

Black spruce (Sb) - *Picea mariana*

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BC Distribution of Black spruce (Sb)

Range of Black spruce



A wetland, open-canopy black spruce stand with a well-developed, willow-dominated shrub layer in the Fort Nelson Forest District

Geographic Range and Ecological Amplitudes

Description

At maturity, black spruce is a small- to medium-sized (exceptionally >30 m tall), evergreen conifer, with a narrow, compact, conical crown, which may develop a characteristic club-like shape, and grayish-brown, thin, scaly bark. The wood of black spruce is used for making high quality pulp with balanced strength properties.

Geographic Range

Geographic element:

North American transcontinental-incomplete

Distribution in Western North America:

(north) in the Pacific region; north and central in the Cordilleran region

Ecological Amplitudes

Climatic amplitude:

subarctic – subalpine boreal – **montane boreal** – (cool temperate)

Orographic amplitude:

submontane – **montane** – subalpine

Occurrence in biogeoclimatic zones:

SWB, **BWBS**, SBS, (SBPS), (northern IDF), (northern ICH)

Edaphic Amplitude

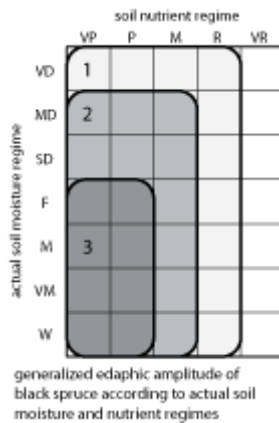
Range of soil moisture regimes:

(very dry) – moderately dry – slightly dry – **fresh – moist – very moist – wet** – very wet

Range of soil nutrient regimes:

very poor – poor – medium – (rich); oxylophytic

The most productive growth of black spruce occurs on moist and medium sites; therefore, it could be concluded that black spruce does not tolerate as high a supply of calcium and magnesium as does white or Engelmann spruce. The



stunted growth and krummholz form on limestone – and dolomite-derived soils, where white spruce grows very well, indicates that high levels of calcium, magnesium, and nitrate-nitrogen adversely affect black spruce growth.

Black spruce tolerates very acid substrates. For example, in circumneutral or even alkaline swamps, where tamarack or white spruce are primary species, black spruce grows only on acidic decaying coniferous wood.

Tolerance and Damaging Agents

Root System Characteristics

Although some black spruce roots may penetrate to the depth of 60 cm, most spread laterally at the moss-forest floor interface. The bulk of the root biomass is in the upper 20 cm of organic horizon. Roots of black spruce are associated with both ecto – and endo-mycorrhizae.

Tolerances

tolerance to	tolerance class	comments
low light	H	more shade-tolerant than the other spruce species
frost	H	withstands severe winter temperature and permafrost soils
heat	M	infrequent on insulated sites
water deficit	M	infrequent on very dry sites
water surplus	H	abundant on waterlogged sites; less tolerant of prolonged flooding
nutrient (mainly N) deficiency	H	oxylophyte; common on acid substrates and very poor sites

Damaging Agents

damaging agent	resistance class	comments
snow	H	due to very narrow, shedding crown and stringy branches
wind	L	prone to windthrow, especially in mature stands

risk class		
fire	H	high on upland sites, not a concern in wetlands
insect	M	spruce budworm, white pine weevil
fungi	L	not a major concern; root and butt rots (<i>Armillaria</i> root disease, <i>tomentosus</i> root rot, and red ring rot)

Associated tree species and successional role

In British Columbia, black spruce usually grows in pure stands, especially on wet and very wet, very poor and poor sites. This is more particularly the case in Quebec, where rich soils are rare. Black spruce is a pioneer species (primary succession) in ombotrophic wetlands and present in early, mid-, and late stages of secondary succession; a variable component in old-growth stands in the SWB, BWBS, and SBS zones.

associated tree species	occurrence class	major area of occurrence
lodgepole pine	H	The most commonly associated species in BWBS
white spruce (& hybrids)	H	SWB and BWBS
tamarack	M	BWBS
balsam poplar & Black cottonwood	L	BWBS
trembling aspen	L	BWBS
paper birch	L	BWBS
subalpine fir	L	BWBS; usually in old-growth stands

Silvical Characteristics

characteristic	interpretive comments class	
reproduction capacity	H	seed production may be as early as at an age of 10 years; seed years are less frequent in the north; cones persist on trees for 20 to 30 years and their seeds are not shed unless they are opened by fire; may reproduce by layering
seed dissemination capacity	L	dispersion up to 100 m from the parent tree
potential for natural regeneration in low light	H	regenerates well on organic substrates
potential for natural regeneration in the open	H	especially after fire

potential initial growth rate (<5 years)	L	slow in the establishment period (usually <5 cm/yr)
response of advance regeneration to release	H	low for regeneration developed by layering, high when originating from seed
self-pruning capacity in dense stands	M	but dense stands are infrequent
crown spatial requirements	L	Very narrow but long crowns.
light conditions beneath closed-canopy, mature stands	L	associated with poorly developed understory vegetation
potential productivity	M	site index (50 yr @ bh) approaching 20 m on the most productive sites
Longevity	M	Ages >280 years were reported in the Ontario Clay Belt.

Genetics and Notes

Genetics

Genetic variation in black spruce is clinal, primarily along a latitudinal gradient. The hybrids between black and white spruces (see *Picea glauca*) are nowhere near as frequent as hybrids between white and Engelmann spruces.

Notes

Black spruce is a desirable component in pure or mixed-species stands, either with other conifers, such as lodgepole pine or white spruce, or hardwoods, such as trembling aspen, in northern, montane boreal forests. Black spruce regenerates naturally following fire disturbance or can be planted if it was a minor component in the original stand. More detailed silvics information is given by:

Viereck, L.A. and W.F. Johnston. 1990. *Picea mariana*. Pp. 227-237 in R.M. Burns and B.H. Honkala (technical coordinators) *Silvics of North America*, Vol. 1. Agri. Handbook 654, USDA For. Serv., Washington, D.C.