

# douglas- fir



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## "the real tree"

When Captain Cook visited the Pacific coast of North America in 1778, the trees and plants growing there had only Indian names, which differed from tribe to tribe. The largest tree was often called the "big tree" or the "real tree" — in Squamish, "Kwekwel hay". In the ship's diary, Cook referred to this "real tree" as fir, because its appearance resembled the true firs of Europe.

In 1792, Archibald Menzies, a naturalist of the famous Vancouver expedition and the first European scientist to visit the Pacific coast, collected herbarium specimens of local trees. From this collection the botanist Lambert, the leading English authority on conifers, described the "real tree" as a pine, *Pinus taxifolia*.

In 1825, the Royal Horticultural Society sent David Douglas, a Scottish botanist, to the Pacific coast to study the local forests and bring back seed of any species he considered suited to the English climate. Douglas recognized the "real tree" as an unknown species and gave it its present generic name, *Pseudotsuga menziesii* (false hemlock). In his honour, it became generally known as "Douglas-fir".



Coastal



Interior

## historical uses

Douglas-fir played an important role in the lives of British Columbia's first settlers, the Indians. It was the most important source of fuel; the bark was eagerly sought because it burned with a hot smokeless flame. The word "p'elan" meant fuel or bark to the Salish around Sechelt, B.C., and "p'elaney" meant Douglas-fir. Pitchy wood and branches were used for torches.

Because of its hardness and resistance to splitting, Douglas-fir was rarely used in woodwork. However, tools, harpoon shafts, spears, handles, utensils, fire tongs and other articles were made of fir. Fir knots were molded into curved halibut and cod hooks by steaming and bending them to the desired shape. The finished hook was rubbed with tallow to keep its shape.

In the sweat lodge, Douglas-fir boughs were put over hot rocks. A dye prepared by boiling the bark was used to make nets invisible to fish. Hides were tanned by rubbing them with rotten wood. The pitch was used to patch canoes and other water vessels.

Pitch was also applied to sores and wounds as a poultice. Boiled with or without needles into a tea, it was used as a cold medicine. Buds were chewed for sore throat or sores in the mouth. Needles were boiled to make a tonic tea. Heated, they were applied to the chest to "draw out the pain", or burned to ashes and mixed with animal fat and used as a general ointment. For "moving pains in the bones", half-burned ashes or coals were placed on the affected parts and allowed to burn slowly into the flesh. Those who lacked the courage to use this heroic treatment were held by their friends during the process.

## early exploitation

With the growth of the white settlement, the use of Douglas-fir increased. Dr. John McLaughlin, Hudson's Bay Company agent and a friend of David Douglas, erected, in 1828, the first sawmill on the northwest coast and began cutting fir.

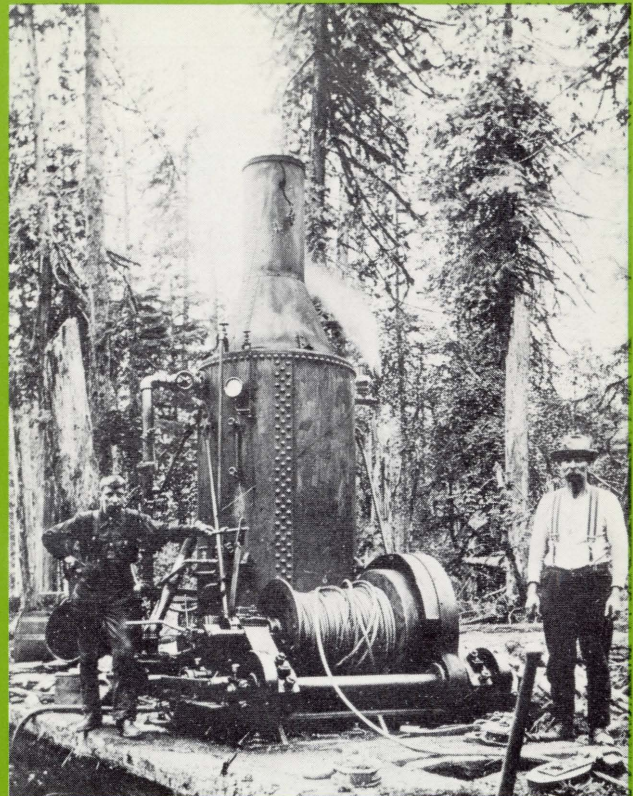
The great days of northwest logging really began toward the end of the last century, after lumbering in the east had depleted the virgin forests of eastern white pine. Some firms came west as a



unit, bringing their lumberjacks with them; one old Maine firm even transported its mills in sections around Cape Horn. Many bought up great blocks of forests from the railroads, which had received them from the government as grants to compensate them for building transcontinental lines. Others bought large tracts from homesteaders or leased the land directly from the government.

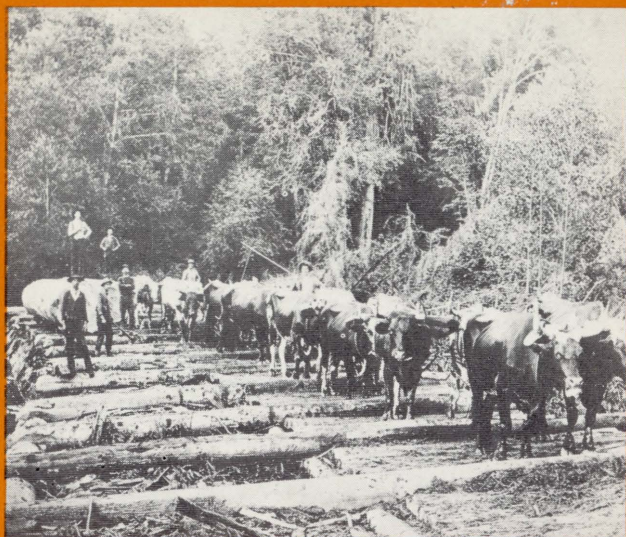
Falling the giant trees called upon all the skill, courage and inventive genius the loggers had gained in a hundred years of cutting eastern pines. The fallers worked on springboards, and undercut notches were chopped as much as five feet deep. Then started the Herculean task with a 12-foot falling saw that ended, often the next day, with the loud warning "Timber! Timber!"

The next step was to get the big sticks out of the woods. Long strings of oxen dragged the giant timber along skidroads until the logs that acted as



rollers smoked from the heat of friction. The air was often blue with the oaths of the hard-driving bullwhackers.

The arrival of the donkey engine speeded delivery of logs. The mills grew larger and installed multiple saws, and a further speed-up of log delivery was needed. This was done by "high-lead", where logs moved along on cables slung above the tops of the forest. The loggers called it "high-balling". The need for a great "spar" on which to rig the pulleys and cables brought into existence the "high-rigger", the steeple-jack of the woods who, some 200 feet up the trunk, sawed off the top of a giant tree and attached blocks weighing more than a ton to its top. Slingers hooked chokers to the logs; chasers hooked them to the main line; flagmen waved to the whistlepunk; the donkey punchers started the steam engine, and a log weighing up to 30 tons was on its way to the mill.



The lumber industry in the northwest learned nothing from the wastage, the fires, and the boom-and-bust days of lumbering pines in the east. Those were the crude days of exploitation, of timber barons and timber pirates, when labour troubles went to the shooting stage and saloon bars were a mile long. Those boisterous days are gone. Lumber camps grew into permanent towns with fine schools, churches, hospitals and parks. Today, employees in the industry enjoy high living standards and a way of life similar to that of people living in the cities.

## properties and uses

In the heyday of early exploitation, the area where Douglas-fir grew — from central British Columbia to northern Mexico — became the lumber yard of the world. True, for a century after its discovery, this region was remote from the lumber markets, but transcontinental railroads, and especially the Panama Canal, made it possible to sell Douglas-fir all over the world. Protected waters along the intricate Puget Sound and inlets of Vancouver Island and the mainland facilitated the movement of great log rafts and permitted ocean-going vessels to dock at the mill yards.

But most significant of all has been the fact

that wood from this giant tree is, by its physical properties, of the very best grade. In proportion to weight, Douglas-fir is one of the strongest woods ever tested and one of the most durable of soft-woods. It is comparatively light and moderately hard, tough, resilient, water and stain resistant and easily workable. It is used in large-frame structures because of its stiffness and because it can be obtained in sizes equalled only by a few other species. Timbers of large dimensions remain of great importance and are called for in structural beams and trusses as well as in the construction of reinforced concrete buildings, where long and strong wooden forms must rigidly hold large volumes of wet concrete.

One of the most revolutionary developments in the construction industry has been the invention of plywood. In this field, Douglas-fir has taken the lead — a position it probably will always hold. Layers of veneer, bonded together under heat and pressure by modern glues, stronger than the natural wood itself, can be extended to any size and bent into any shape.

Douglas-fir lumber can be dried quickly, either in the air or in kilns, and yields high uniformity of seasoned stock. Kiln-dried, it makes beautifully figured interior woodwork, both in vertical and flat grain. It does not check, warp, twist, shrink excessively or pull nails with changes of moisture content. It can be finished easily; it takes stain, oil, polish, varnish and paint well.

Thousands of miles of railroad tracks are laid on Douglas-fir ties; electric power and telephone messages are transmitted by wires held by Douglas-fir poles. When creosoted under alternating vacuum and pressure, Douglas-fir is suitable for structural use even in salt water — wharves, battered by high waves and heavy ships for more than 50 years, are still in service on the coast of British Columbia.

Because of the high demand for other uses, only low-grade Douglas-fir logs are used for pulp. Kraft paper from Douglas-fir is, in quality, equal to the best of the other conifers.

A list of uses of Douglas-fir is very nearly a complete list of the uses of wood. Even the bark, once considered a loss, is ground up to serve as a soil conditioner, as absorbent filler in plaster and acoustical products, as a substitute for cork, in



sound recording and numerous other uses. More than 500 inventions using Douglas-fir bark have been patented.

No wonder heavy demand brought about a depletion of Douglas-fir in accessible areas. In spite of this, as well as a limited distribution in Canada, it is one of our most valuable sources of timber. It rates fifth in the timber resources of British Columbia, behind spruce, hemlock, true firs and cedar. The volume now comes from areas previously considered inaccessible and from second-rotation stands.

In the United States, where most of its range lies, Douglas-fir constitutes almost 20 per cent of the total volume of wood cut each year, surpassing all other species.

## description

Douglas-fir is really a mighty tree. Mature specimens about 600 years old, attaining a height of 250 feet and diameter of six feet are common. Individuals 1,200 years old, more than 300 feet in height and 15 feet in diameter, have been indisputably reported. There is also a report of the legendary "Carey fir", said to have been cut in 1895 in Lynn Valley near Vancouver, which was 417 feet high, 300 feet to the first limb, 25 feet in diameter, and still nine feet

in diameter at a height of 207 feet. Although it is listed at the top of "big tree" records around the world, foresters doubt that it ever existed; if so, it was the tallest tree ever recorded.

Douglas-fir reaches its best development on deep, well-drained soils, where the annual precipitation is around 70 inches and the climate is not subject to extremes. However, it can grow under a wide range of soil and climatic conditions. On the Coast, it is a wet-climate tree, growing in humid mountainous regions where the annual precipitation may approach 200 inches. It is also a dominant species on the interior plateau, where precipitation may be less than 20 inches and temperature extremes considerable.

At the northern limits of its distribution, Douglas-fir is a low-elevation species, descending on the Coast to sea level and in the Interior growing mainly on warm, south-facing slopes, because temperature, not moisture, is the limiting factor. In the United States, at the southern limits of its distribution, it is often found at the timber line, 11,000 feet high. In the southern interior, where lack of moisture is the limiting factor, the best Douglas-fir stands are on the north-facing slopes.

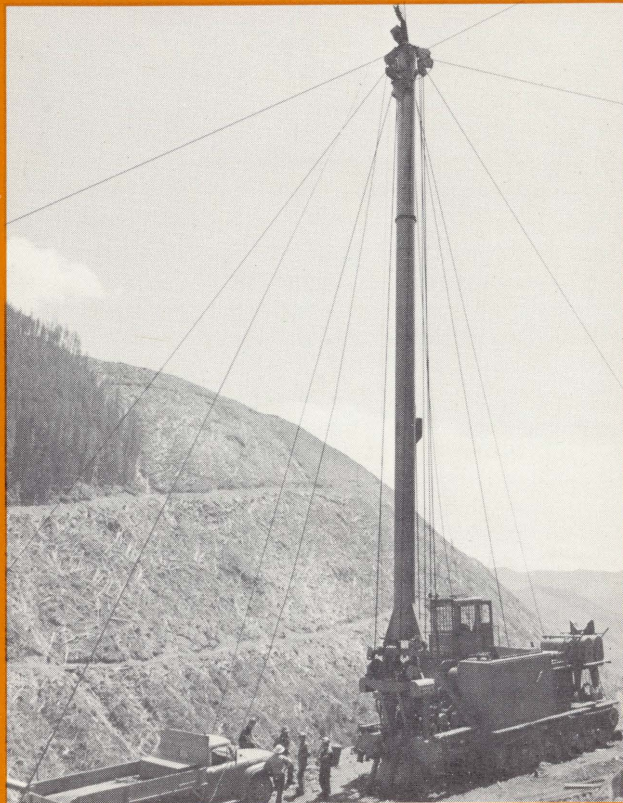
In the wet zone of its distribution, the most outstanding characteristic of Douglas-fir is its intolerance of shade; it requires an open or lightly shaded site, preferably of mineral ground, for establishment. Once established, its existence is only temporary. As the first generation grows and closes the crown canopy, young Douglas-firs cannot grow in the shade cast by their own parents. A new regeneration is composed of the more shade-tolerant species — Western Hemlock, Western Red Cedar and the true firs. As old stands break up and trees die and fall, shade-tolerant species form a dense, more permanent forest. Foresters speak of Douglas-fir as being a pioneer and the others as climax species.

Yet Douglas-fir has not disappeared from the wet coastal forests, as its shade intolerance would suggest. Pure Douglas-fir forests were common before white settlement. Since the Ice Age ended some 10,000 years ago and the forest vegetation returned, practically every pure stand of Douglas-fir composed of trees of similar age can trace its origin to a fire, as the charcoal in the soil unquestionably indicates. A severe fire only once in every 500 years

is sufficient to suppress the shade-tolerant species and preserve the site permanently for Douglas-fir.

Rain and fog along the exposed shores of northern British Columbia have essentially prevented forest fires; consequently, Douglas-fir is rare on the wet outer coast of Vancouver Island and absent from the northern mainland coast and Queen Charlotte Islands. There, the uneven-aged forests of mixed, shade-tolerant species are approaching the climax, a more permanent stage in the natural forest succession.

In the interior of British Columbia, Douglas-fir does not attain the same size as on the coast, but it is still the largest tree in the forest. In the "wet belt" similar to the coast, its presence depends on the destruction of the original stand and its position is that of a pioneer. In the dry zone, Ponderosa Pine becomes the pioneer species, and Douglas-



fir regenerates under its canopy. On these dry sites, even Douglas-fir stands are typically open. Regeneration establishes under the mature canopy and assumes the role of a climax species.

Within its natural range, Douglas-fir is the species preferred by foresters. It regenerates successfully after logging where seed is available and is planted even on sites where, under natural conditions, it would be rare. Natural stands of Douglas-fir often start with several thousand seedlings per acre. At 100 years, 300 trees per acre on poor sites and only about 75 trees per acre on the best sites constitute a fully stocked stand. Suppressed trees are shaded out and die.

When Douglas-fir develops in closed stands, the lower shaded branches die rapidly. However, breaking off of dead branches or "natural pruning" is slow because the dead branches resist decay. Generally, on sites of medium quality, 30 feet of clear bole is achieved at about 100 years. The massive trunks of mature trees, clear of branches for 80 to 100 feet, are usually straight with only a slight taper.

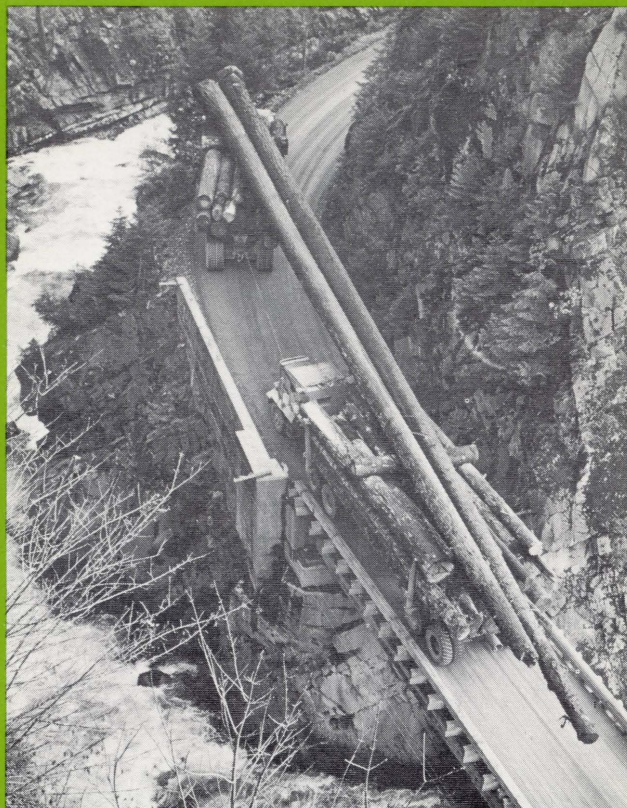
The tree has only a narrow ring of sapwood, seldom over two inches thick. The sapwood is usually yellow; the heartwood is yellowish brown to reddish brown and becomes more distinct upon exposure to air.

On young trees, until they reach about 12 inches in diameter, the bark is ashy brown, often chalky in patches, and thin and smooth. On old trees, it is typically rough and deeply furrowed, dark brown on the outside and reddish brown when cut. It may be as much as 16 inches thick at the base of the trunk.

The typical crown form of young trees is a broad, sharp pyramid. The lower branches are drooping, the higher ones trend upward, forming a rather open crown top. As the trees grow older, the crowns become rounded and flattened.

The young foliage is deep yellow-green; mature foliage is usually dark green on the Coast and blue-green in the Interior. The needles remain on the tree for about seven years; they are usually 1 to 1½ inches long, flat, soft and blunt-pointed.

Male and female cone buds form on the new shoots in late summer and are distinguishable by early September. Female buds usually occur just



below the terminal buds; the male buds are further down the shoot.

Reproductive buds of both sexes open in April. Female cones are receptive to pollination within a week of opening. At that time they are flame-red and erect, with prominent, three-pronged bracts. These long, three-pronged bracts distinguish Douglas-fir cones from any other species. Soon after pollination, they turn light green and hang down. Male cones, yellow-green during pollination, are on the underside of the twigs; after pollination they wither and break off. The actual fertilization of the female cone takes place about two months after pollination and cones ripen by early September. The seed is provided with a wing and wind dissemination occurs two to four weeks after ripening.

With a few exceptions, Douglas-fir trees do not produce seed until about 15 years old, with

maximum seed production at about 200 years. Heavy seed crops occur once every three to 15 years, depending on the elevation at which the trees are growing.

Germination takes place from early April to late June on almost any seedbed that provides adequate moisture and temperature. Except for those eaten by rodents, most seeds germinate but mortality of germinants may be high, due to heat injury, drought, competition, frost, insects or disease. Some shade is beneficial for seedling establishment on dry sites, but older seedlings grow best in full light. Height growth is usually completed during August; diameter growth may continue until October.

During the first few years, the tap root is the most important root of the root system, but laterals, growing obliquely into the soil, soon penetrate a large volume of soil and provide water, nutrition and relative stability, even in high winds. Generally, the root system spreads over an area three to six times larger than that covered by the crown, and overlapping of root systems in a stand is normal. Young trees up to about 30 years of age have extensive root systems; as the trees grow older, growth takes place more to fill in the spaces between the roots than to enlarge the area of the root system.

## natural enemies

During development, Douglas-fir stands are subject to damage from a variety of agents. On clay soils, heavy rains and high winds may cause losses from wind-throw. Heavy snow and ice may break the tops of young trees. Fires may destroy stands of any age, although the thick bark makes older trees less susceptible.

The Douglas-fir beetle kills trees from pole-size stage to maturity, and sometimes epidemics cause extensive damage. Trunk and root rots reduce the merchantable volume in both young and mature stands. *Poria weirii*, a root decay, is the most serious fungus enemy in British Columbia. Heartwood decay is caused by *Polyporus schweinitzii* and several *Fomes* species. In the dry, hot climate of the Interior, dwarf mistletoe may cause brooming, dead tops, decreased growth and even mortality.



Deer sometimes cause serious damage by browsing in young stands.

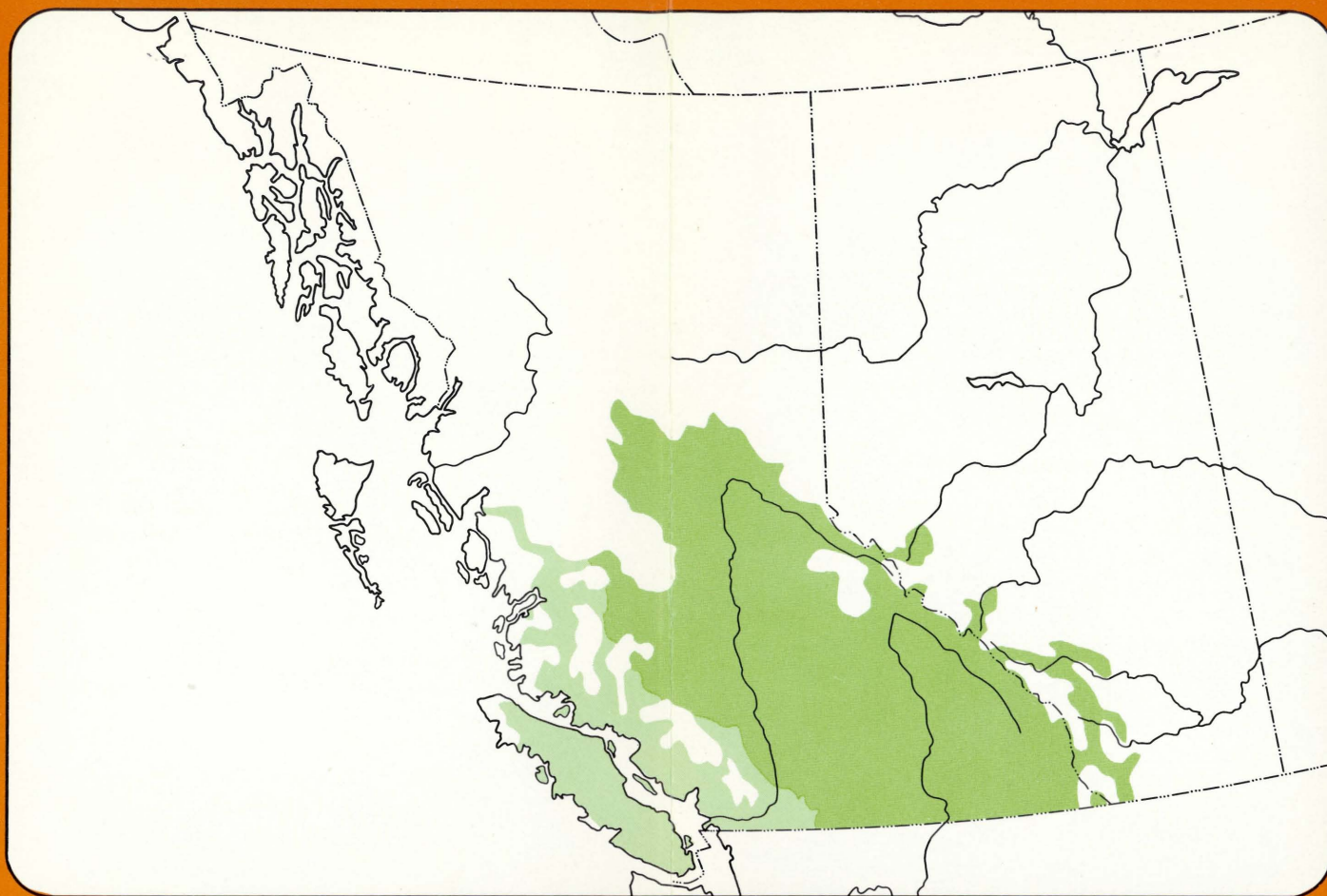
## bright future

The future of Douglas-fir is brighter than that of almost any other important tree species. Most of its range lies under the moderating influence of the Pacific Ocean, and enjoys long growing seasons, mild winters and abundant rainfall. The favourable climate allows full utilization of its inherent vigour. Steep topography and rocky soils in the north and high altitudes in the south exclude further encroaching of agriculture on the forest land.

Fire protection has developed into a science; detection from infrared photographs transmitted from satellites is almost immediate and water bombers usually extinguish fires before they reach unmanageable proportions.



Present clear-cut harvesting practices remove shade-tolerant competitors and preserve the site for Douglas-fir. Inherent early and high fertility provides seed for regeneration of most sites; where natural regeneration fails, progressive forest companies use artificial means to restock forest land. Harvesting is generally based on the "sustained yield" principle, which ensures that in any management area no more is harvested in any year than the amount of annual increment.



## reading list

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## the canadian forestry service

The Canadian Forestry Service is a federal agency concerned with all aspects of the forest environment in this country. An element of Environment Canada, the Service promotes the conservation, enhancement and wise use of our forests for the many benefits they afford Canadians. To this end, the Service

- conducts research in forest management and protection, and in wood utilization
- provides information, advice and technical services to provincial governments, the forest industries and other agencies
- disseminates information on forestry and the forest environment to the Canadian public
- supports, through science subventions, forestry-oriented research conducted by other Canadian agencies

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