

**California Wildlife Habitat Relationships System**  
**California Department of Fish and Game**  
**California Interagency Wildlife Task Group**

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## Douglas-Fir

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### Vegetation

**Structure--** This habitat forms a complex mosaic of forest expression due to the geologic, topographic, and successional variation typical within its range (Sawyer 1980). Typical aggregations include a lower overstory of dense, sclerophyllous, broad-leaved evergreen trees (tanoak, Pacific madrone) up to 35 m (114 ft) tall, with an irregular, often open, higher overstory of tall needle-leaved evergreen trees (Douglas-fir) up to 90 m (295 ft) (Marcot 1979, Sawyer 1980, Franklin et al. 1981, Thornburgh 1982). A small number of pole and sapling trees occur throughout stands (Thornburg 1982). On wet sites, shrub layers are well developed, often with 100 percent cover. Cover of the herbaceous layer under the shrubs can be up to 10 percent. At higher elevations, the shrubs disappear and the herb layer is often 100 percent. Typical mesic habitats have a poorly developed or non-existent shrub and herb layer. Dry habitats have greater cover of shrubs and especially grasses (Franklin and Dyrness 1973, D. A. Thornburgh, pers. comm.). On steeper (> 75%), drier slopes with shallow soils, the shrub and herb layer is poorly developed, represented mainly by moss-covered rocks (Sawyer et al. 1977). Diameter of overstory Douglas-fir ranges up to 450 cm (1140 in) and averages 150 to 220 cm (360 to 560 in) on better sites (Franklin and Waring 1980). Density of Douglas-fir decreases with stand age from about 400 stems >2 m tall/ha (160/ac) in 100-year old stands to 290 stems/ha (116/ac) in 250-year-old stands; density of other species increases from 765 to 1212 stems/ha (306 to 490/ac) M. G. Raphael, unpublished data). In a study of similar forests in Oregon, overstory foliage biomass was similar in young (37-year-old) stands, but understory biomass was nine times greater in the older stand (Grier et al. 1974). Mature overstory Douglas-fir trees have a typically cylindrical crown beginning at 20 to 40 m (66 to 131 ft), composed of irregularly scattered branches (Franklin et al. 1981). Diversity of tree size typically increases with stand age, as does tree spacing (Franklin et al. 1981). Young stands have closely spaced and uniformly distributed trees, whereas older stands show a more patchy stem distribution. Snags and downed logs, an important structural component of this habitat, increase in density or volume with stand age (Franklin and Waring 1980, Raphael and Barrett 1984).

**Composition--** Overstory composition varies with soil parent material, moisture, topography, and disturbance history. Dry steep slopes on metamorphic and granitic parent materials are dominated by canyon live oak. Less rocky, dry soils support Douglas-fir, tanoak, and Pacific madrone in association with sugar pine, ponderosa pine, black oak, and canyon live oak. Deep mesic soils support an overstory of Douglas-fir with a tanoak-dominated understory. Wettest sites include Pacific yew and, less

consistently, Port-Orford cedar. On ultrabasic derived soils, Douglas-fir attains less dominance and is replaced by Port-Orford cedar on mesic sites to the extreme northwest (Stein 1980a) and open stands of Jeffrey pine, incense cedar, sugar pine, knobcone pine, and western white pine on more xeric sites (Whittaker 1960, Whittaker 1961, Rockey et al. 1966, Mize 1973, Sawyer et al. 1977). In the southern and eastern extent of the type, ponderosa pine becomes a major codominant with Douglas-fir, and cover of black oak increases (Waring and Major 1964, Sawyer et al. 1977). In the absence of fire or other disturbance, western hemlock may occur as a codominant with Douglas-fir and tanoak at the western extent of the type in areas transitional to redwood forest (Sawyer et al. 1977). The shrub layer is typically composed of canyon live oak, Oregon-grape, California blackberry, dwarf rose, and poison-oak (Franklin and Dyrness 1973). Mesic sites support vine maple, California hazel, salal, and Pacific rhododendron (Sawyer et al. 1977). On sedimentary soils, the principal understory shrubs are California huckleberry, snowbrush, ceanothus, salal, and Oregon-grape. Ultrabasic soils support a shrub layer of huckleberry oak, shrub tanoak, California-laurel, California buckthorn, and Brewer oak (Whittaker 1960). Forbs and grasses include Pacific trillium, western swordfern, insideout flower, broad-leaf starflower, deervetch, vanillaleaf, American deervetch, prince's pine, common whippolea, California honeysuckle, American trailplant, whitevein shinleaf, western rattlesnake plantain, Sierra fairy bells, bracken fern, western fescue, common beargrass, and hartford oniongrass (Franklin and Dyrness 1973, Sawyer et al. 1977). Mize (1973), Simpson (1980), and Laidlaw-Holmes (1981) discuss understory composition in relation to parent material and soil moisture.

**Other Classifications--** Other names for Douglas-fir habitat include Douglas-fir-Tanoak-Madrone, Douglas-fir-Pine-Madrone, Douglas-fir Series (Parker and Matyas 1981), Port-Orford-Cedar-231 (Stein 1980a), Douglas-fir-Tanoak-Pacific Madrone - 234 (Sawyer 1980), Western Hemlock Forest -8.22, and Douglas-fir Forest -8.24 (Cheatham and Haller 1975), Douglas-fir Forest -13 (Munz and Keck 1959), Evergreen Forest Land -42 (Anderson et al. 1976), Mixed-Evergreen Zone (Franklin and Dyrness 1973), Pseudotsuga-Hardwood Forest (Sawyer et al. 1977), Mixed Evergreen Forest with Chinquapin, and Mixed Evergreen Forest with Rhododendron (Küchler 1977), and Mixed Evergreen Forest (Marcot 1979).

## Habitat Stages

**Vegetation Changes--** 1; 2-5:S-D;6. After a major disturbance, Douglas-fir habitats can proceed through structural classes 1-5, although the sequence is often truncated on poorer sites. Stage 6 stands occur when periodic disturbance leads to a multi-aged stand or a shade tolerant understory develops. This habitat can exist as any of the canopy closure classes S-D, although class D is most frequent. After logging or intense fire, tanoak regenerates by sprouting and Douglas-fir by seeding. Good seed years are irregular, with peaks at about seven-year intervals (Thornburg 1982). Tanoak sprouts grow faster than Douglas-fir seedlings and initially dominate along with various shrubs and herbs. Tanoak can form a nearly solid canopy for 60 to 100 years until natural mortality allows Douglas-fir to become dominant. In mixed stands of tanoak and

Douglas-fir, the latter overtops tanoak in 15 to 30 years on mesic sites (Thornburgh 1982). On xeric sites, hardwoods dominate longer. Thus, abundance and growth of tanoak sprouts depends on the structure of the previous stand and on available soil moisture. Over the course of succession, grasses, herbs, and shrubs are most abundant in the seedling tree class, least abundant in pole and small tree classes, and moderately abundant in the medium/large tree class. Snag and log volume also increase with stand age.

**Duration of Stages--** Because of frequent fires, typical climax Douglas-fir habitat is rare (Thornburgh 1982). In the absence of disturbance, such stands develop in 80 to over 250 years, depending on site quality (McArdle 1961, Lang 1980). Individual Douglas-fir trees can live to 1250 years; ages in excess of 750 years are common (Franklin and Waring 1980). Following disturbance, the seedling tree class persists for 5 to 20 years, depending on site quality. The sapling tree class can be 5 to 60 years old the pole-tree, small tree, and medium large tree classes can be 20 to 130, 35 to over 130, and 80 to over 250 years, respectively (McArdle 1961, Lang 1980, Franklin et al. 1981). Multilayered (class 6) stands probably develop over the same time period as medium/large tree stands.

## Biological Setting

**Habitat--** Douglas-fir occurs at low to moderate elevations in juxtaposition with a number of other habitats. Redwood (RDW) occurs at lower elevations to the west, and Mixed Conifer (MCN) occurs to the east and at higher elevations within the range of Douglas-fir. To the north, especially in more mesic sites, this habitat is bounded by hemlock and sitka spruce zones of Franklin Dyrness (1973)(No 1973 cite. Only a 1969 Cite. Not placed in Lit Cite at enc.). More xeric sites to the south are bounded by and interspersed with Valley-Foothill Hardwood (VFH) and Valley-Foothill Hardwood-Conifer (VHC). Other habitats, such as Montane Hardwood (MHW), Montane Hardwood Conifer (MHC), Montane Riparian (MRI) and Montane Chaparral (MCP) form a complex mosaic with Douglas-fir at similar elevations (Sawyer et al.1977).

**Wildlife Considerations--** This habitat supports a high abundance of wildlife species. Weins (1975)(Not in Habitat Lit Cite.) reported that northwest coastal coniferous forests supported a higher average bird density than any other forest type in North America. Bird species typical of this habitat include spotted owl, western flycatcher, chestnut-backed chickadee, golden-crowned kinglet, Hutton's vireo, solitary vireo, hermit warbler, and varied thrush. Among amphibians and reptiles, the distributions of northwestern salamander, Pacific giant salamander, Olympic salamander, Del Norte salamander, black salamander, clouded salamander, tailed frog, and northwestern garter snake are largely coincident with the distribution of Douglas-fir habitat. Although not restricted to this habitat, the ensatina is its most abundant amphibian. Typical mammals include fisher, deer mouse, dusky-footed woodrat western redbacked vole, creeping vole, Douglas' squirrel, Trowbridge's shrew, and shrew-mole.

## Physical Setting

Climatically, this habitat experiences hot, dry summers and cool, mild, wet winters. Mean July temperatures range from 14 to 22 C (57-72 F). Average January temperatures range from 0 to 8 C (32-46 F) (Proctor et al. 1980). Annual precipitation varies from 60 to 170 cm (24-27 in), generally less than 15 percent falling during summer. Precipitation increases inland and at higher elevations. Snowfall ranges from 3 to 80 cm (2 to 31 in) and rarely persists later than June (Proctor et al. 1980). Topography is characterized by rugged, deeply dissected terrain and steep slopes (Franklin and Dyrness 1973), especially toward the south. Major soil types are based on sedimentary granitic, and ultramafic parent materials of gabbro, peridotite, and serpentine (Whittaker 1960).

## Distribution

Douglas-fir habitat occurs in the north Coast Range from Sonoma County north to the Oregon border and in the Klamath Mountains of California and Oregon. This habitat usually occurs at elevations from 150 to 600 m (500 to 2000 ft) in the Coast Range and from 300 to 1200 m (1000 to 4000 ft) in the Klamath Mountains. It can occur at higher elevations if plentiful precipitation is present (Sawyer 1980).

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