DOUGLAS-FIR

Pseudotsuga menziesii, Pine family—Pinaceae

Douglas-fir is the hallmark of the Northwest's timber industry, the State Tree of Oregon, and our customary wild Christmas tree. Most Westerners who know anything about native trees are familiar with Douglas-fir—but which Douglas-fir do they know? Throughout the Greater Northwest, Douglas-fir colonizes a broader range of habitats than do any of its associates. It could be considered nature's all-purpose tree.

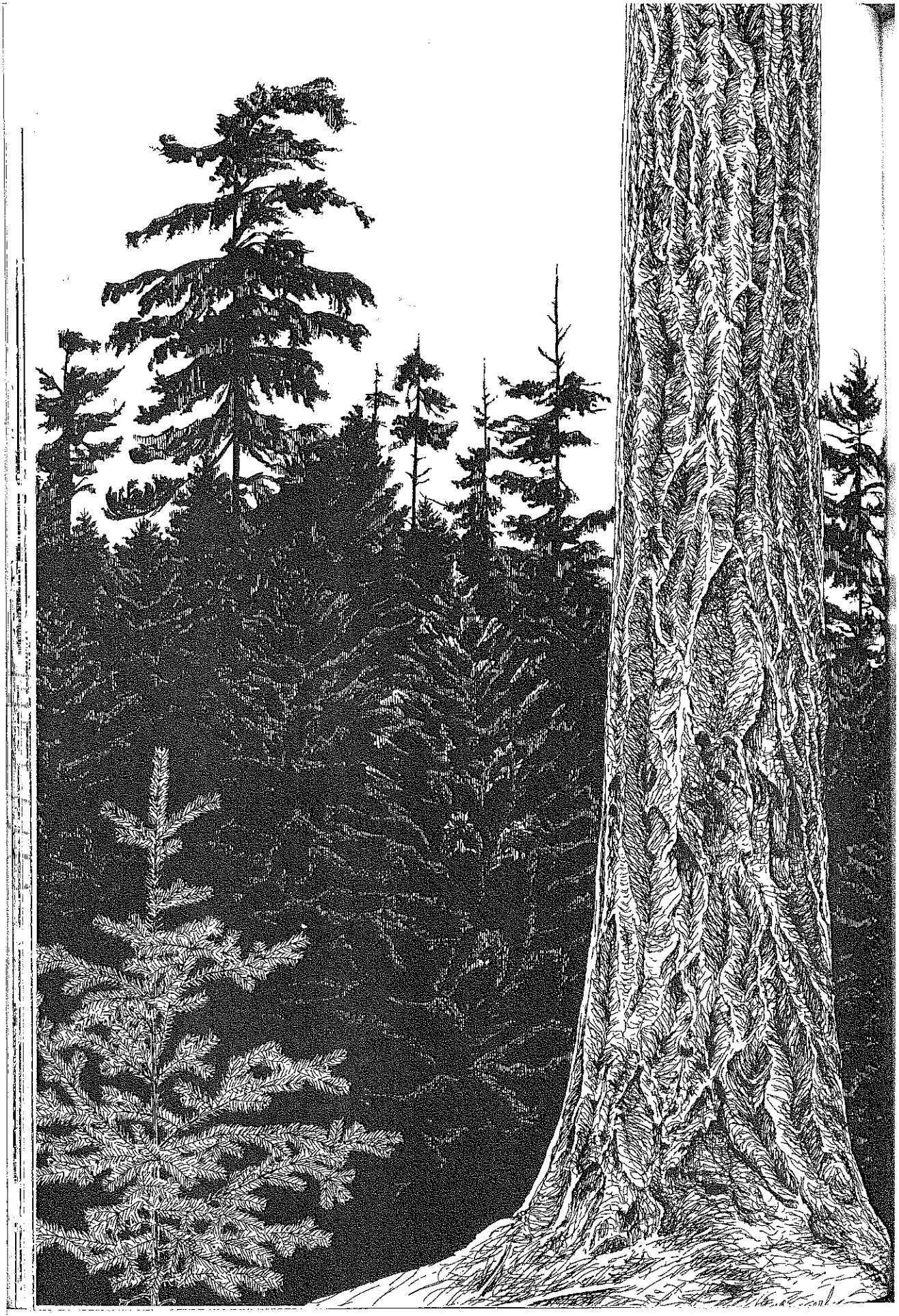
In some forests, Douglas-fir is a pioneer (or early successional) species that depends on fires or other disturbances lest shade-tolerant true firs (*Abies* species) or western hemlock displace it. In other forests, Douglas-fir is the most shade-tolerant tree, and it supplants fire-dependent trees including ponderosa pine and western larch. Then again, in some cold, dry environments Douglas-fir alone makes up the forest.

West of the Cascade crest, Douglas-fir is the most common native evergreen in residential and rural areas. It is also the vigorous young conifer that regenerates after logging, a magnificent old-growth colossus in the rain forest, the predominant conifer in dry areas including the San Juan Islands, and often the small misshapen tree clinging to rock cliffs. In humid northern Idaho, Douglas-fir colonizes and grows rapidly following disturbance; but it typically dies by age 80 or so and is replaced by other species. Conversely, in the dry mountains of southwestern Montana, Douglas-fir grows slowly but can produce a bulky, heavy-limbed giant that survives 500 years.

Thus, our challenge is to comprehend the many faces of Douglas-fir and the various ecological roles it plays in different habitats. However, comprehending the Northwest's most common tree requires confronting the paradox about its identity:

Identification difficulties. Botanical explorers were impressed but also perplexed when they first encountered this species. The huge, corky-barked coastal trees were first reported in 1793 by the Scottish physician and naturalist Dr. Archibald Menzies, who encountered them on Vancouver Island while accompanying Captain George Vancouver. Three decades later, botanical explorer David Douglas described this tree in Oregon. At first, botanists classified it as a pine, and it was commonly called Oregon pine. However, this magnificent conifer does not bear needles in clusters as pines do, nor does it have pinelike cones. Bark on the young trees is smooth and pocked with resin blisters like that of the firs (*Abies*). The pointed, inch-long needles somewhat resemble spruce (*Picea*) or yew (*Taxus*), but the cone with its long, three-pronged bracts is unique. One botanist called it a fir with a yewlike leaf—in other words, *Abies taxifolia*—while John Muir and some others named it Douglas spruce.

Later in the nineteenth century, botanists exploring the mountains of China and Japan brought back samples of other similar trees that also had three-pronged cone bracts. The genus name *Pseudotsuga*, meaning "false hemlock," was proposed for this distinctive group. For a long time, our tree was called *Pseudotsuga taxifolia*; however, that name had not been recorded properly under the rules of plant nomenclature. Consequently, the official name became *Pseudotsuga menziesii* based upon the next-oldest name. Thus, the botanical name now acknowledges the original discoverer, while the common name, Douglas-fir, is applied to all the members of the genus *Pseudotsuga*. (The only other *Pseudotsuga* in the western hemisphere is a small tree bearing large cones that grows in

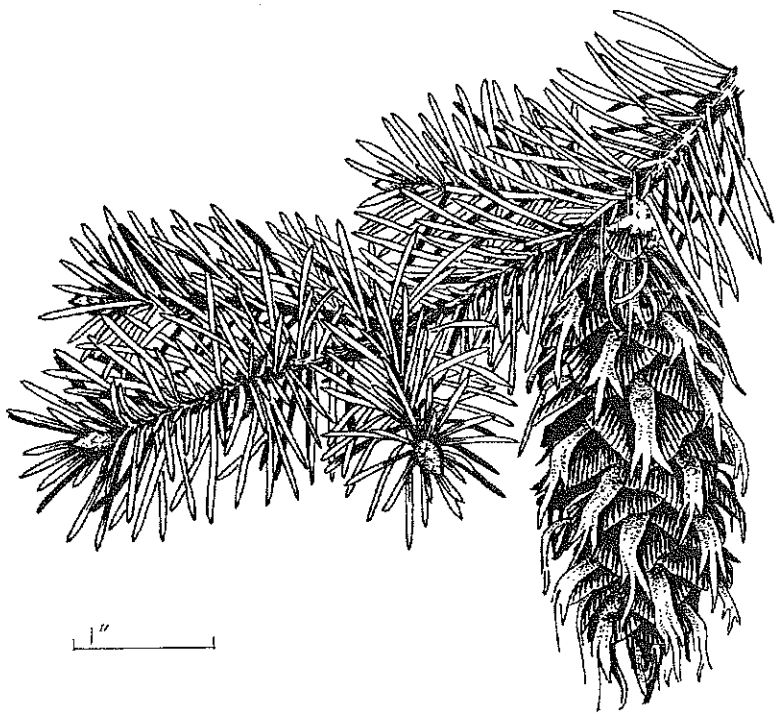


the mountains of southern California, and it is called bigcone Douglas-fir, *P. macrocarpa*.)

The common name should be hyphenated or run together as a single word (Douglasfir) because these trees are not actually firs (*Abies*). Loggers often call this tree red fir in recognition of its light reddish brown heartwood, apparent on cut logs and stumps. Naturalist Donald Culross Peattie (1950) advanced the name Douglastree, to clearly differentiate it from firs, and John Worrall and some of his colleagues at the University of British Columbia call it common douglas.

Where It Grows

Douglas-fir extends north along the Pacific coast nearly to the northern tip of Vancouver Island, in central British Columbia to about 55 degrees N latitude (vicinity of Smithers), and in Alberta to Jasper. It occupies nearly all of southern British Columbia, western Washington, and western Oregon from sea level to 5000 feet (1500 m) elevation and sometimes higher. It inhabits all inland forests in the Greater Northwest except for the driest ponderosa pine types, juniper woodlands, and highest subalpine habitats. Along the eastern slope of the Continental Divide in northern Montana and southern Alberta, Douglas-fir, sometimes accompanied by limber pine, replaces ponderosa pine in forming low-elevation dry-site forests, in a climate that is apparently too cold for



Douglas-fir

inland Douglas-fir high-lined by elk

ponderosa. Southward, Douglas-fir grows in nearly all the higher mountain ranges from Utah and Wyoming well into Mexico. It also spreads southward along the coast and Sierra Nevada to central California.

Two geographic varieties are recognized, which probably reflect genetic and ecological differences more than physical distinctions. Coastal Douglas-fir, *P. menziesii* variety *menziesii* inhabits the Cascade–Sierra Nevada and British Columbia Coast Range and lands to the west. Areas farther east are occupied by the Rocky Mountain or inland Douglas-fir, *P. menziesii* variety *glauca*.

Appearance

A healthy young Douglas-fir typically has a full canopy of long, outward-projecting limbs with abundant branchlets. Limbs near the treetop sweep upward. The branches and twigs are arranged irregularly, unlike the more symmetrical branching pattern of true firs. As trees mature in fairly dense stands, their lower branches die and eventually fall off, so that live foliage occupies only the upper 30 to 40 percent of the main stem.

Douglas-fir has needlelike leaves about 1 inch (2.5 cm) long that are attached to all sides of the twigs and are not sharp or prickly to touch. The leaves are green on the upper surface and have two white bands (of microscopic pores) on the underside. Distinctive buds aid identification; they are brown, sharp-pointed, and covered with overlapping scales that flex backward and remain after bud-burst in late spring. In contrast, buds of Northwestern true firs are blunt and covered with wax.

Douglas-fir cones have a unique diagnostic feature: three-pronged pitchfork-shaped bracts that project from between the scales. The cones are tan when mature and 2½ to 4 inches (6 to 10 cm) long in coastal Douglas-fir versus 1½

to 2¾ inches (4 to 7 cm) long in the inland variety. Some of the bracts on cones of inland Douglas-fir are bent backward.

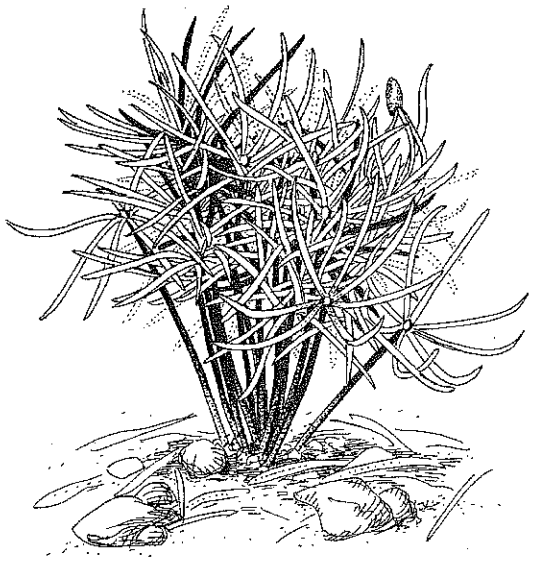
The bark on small trees is smooth and has resin-filled blisters like true firs, but once the trunk is about 12 inches (30 cm) thick, the bark starts to grow furrowed and corky. Bark continues to accumulate, becoming dark brown and deeply furrowed. It often thickens to 9 inches (22 cm) at the base of old coastal Douglas-firs and 5 inches (13 cm) on inland trees. This corky material is dense and durable, and chunks of it can still be found near ground line on stumps cut a century ago. The bark aids identification of Douglas-fir, since when cut with a knife it shows well-defined, wavy bands and lenses of light tan and dark brown, somewhat like the pattern in a pile of sliced bacon.

Coastal Douglas-firs up to 8 feet (2.5 m) thick and 250 feet (75 m) tall grace many parks and natural areas in southwestern British Columbia, western Washington, and western Oregon. Occasional trees in sheltered valleys tower 300 feet (90 m) in height, but the largest trees have often lost part of their crown to raging windstorms during their 600- to 1000-year existence. The 12- to 15-foot- (3.5- to 4.5-m) thick trunks of record-sized coastal Douglas-fir are equaled in volume only by Sitka spruce and exceeded only by giant sequoia, redwood, and western redcedar among the world's arboreal behemoths (Van Pelt 2001). Hulking old sentinels of inland Douglas-fir with enormous limbs, perched on grassy ridges at about 7000 feet (2100 m) elevation, are also impressive. Some of them—4 to 5 feet (1.2 to 1.5 m) thick and up to 90 feet (27 m) tall—can be seen along the road near Tower Junction in Yellowstone National Park.

Ecological Role

Douglas-fir is classed as intermediate in shade tolerance, which means it has the ability to regenerate and grow up beneath other trees and eventually displace them. (This process of vegetation change is called forest succession.) As a result, Douglas-fir may be either an early successional species subject to replacement by other trees or a late successional species that deposes its associates. Additionally, a third situation arises in some habitats where Douglas-fir is the only forest tree. Below, each of these roles is described in detail:

Douglas-fir is an early successional species in humid regions such as the coastal Northwest and in moist inland areas including northern Idaho. Here it depends on occasional disturbances that kill patches of forest. Otherwise shade-tolerant trees such as grand fir and western hemlock will eventually replace it. Huge old Douglas-fir trees once dominated much of the landscape west of the Cascades, largely as a result of fires sweeping through drier areas (including the Puget Sound valley) every few decades and burning moist mountain habitats every few centuries. Because of its thick bark, deep roots, and lofty crown, coastal Douglas-fir is able to survive fire better than its competitors do, and it readily colonizes burned areas. Even today, char from long-ago fires can be seen on the bark of great old Douglas-firs. Although veteran Douglas-firs still occupy large areas of



Douglas-fir seedlings from rodent seed cache

parks and forest reserves west of the Cascade crest, fire suppression is so successful here that very few of these forests experience the disturbances that helped create and sustain them. The age-old process of survival and regeneration in an old-growth Douglas-fir forest swept by fire (in 1986) can be witnessed along the Skokomish River trail a short way above Staircase Ranger Station in Olympic National Park.

In many inland areas, Douglas-fir is a late successional species that, barring disturbance, will replace its associates—ponderosa pine, lodgepole pine, western larch, and quaking aspen. Similarly, it will displace native prairies and Oregon white oak woodlands in coastal lowlands. Historically, fires favored the shade-intolerant trees or prairie vegetation and controlled the abundance of Douglas-fir. Large old ponderosa pine and larch commonly grew in open stands with Douglas-fir as a result of frequent low-intensity fires that killed most Douglas-fir saplings, whereas saplings of ponderosa pine and larch are more fire-resistant. After the pattern of historic fires was interrupted in the early 1900s, Douglas-fir saplings filled the understory and developed into thickets of small trees, susceptible to epidemics of insects and disease and more-severe crown fires.

dwarf mistletoe in inland Douglas-fir

A third situation, wherein Douglas-fir is essentially the only tree, occurs in cold, dry mountain habitats especially in southwestern Montana and eastern Idaho. Historically, scattered open stands of Douglas-fir were mixed with mountain grasslands, and periodic grass fires killed most saplings. By the 1930s, livestock grazing had removed much of the grass that served as fire fuel, and human suppression efforts had largely prevented fire. As a result, Douglas-fir saplings were able to colonize grasslands and proliferated in open forests, eventually growing into thickets of small, drought-stressed trees. This greatly diminished forage values in these formerly productive wildlife and livestock habitats (Gruell and others 1986).

Although Douglas-fir plays different roles in a myriad of forest types, most of these communities were shaped through past millennia by patterns of fire. Efforts to exclude fire have often led to undesirable consequences in Douglas-fir communities. People interested in native forests are now beginning to recognize these problems and in some cases seek remedies using knowledge of the historical ecosystem (Arno and Fiedler 2005).

Human History

Native peoples, including the Bella Coola tribe of British Columbia, had many medicinal uses for Douglas-fir, such as mixing the tree's resin with dogfish oil as a virtual panacea (Moerman 1998). Several tribes used Douglas-fir foliage as a body freshener in conjunction with sweat

Felling a coastal Douglas-fir, Mason County, Washington, in 1899. (U.S. Forest Service photo)

baths. The leaves were used by some peoples as a substitute for coffee. (Starbucks beware!) The wood and resin were widely used, and then as now, Douglas-fir was preferred firewood. The bark of coastal Douglas-fir was especially favored, possibly because this thick, corky material makes long-lasting hot coals.

Douglas-fir's wood is relatively heavy, hard, strong, and resilient under stress and is therefore broadly useful. By the turn of the twentieth century, it had replaced white pine as the prime industrial timber, since coastal Douglas-fir grew in vast forests of very large trees. It made an excellent structural material also because it was available in high-grade lumber in large sizes. Gigantic timbers of virtually any length could be cut from these trees. A 299.5-foot-long (91-m-long) Douglas-fir flagpole was part of Oregon's exhibit at the 1915 Panama-Pacific Exposition in San Francisco. Douglas-fir became a prime material for plywood and is used for a variety of other forest products as well. Today, large old trees are not widely available or needed for most lumber and other products, and there is high demand for the smaller Douglas-fir. Much of this is obtained from plantation forests in coastal areas and from thinning the overly dense stands in inland areas.