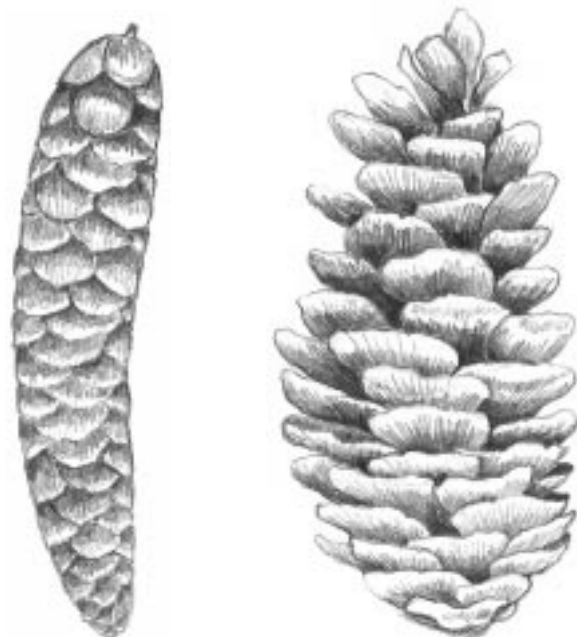
### BARK

The bark is thin and scaly. The outer bark is a light greyish-brown. The inner bark is silvery-white.

### CONES

White spruce cones are about five centimetres long, slender and cylindrical. When they open the close-fitting, light-brown scales spread to almost form right angles with the cone.

The cones mature in one season. They open in late summer or autumn, and fall off the tree in winter or the following spring.



## WHERE WHITE SPRUCE GROWS BEST

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White spruce is one of the farthest ranging conifers in North America. It is found across Canada and throughout Ontario. This hardy tree survives in a variety of climates and sites.

### SOIL

White spruce grows well in a wide variety of site and moisture conditions. It grows best on well-drained, moist fertile soils. It doesn't grow well near stagnant water. White spruce can tolerate a considerable range in soil pH, from 4.5 to as high as 7.5.

### SHADE OR SUNLIGHT?

White spruce tolerates shade, but grows best in full sunlight. In a hardwood stand, white spruce will survive

as understorey trees for up to 50 years. When the competing shade trees die or are removed, they grow at a faster rate. In conifer stands, white spruce will often become the dominant species as the stand ages.

### STAND COMPOSITION

In Ontario, white spruce is rarely found in pure stands, except for those growing in plantations. It is commonly found with trembling aspen, white birch and balsam fir. It is also found with red pine, white pine and yellow birch. In many areas, white spruce is classified as the climax species, which means that it represents the last stage in a succession of changes in plant species over a long period of time.

## HOW TO GROW AND CARE FOR WHITE SPRUCE

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How you manage your white spruce stand depends on your goals. Stands can be managed to enhance their abilities to produce sawlogs and wildlife habitat. They can also be managed as windbreaks and for landscaping.

Whatever your goals, a forest management plan for your property can help you achieve them. Assistance with preparing a plan is available from independent forestry consultants and the Ontario Ministry of Natural Resources.

### MANAGING TO ENHANCE WILDLIFE HABITAT

Selective cutting, which removes deformed, diseased and competing trees from a mixed woodlot, can be used to open up the forest to allow white spruce to grow and provide more food and shelter for wildlife. Dead and dying spruce also provide important habitat for birds that nest in cavities.

### MANAGING FOR WOOD PRODUCTS

White spruce can be managed to produce high quality sawlogs and pulpwood. For sawlogs, the goal is to produce trees with long, straight, branch-free stems. To encourage trees to compete for light and grow tall, rather than branching at lower levels, stands of white spruce should be thinned at regular intervals. The first thinning should be done when the trees reach a diameter of 15 centimetres at your chest height.

To produce knot-free lumber, trees should be pruned between thinnings. Remove the lower branches of any crop trees to a height of about five metres. You may also want to prune the lower branches of every third or fourth

row to improve access to the stand. Do not prune the trees along the edge of the plantation. The lower branches of these trees are important shelters for wildlife.

When managing for white spruce wood products, stand composition is an important factor to consider. In stands in which white spruce is overtopped by hardwoods, the leader and upper stem of spruce are frequently damaged by hardwood branches whipping in the wind. This leads to branching at the top, rather than the development of tall straight stems. White spruce are also vulnerable to snow and ice, which can break up to 70 per cent of the trees in pure stands.

### CREATING A NEW WHITE SPRUCE PLANTATION

Because white spruce seeds are a favorite food of many wildlife species, planting young seedlings is a more effective method of establishing plantations than seeding. Plant the white spruce seedlings about 2.4 metres apart for an overall stocking rate of 1,736 seedlings a hectare.

White spruce seedlings are sensitive to transplanting shock. Shock is difficult to predict and prevent, but seedling quality is a factor. Treatments that improve early root growth are beneficial. The soil on planting sites needs to be turned over or burned to create suitable conditions for seedlings.



## WHITE SPRUCE HEALTH

Many insects and diseases affect the health of white spruce. However, they are most damaging when combined with other stresses or when trees are growing in low, moist areas. Here are some common insect pests:

### SPRUCE BUDWORM

This greenish-brown larva has yellowish sides and four white dots on each segment down the back. The adult is a dull grey moth with spots of brown on the wings. The worms feed on the needles, often killing or stunting the growth of trees. The needles of infested trees turn brown and become dry. The bacterial insecticide, *Bacillus thuringiensis* (Bt), can be used to control infestations.

### YELLOWHEADED SPRUCE SAWFLY

This fly is olive-green with longitudinal dark green stripes, a conspicuous yellowish-brown head and a waxy appearance. The larvae spend the winter in the ground in a brown cocoon.

Infested trees, especially young trees growing in open areas, may lose all their leaves, resulting in stunted growth or death. Small infestations can be controlled by removing the flies by hand and destroying the larvae. Larger infestations are difficult to control without pesticides.

### SPRUCE NEEDLEMINER

The larvae are green caterpillars with brown heads. They pupate in silken cocoons in late spring and early summer. The adults are small brown moths with three irregular greyish bands across the forewings. The caterpillars spin webs that damage needles. On large trees, the infestation is usually heaviest on the lower branches. On young trees, the entire crown may be infested. Heavy attacks cause a heavy loss of needles, and weakened trees often succumb to other pests. To control this insect, wash the webs from the trees with a strong stream of water in early spring or autumn, and destroy the dislodged nests.

### ENVIRONMENTAL STRESSES

- drought
- fire
- frost or ice
- wind
- lightning

### BIOLOGICAL STRESSES

- seed consumption by wildlife
- insects
- blight
- needle rust
- fungi

### STRESSES CAUSED BY POOR MANAGEMENT

- livestock grazing
- poor pruning practices
- poor thinning practices
- poor harvesting practices that damage the remaining trees

You can protect the health of white spruce stands by ensuring that your actions don't combine with other factors to weaken trees. Monitor the health of the forests in your area and watch for insect pests in your stands. Avoid cutting, pruning or other activities when your trees are stressed by insects or disease, severe weather or other factors.

You should also consider protecting your stand from livestock grazing. Livestock trample the roots of mature trees and compact the forest soil. Browsing also results in the introduction of prickly-ash, ironwood, hawthorn and other species, which are important species for wildlife but have low value for wood products.

Further reading:

- Hosie, R.C. 1990. *Native Trees of Canada*. Fitzhenry & Whiteside Ltd., Markham, Ontario. pp 62-73
- Ontario Ministry of Natural Resources. 1991. *Common Pests of Trees in Ontario*. Queen's Printer, Toronto.
- Strickland, Dan. 1989. *Trees of Algonquin Provincial Park*. The Friends of Algonquin Park and the Ministry of Natural Resources. Whitney, Ontario. pp 9.

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