



Douglas-fir

The good structural qualities of Douglas-fir timber have earned it a sound international reputation and world-wide market.



Douglas-fir (*Pseudotsuga menziesii*) is widely planted around the world for its timber, which is stiff and strong. In New Zealand Douglas-fir ranks as the second most important plantation softwood after radiata pine, accounting for around 6% of the planted forest estate.

Douglas-fir is generally slower growing than radiata pine, especially in its early years, with commercial rotations of around 45 – 50 years. It is especially suited for areas that are too cool for radiata pine but needs to be sited to reduce the risk of wilding spread.

The timber is often grown for high-quality structural timber. As such, it is generally more valuable than radiata pine timber, and timber volume per hectare at harvest is greater.

History

Douglas-fir is a tall, evergreen conifer native to western North America. It was introduced to New Zealand in 1859 with large scale planting starting from around 1900. Trees from the warmer, southern end of its natural range have been found to be better adapted to New Zealand conditions.

New Zealand's southern South Island regions are among the best in the world to grow Douglas-fir. It also grows well in cooler, wetter parts of the central North Island. It is the species of choice for high-elevation sites with winter snowfall.



Although initially a slow grower, the volume growth of 50-year-old stands can be as much as 50 cubic metres per year. Maximum stand volumes are usually reached at less than 200 years but the trees can reach 1,000 years or more in age.

Silviculture

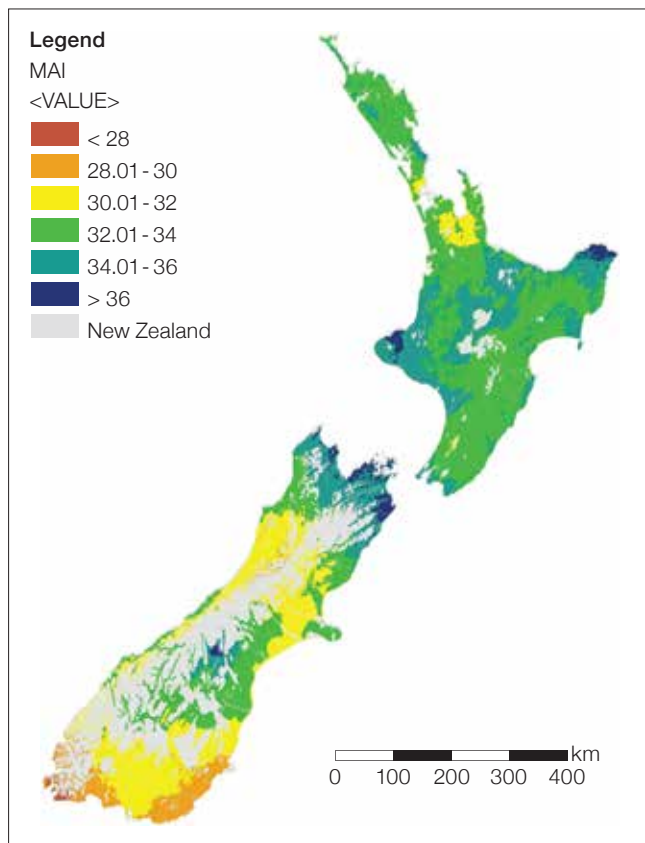
Douglas-fir requires cool conditions and is resistant to snow damage. It grows best at higher altitudes in higher rainfall sites in moist, free-draining, un-compacted soils. On good sites, it will grow for more than 500 years and live for more than 1000 years, reaching up to 100 metres in height and more than 4 metres in diameter.

Douglas-fir should be thinned to 400 and 600 stems per hectare, which will restrict branch size and sapwood growth. It can cope with a moderate amount of shade.

Douglas-fir is susceptible to Swiss Needle Cast, a foliar disease that leads to needle loss and reduced growth rates. The disease is particularly prevalent in warmer North Island sites.

Wildings spreading from Douglas-fir plantations is a risk. Its seed is light, easily dispersed and germinates readily. The wilding trees threaten landscapes and ecosystems, especially in the South Island high country, and there are tight controls on new planting in some locations.

A New Zealand wide productivity index, the 500 Index, can be used to compare Douglas-fir yields across a range of sites. Growth and yield can be also simulated using forest modelling software such as Forecaster <https://forecastercalculator.integral.co.nz>



Douglas-fir mean annual increment (MAI) volume growth per hectare per year at age 45.

Timber

Douglas-fir timber is stiff and strong. It is primarily used for structural timber. It is less suitable for furniture, panelling and veneers due to its tendency to split and splinter, which makes it difficult to machine to a smooth surface. It is also hard to get a consistent finish with staining or gluing.

The heartwood has a pinkish appearance and easily dried and very stable. However, it is not used externally in New Zealand as it is not sufficiently durable and it resists preservative penetration. Clear timber has been used for yacht masts, ladder rails and scaffold planks, where its straightness and stiffness are valued. Small-knot timber will readily pass machine stress grading for framing. Knottier timber is used in larger sections for structural beams and columns. Both heartwood and sapwood require boron treatment for internal structural applications.





Improving performance

The Douglas-fir breeding programme is focusing on improving volume production, wood quality, and tolerance to Swiss Needle Cast. Growth targets include reducing rotation length to 35 years, increasing the total recoverable volume per hectare and increasing the mean annual volume increment per hectare.

The breeding programme faces a challenge in that good seed production years tend to occur intermittently. Research into cloning of Douglas-fir is progressing with work now focussing on maturing embryos into tiny trees.

In wilding management, work is focussing on breeding trees with natural low fertility. Shy-coning trees, which produce low quantities of seed are being crossed and cloning is being used to produce very low fertility trees that will be field tested to test their fertility and overall performance.

Carbon sequestration

The average carbon stock potential of Douglas-fir is around 200 tonnes of carbon per hectare at 40 years of age.

References and resources

NZ Farm Forestry Association, for example <https://www.nzffa.org.nz/farm-forestry-model/species-selection-tool/species/fir/douglas-fir/>

NZ Forest Owners Association Douglas-fir information for growers <https://fgr.nz/programmes/alternative-species/douglas-fir-information-growers/>

A detailed introduction to Douglas-fir, including history, sources, and cultivation. Introduced forest trees in New Zealand: Recognition, role and seed source. 14. Douglas-fir (1994). Miller, J. T. & Knowles, F. B. FRI Bulletin No.124.

New Zealand Douglas-fir www.douglasfir.co.nz/

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About Scion

Scion is the Crown research institute that specialises in research, science and technology development for the forestry, wood and wood-derived materials and other bio-material sectors.

Scion's purpose is to create economic value across the entire value forestry chain, and contribute to beneficial environmental and social outcomes for New Zealand.



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Prosperity from trees *Mai i te ngahere oranga*