

Engelmann spruce (Se) - *Picea engelmannii*

Tree Species > Engelmann spruce



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BC Distribution of Engelmann spruce (Se)

Range of Engelmann spruce



An uneven aged, Engelmann spruce dominated old-growth stand (Duffey Lake Road)

Geographic Range and Ecological Amplitudes

Description

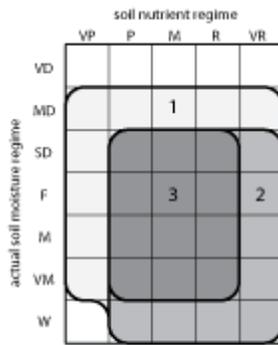
Engelmann spruce is one of the four spruce species indigenous to British Columbia. It is a medium- to large-sized (occasionally >50 m tall), evergreen conifer, with a dense, symmetrical, narrow, spire-like crown; lower branches sloping downward; and a thin, gray-brown bark broken into large, loose, coarse, rounded scales. The wood of Engelmann spruce is used for lumber and pulp. Similar to the other spruces, the pulping properties of Engelmann spruce are excellent: long tracheids, light colour, and low content of resins.

Geographic Range

Geographic element:
Western North American/Cordilleran and marginally Pacific

Distribution in Western North America:
(central) in the Pacific region; **central** and south in the Cordilleran region

Ecological Amplitudes



generalized edaphic amplitude of Engelmann spruce according to actual soil moisture and nutrient regimes

Climatic amplitude:

(alpine tundra) - **continental subalpine boreal** - montane boreal - (cool temperate)

Orographic amplitude:

montane - **subalpine** - (alpine)

Occurrence in biogeoclimatic zones:

(lower AT), (submaritime MH), **ESSF**, (MS), (upper SBS), (upper IDF), (upper ICH), (upper maritime CWH)

Edaphic Amplitude

Range of soil moisture regimes:

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

Range of soil nutrient regimes:

(very poor) - **poor - medium - rich** - very rich

The vigorous growth of Engelmann spruce occurs in soils where calcium and magnesium are available in moderate, well-balanced quantities and on sites with Moder and Mull humus formations.

Tolerance and Damaging Agents

Root System Characteristics

As with other native spruces, Engelmann has a shallow root system, with most roots within 50 cm from the ground surface. In deep, well-drained soils, the lateral roots may be longer than 200 cm. Roots of Engelmann spruce are associated with both ecto- and endo-mycorrhizae.

Tolerances

tolerance to	tolerance class	comments
Low light	M	A moderately shade-tolerant species but less tolerant than its most common associate, subalpine fir.
Frost	H	
Heat	M	infrequent on montane sites
Water deficit	M	Infrequent on water-deficient sites.
Water surplus	H	Frequent on waterlogged sites.
Nutrient (mainly N) deficiency	M	Absent in acid, very poor soils.

Damaging Agents

damaging agent	resistance class	comments
Snow	H	Protection-requiring on high snowpack sites.
Wind	L	shallow rooted, similar to white spruce
risk class		
Fire	H	Especially in dry subalpine climates.
Insect	M	Spruce beetle, western spruce budworm, white pine weevil, and the ragged sprucegall adelgid
Fungi	M	Root and butt rots in old-growth stands (Schweinitzii butt rot, tomentosus root rot, and red ring rot).

Associated tree species and successional role

In British Columbia, Engelmann spruce grows in pure stands, but more frequently in mixed-species stands. It is present in early, mid-, and late stages of secondary succession; a minor component in old-growth stand in the subarctic MH, upper IDF, and subarctic CWH subzones, a variable component in old-growth stands in the ESSF zone.

associated tree species	occurrence class	major area of occurrence
Subalpine fir	H	One of the most common associates.
Lodgepole pine	M	Upper montane boreal and throughout subalpine boreal climates in central and southern B.C.
Subalpine larch	L	upper southern ESSF
Limber pine	L	upper southern ESSF
Mountain hemlock	L	Upper ICH and subarctic MH.
Common douglas	L	Upper MS, ICH, and subarctic CWH.
Western hemlock	L	Upper ICH and subarctic CWH.
Whitebark pine	L	Upper southern ESSF.
Western larch	L	Upper southern MS and lower southern ESSF.
White spruce (& hybrids)	L	Upper MS and SBS.
Pacific silver fir	L	Wetter subarctic CWH and subarctic MH.

Silvical Characteristics

characteristic	interpretive class	comments
Reproduction capacity	M	A moderate seed producer; cone production begins at an age of 15-40 years.
Seed dissemination	M	Dispersion up to 250 m from the

capacity		parent tree.
Potential for natural regeneration in low light	L	very low compared to subalpine fir; mainly develops in canopy gaps
Potential for natural regeneration in the open	H	providing the presence of exposed mineral soil or burnt forest floors; partial shade is beneficial for seedling establishment on high elevation sites
potential initial growth rate (<5 years)	L	Usually <10 cm/yr when planted.
Response of advance regeneration to release	M	less than for subalpine fir, its common associate
Self-pruning capacity in dense stands	M	less than for subalpine fir, its common associate
Crown spatial requirements	L	Long, narrow crowns.
Light conditions beneath closed-canopy, mature stands	M	Understory is better developed than in pure subalpine fir stands
Potential productivity	H	Decreases with increasing elevation; site index (50 yr @ bh) on zonal sites decreases from ± 30 m on lower subalpine sites to <10 m on upper subalpine sites.
Longevity	H	Trees >600 year-old are not uncommon.

Genetics and Notes

Genetics

Population differences have been little studied, and there are no recognized races or geographical varieties. However, there is abundant evidence that natural introgressive hybridization occurs between Engelmann and white spruce and between Engelmann and Sitka spruces.

Natural hybridization between Engelmann and white spruce has been reported widely in the literature (Johnson 1939, Little 1953, Wright 1955, Garman 1957, Taylor 1959, Roche 1969). This hybridization, associated with easy introgression especially in the SBS zone, has resulted in this taxon being considered only as *Picea glauca* ssp. *engelmannii* (Parry ex Engelm.) (Taylor 1959). Because introgression is so common in British Columbia, it becomes hardly practical to use any binary name for the hybrid populations. Introgressive hybridization was discussed by Anderson (1949).

Engelmann spruce hybridizes less commonly with Sitka spruce (Wright 1955, Daubenmire 1968, Roche 1969); however, such a putative hybrid was observed in southwestern British Columbia (Klinka et al. 1982) in the subarctic CWH zone. No attempt was made to coin a binary nothomorph for this hybrid.

Notes

Engelmann spruce is a desirable component in pure or mixed-species stands in high-elevation interior forests. Because it is only occasionally affected by Indian paint fungus, which commonly destroys the heart wood of subalpine fir, Engelmann spruce should be maintained or even increased where timber production is the major management objective. More detailed silvics information is given by:

Alexander, R.R. and W.D. Shepperd. 1990. *Picea engelmannii*. Pp. 187-203 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.