Douglas fir (Fd) - *Pseudotsuga menziesii*

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BC Distribution of Douglas fir (Fd)

Range of Douglas fir - Click to change image size:

An old cohort of common douglas on a moist, rich site in the CWH zone in Coquitlam River valley

Geographic Range and Ecological Amplitudes

Description

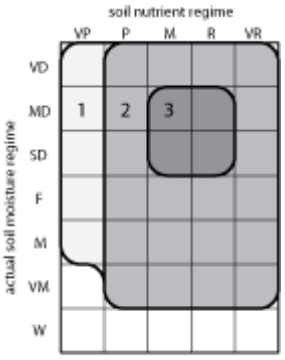
Common douglas is one of the most important and valuable timber species of Western North America, as well as many other temperate forest regions in which it has been successfully introduced. It is a medium- to large-sized (reaching nearly 100 m in height), evergreen conifer, and at maturity has a moderately dense, conical crown with long branches, and deeply furrowed, dark reddish-brown bark with irregular, broad ridges.

Geographic Range

Geographic element:
Western North American/Pacific and Cordilleran

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

Ecological Amplitudes



generalized edaphic amplitude of common douglas according to actual soil moisture and nutrient regimes

Climatic amplitude:
(subalpine boreal) - montane boreal - (semiarid) - **cool and warm temperate - cool (and warm) mesothermal**

Orographic amplitude:
submontane - **montane** - (subalpine)

Occurrence in biogeoclimatic zones:
(lower southern MH), (lower southern ESSF), MS, southern SBS, (SBPS), (BG), (PP), **IDF, southern ICH, CDF, southern CWH**

Edaphic Amplitude

Range of soil moisture regimes:
very dry - **moderately dry - slightly dry** - fresh - moist - very moist

Range of soil nutrient regimes:
(very poor) - poor - **medium** - rich - very rich

It has been experimentally found that common douglas grows poorly where it is

dependent only on NH4-N for its nitrogen supply, but grows best in soils that are rich in NO3-N (Garm 1958, Krajina 1969). Nitrate-poor soils are indicated by Mor humus formation and the presence of oxylophytic plants, while nitrate-rich soils are indicated by Moder and Mull humus formation and the presence of nitrophytic plants (nitrate accumulators) which have easily detectable nitrates, especially in their leaves: such as *Sambucus racemosa L., Rubus spectabilis Pursh, R. parviflorus Nutt., Ribes bracteosum Dougl. ex. Hook., R. lacustre (Pers.) Poir, Adenocaulon bicolor Hook., Asarum caudatum Lindl., Athyrium filix-femina (L.) Roth, Bromus vulgaris (Hook.) Shear, Cardamine breweri S. Wats., Carex deweyana Schwein., C. hendersonii Bailey, Cinna latifolia (Trev. ex. Goepp.) Griseb, Claytonia sibirica (L.), Dicentra formosa (Andr.) Walp., Galium triflorum Michx., Geum macrophyllum Willd., Melica subulata (Griseb.) Scribn., Mitella ovalis Greene, Oenanthe sarmentosa K. Presl ex. DC., Osmorhiza chilensis Hook. & Arn., Stachys cooleyae Heller, S. mexicana, Stellaria crispa Cham. & Schlecht., Tellima grandiflora (Pursh) Dougl. ex. Lindl., Tiarella laciniata Hook., T. trifoliata L., Tolmiea menziesii (Pursh) Torr. and Gray,* and *Urtica dioica (L.)*. However, in addition to nitrates, some ammonium compounds are beneficial for common douglas as they are necessary for phosphorus to be in soluble form.

Calcium deficiency is manifested in calcium-dieback of roots. However, common douglas may survive more easily than other species because it can develop new roots when older ones die.

Tolerance and Damaging Agents

Root System Characteristics

Common douglas is a deep-rooting species; however, as in many other tree species, its root morphology varies according to the nature of the soil. In deep, well-drained soils, taproots may grow up to 50% of their final depth in 3 to 5 years. Plate-like root systems develop when it grows in shallow soils or with a high water table. Fine roots are concentrated in the upper 20 cm of soil. Roots of common douglas are associated with both ecto- and endo-mycorrhizae.

Tolerances

tolerance to	tolerance class	comments
low light	L - H	protection-requiring in dry climates, exposure-requiring in humid climates
frost	L - M	low in coastal populations, intermediate in interior populations
heat	M - H	intermediate in coastal populations, high in interior populations; protection-requiring on warm and dry sites
water deficit	M	protection-requiring on dry and warm sites
water surplus	L	intolerant of flooding and strongly fluctuating water table
nutrient (mainly N) deficiency	M	infrequent on very poor sites

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Damaging Agents

damaging agent	resistance class	comments
snow	L - M	low in coastal populations, intermediate in interior populations
wind	H	n well-drained soils
	risk class	
fire	M - H	resistant to ground fires when mature; susceptible to crown fires

insects	H	a major concern in interior populations; western spruce budworm; Douglas-fir tussock moth
fungi	H	root and butt rots (e.g., red ring rot, Armillaria root disease) are a major and increasing concern; Douglas-fir needle cast not a serious concern
other agents	L	dwarf mistletoe (Arceuthobium douglasii Engelmann); browsing and clipping by rabbits, hares, pocket gophers, mountain beavers, and deer

Associated tree species and successional role

In British Columbia, common douglas grows in pure even-aged (usually after wildfires), uneven-aged stands, or in a great variety of mixed-species stands. It is often a pioneer species (primary succession) on colluvial sites, and is present in early, mid-, and late stages of secondary succession. It is a major or minor component in old-growth forests in boreal, cool temperate, and cool mesothermal climates.

associated tree species	occurance class	major area of occurance
western hemlock	H	one of the most common associates in CWH and ICH
western redcedar	H	one of the most common associates throughout the native range of common douglas
trembling aspen	M	central and southern B.C
ponderosa pine	M	Southern B.C
lodgepole pine	M	throughout the native range of common douglas
western larch	M	throughout the native range of western larch
white spruce (& hybrids)	L	mainly in southern SBS
engelmann spruce	L	lower central and southern ESSF

	paper birch	L	throughout the native range of common douglas
	bigleaf maple	L	CDF and southern drier CWH
	subalpine fir	L	MS, southern SBS, and southern ICH
	grand fir	L	southern ICH and CDF
	pacific silver fir	L	southern montane CWH

Silvical Characteristics

characteristic	interpretive class	comments
reproduction capacity	H	cone production as early as 10 years; even old trees produce viable seed
seed dissemination capacity	H	most seeds fall within 100 m of the source; maximum distance to 2 km
potential for natural regeneration in low light	L - H	low in wettest climates, high in driest climates
potential for natural regeneration in the open	H	especially after wildfires
potential initial growth rate (<5 years)	H	first-year seedlings on productive sites may develop shoots about 10 cm long
response of advance regeneration to release	H	diameter response is immediate, height growth response is delayed
self-pruning capacity in dense stands	H	higher in coastal populations than in interior populations
crown spatial requirements	M	higher in coastal populations
light conditions beneath closed-canopy, mature stands	M	usually associated with a well developed moss and herb layer
potential productivity	H	site index (50 yr @ bh) about 40 m on the most productive coastal sites; continued height growth of coastal trees for more than 200

		years; the tallest tree on record over 100 m
longevity	H	the oldest trees may be >1,500 years

Genetics and Notes

Genetics

Common douglas has two widely recognized varieties: *menziesii*, the green or coastal variety, and *glauca*, the blue or interior variety. Intravariety breeding is fairly frequent but not easily detectable morphologically. The interior variety grows more slowly than the coastal variety, both in the interior and along the coast; but the coastal variety does not survive or grows poorly in cool temperate climates.

Common douglas has one of the broadest latitudinal range of any North American conifer. Thus clinal patterns of variation in growth and phenological traits have been observed over latitudinal, as well as longitudinal, and elevational transects.

Notes

Common douglas is a very productive and desirable species considering its easy regeneration and good growth which remains fairly constant for a long time. More detailed silvics information is given by:

Hermann, R.K. and D.P. Lavender. 1990. Pseudotsuga menziesii. Pp. 527-540 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.

Oliver, C.D., D.P. Hanley, and J.A. Johnson. (editors) 1986. Douglas-fir: Stand management for the future. Institute of Forest Resources, Contribution No. 55, University of Washington, Seattle, Washington. 388 pp.