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SILVICAL LEAFLET 5.

LOWLAND FIR.

Abies grandis, Lindl.

Lowland fir is at present a species of secondary commercial importance. It is, however, of silvical significance because it grows in mixture with more valuable timber trees, like Douglas fir, western white pine, and western larch, and must be taken into consideration in the management of these species. The knowledge of its silvical characteristics is of importance in determining the diameter limit to which it must be cut and in arranging the cuttings to favor the reproduction of better species.

RANGE AND OCCURRENCE.

Lowland fir grows along the Pacific coast from the Navarro River in Mendocino County, Cal., northward into southwestern British Columbia. It extends eastward from the coasts of Washington and Oregon to the western slope of the Rocky Mountains in southern Canada and in northern Idaho and Montana, where it is common in the Bitterroot and Coeur d'Alene mountains. Although on the western slope of the Coast ranges it grows as far south as Mendocino County, Cal., it extends in the Cascade Mountains in Oregon only to the headwaters of the Umpqua River on the west slope and to the vicinity of Mount Jefferson on the east slope.

The altitudinal range of lowland fir is from sea level to an elevation of 7,000 feet. In the Coast ranges it grows at lower elevations than in the Cascades and the Rocky Mountains. On the western slope of the Coast ranges in Washington and Oregon it extends from the coast to an elevation of 3,000 or 4,000 feet; in the Cascades it is usually found at an elevation of from 1,500 to 5,000 feet; while in the Bitterroot and Coeur d'Alene mountains it grows from 2,000 to 7,000 feet above the sea. It is most abundant and attains its largest

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size at the lower elevations, while at its upper altitudinal limits and in situations deficient in soil and moisture it is more or less stunted. It attains its best development along the coast, on streams, at the bases of mountain slopes, and in gulches and valleys.

CLIMATE.

The climatic conditions within the range of lowland fir are favorable for tree growth. The summers are cool and humid, the winters ordinarily not severe, and the changes of temperature gradual. Precipitation is well distributed through all the months except July and August, when the rainfall is very slight over the greater part of its range. During this time the forest floor dries out and is susceptible to destructive forest fires. The annual precipitation varies from less than 20 inches to over 100 inches, while in the Bitterroot Mountains of Idaho, and northward, the temperature occasionally falls to —30° F.

HABIT.

Under favorable conditions for growth, which the equable climate and the moist, deep, alluvial soils in the coast region afford, lowland fir attains a diameter of 4 feet and a height of from 200 to 250 feet. Its size, however, is proportionately reduced as the soil, moisture, and general climatic conditions become less favorable. Toward its eastern limit on the western slope of the Rocky Mountains it is a rather small tree, commonly less than 2½ feet in diameter and 100 feet in height. In the forest it forms in the best situations a tall, graceful tree with a long, clean stem. Its root system is comparatively shallow, but in the drier and deeper soils extends to a considerable depth. The foliage is persistent for about 5 years. Its wood is light, soft, coarse-grained, and neither durable nor strong.

ASSOCIATED SPECIES.

Lowland fir rarely forms pure stands. It forms with Douglas fir the dominant growth over more tolerant and slower-growing species, such as giant arborvitæ, Pacific yew, and western hemlock. In the forests of Oregon and Washington it grows at lower elevations with western hemlock, giant arborvitæ, Pacific yew, and amabilis, noble, and Douglas firs. In swampy situations it oftens associates with hardwoods, such as maple, alder, and cottonwood. In northern Montana and Idaho and eastern Oregon it associates with Douglas fir, yellow pine, western hemlock, giant arborvitæ, western white pine, western larch, Engelmann spruce, and lodgepole pine. At higher elevations on the slopes of the Cascades and Rocky Mountains it grows with

western larch, western white pine, Engelmann spruce, and lodgepole pine, and at its upper altitudinal limit mixes to some extent with black hemlock and alpine fir. Along the coast in Washington and Oregon it associates at low elevations with Sitka spruce, and in California with redwood.

SOIL AND MOISTURE.

Lowland fir prefers a fairly deep soil, somewhat moist, but porous and well drained. With favorable moisture and climatic conditions it thrives on rather poor and thin soils, while better soils become necessary where there is lack of moisture and where evaporation is rapid.

TOLERANCE.

Lowland fir is not as shade enduring as giant arborvitæ, western hemlock, California yew, and amabilis fir, but is more tolerant of shade than western larch, yellow pine, Douglas fir, western white pine, and noble fir. It endures considerable shade in its seedling stage, but in later life requires full overhead light for its best development. When young growth of lowland fir comes up in the shade of dense stands it remains dwarfed and dies out unless light is admitted from above. With overhead light, but shaded from the side, it grows rapidly in height, readily clears itself of branches, and forms a long, slender, clean stem.

Its endurance of shade varies with age, moisture, exposure, quality and quantity of soil, altitude, and latitude. Under favorable conditions of moisture, soil, and heat, lowland fir thrives in full sunlight, and also endures considerable shade. On comparatively poor, dry soils, and in warm, exposed situations, shelter and some shade are beneficial to reduce evaporation and transpiration, and under such conditions lowland fir usually confines itself to the cooler and more sheltered locations.

REPRODUCTION.

Lowland fir is not a very prolific seed producer. Fairly good seed years occur at somewhat irregular intervals. The seeds develop, mature, and fall in one season. They are winged, and are scattered a considerable distance by the wind. Under favorable conditions they germinate during the autumn of the year they fall, and the seedlings may reach a height of 2 inches before cold weather sets in. A mildly humous soil makes the best seed bed, but the seeds will germinate and the seedlings will thrive in fresh mineral soils. Partial shade is usually required in the seedling stage to moderate the temperature, reduce transpiration, and keep the soil from drying out.