

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

White Fir

Karen Shimamoto

Vegetation

Structure-- The White Fir (WFR) habitat is characterized by nearly monotypic even-aged overstory (Cheatham and Haller 1975, Paysen et al, 1980, Riegel 1982, Rundel et al. 1977). Overlapping crowns that cast deep shade are characteristic, although open stands are common (Cheatham and Haller 1975, Eyre 1980, Riegel 1982). Northern California specimens grow to about 70 m (230 ft) in height. Southern California specimens grow to about 30 m (100 ft) (Cheatham and Haller 1975). The understory may consist of sparsely scattered grasses, forbs, and shrubs, or white fir seedlings and saplings (Cheatham and Haller 1975, Eyre 1980, Paysen et al. 1980). However, on moist swales or drainage bottoms, herbaceous cover may approach 100 percent (Rundel et al. 1977). Downed material usually consists of logs, branches and needle litter (Cheatham and Haller 1975). Fire influences the white fir habitat by causing a mosaic of even-aged stands in different successional stages.

Composition-- Mature white fir stands, normally monotypic, with more than 80 percent occurring as white fir, are found throughout California; from the Klamath Mountains along the north coast to the south coast mountain ranges, and in interior ranges from the Warner Mountains in the Great Basin to the Clark, Kingston, and New York mountain ranges in interior southern California (Rundel et al. 1977, Parker and Matyas 1981).

Shade and downed woody material tend to inhibit understory species (Parker and Matyas 1981). In the Klamath Mountains, for example, canyon live oak and chinquapin are the predominant understory species and open stands usually include squawcarpet and barberry. Dense stands, however, have herbaceous species such as wake robin, vetch, and pipsissewa. Jeffrey pine is an associate in the Cascades and Warner mountain ranges, with Greenleaf manzanita and currant as understory shrubs. Tree associates change in the southern Sierra Nevada, where sugar pine, incense-cedar, and red fir are found. Pipsissewa, wintergreen, current, and snowplant are in the understory (Cheatham and Haller 1975). In the south coast range and south interior range, sugar pine and single-leaf pinyon occur as associates of white fir, most commonly on cool, north- and east-facing slopes, respectively. Rundel et al. (1977) describes white fir vegetative composition over elevational and moisture differences in the Sierra Nevada.

Other Classifications-- Historically, the white fir habitat has been described as part of the mixed conifer habitat (white fir phase) (Griffin 1967) or as ecotonal between mixed

conifer and red fir. Munz and Keck (1959) simply included it in yellow pine forest. White fir habitat is now named White Fir (Parker and Matyas 1981); White Fir (211) (Eyre 1980); White Fir Series (Paysen et al. 1980); White Fir Zone (Franklin and Dyrness 1973); Sierran White Fir (8.424) and Southern California White Fir (8.532) (Cheatham and Haller 1975); White Fir-Sugar Pine Forest (Thorne 1977).

Habitat Stages

Vegetation Changes--1;2-5:S-D;6. Following disturbance, white fir proceeds through the seral stages (Gordon 1970,1973b, Eyre 1980, Conard 1980, Conard and Radosevich 1982, Hopkins 1982, Laacke and Fiske 1983). In the grass/forb stage, bare mineral soil provides the best seedbed for white fir. If the site has been burned, brush seedlings such as manzanita, snowbrush ceanothus, mountain whitethorn, deerbrush, willow, bittercherry, huckleberry oak, currant, gooseberry and chinquapin also become established.

In the shrub/sapling stage, large brush fields comprise 75 percent of the vegetative cover and persist for 30-50 years. Varying density of white fir seedlings (1000-10,000 stems per ha) establish within 10 to 20 years, growing under and eventually overtopping the brush. In managed situations, brush is removed and white fir growth increases by as much as 200 percent in height.

In the pole/medium tree stage, white fir overtops the shrubs which for the most part are shaded out and die. Sometimes an understory of white fir establishes by the time the overstory reaches pole height. This multilayered condition persists into later stages. In the large tree stage, a characteristic understory develops including whitevein shinleaf, little prince's pine, bracken fern, striped coralroot, and milk kelloggia primarily root parasites and semiparasitic species.

Duration of Stages-- The duration of the grass/forb stage is dependent on the availability of a white fir seed source and a good seed crop every 3-9 years (Schopmeyer 1974, Gordon 1978). Reforestation activities would limit the duration of this seral stage to less than 5 years. In the shrub/sapling stage, white fir seedlings and saplings can persist for 30 to 50 years under a brush overstory. The average age in the large tree stage is 250 to 300 years with 70 to 90 cm (28-35 in) dbh (Hopkins 1979a, 1979b).

Biological Setting

Habitat-- In the Klamath Mountains, the Cascades, and the Sierra Nevada, white fir habitat occurs between mixed conifer and red fir habitats (Eyre 1980, Parker and Matyas 1981). In the south coast Transverse and Peninsular ranges, and in the mountain ranges of interior southern California, white fir intergrades at lower elevations with mixed conifer and is replaced at higher elevations by lodgepole pine (Cheatham and Haller 1975, Parker and Matyas 1981).

Wildlife Considerations-- White fir habitat is probably the coolest, moistest, nonriparian habitat within the lower to mid-elevation forests in northern California. In southern California this habitat is colder and drier, probably equivalent to the red fir habitat elsewhere, but with drier conditions (Cheatham and Haller 1975).

As stands mature, a high percentage of defective trees are found, the result of windthrow and heart rot fungus (Gordon 1973, Hopkins 1982). Excellent habitat is provided for snag and cavity dependent wildlife species, particularly when breaks occur between 15-30 m (50-100 ft). The additional benefit of heart rot is the cylindrically stable snag created as a result of the rot moving from the inside of the tree to the outer diameter.

White fir is the preferred tree species for insect-gleaning yellow-rumped warblers and western tanagers, and is also commonly used by other insect-gleaning birds, such as mountain chickadee, chestnut-backed chickadee, golden-crowned kinglet, and black-headed grosbeak (Airola and Barrett 1985).

Physical Setting

White fir habitats are found on a variety of soils developed from different parent material, including volcanic and igneous rocks, granitics, various metamorphics, and sedimentary material (Franklin and Dyrness 1973, Fowells 1965, Hopkins 1982). Soils are coarse textured, well-drained, have poorly developed profiles, are often rocky, and are cold, with mean annual temperatures from 0 to 10 C (32 -50 F) (Cheatham and Haller 1975, Riegel 1982, Laacke and Fiske 1983a). Cooler north- and east-facing slopes are the most common sites throughout the state, however, Riegel (1982) noted the presence of unusually xeric white fir stands in the Warner Mountains. Precipitation is between 76-178 cm (30-70 in) mostly in the form of snow. Almost all precipitation falls between October and May (Laacke and Fiske 1983).

Distribution

Elevation of white fir habitat varies with latitude. In the Klamath Mountains of Trinity and Siskiyou Counties, white fir is found from 1370 to 1680 m (4500-5500 ft); from 1520 to 1830 m (5000-6000 ft) in the Cascade and Warner Mountains; at about 1675 m (5500 ft) in the Southern Sierra Nevada; above 1800 m (6000 ft) throughout the Transverse and Peninsular Ranges; and between 1800 to 2135 m (6000-7000 ft) in the southern interior ranges (Cheatham and Haller 1975, Parker and Matyas 1981). Small relict stands are also found at 2300 to 2880 m (7500-9500 ft) in the Clark, Kingston, and New York Mountains in the Mojave Desert (Thorne 1977, Paysen et al. 1980).

Literature Cited

Airola, D. A., and R. H. Barrett. 1985. Foraging and habitat relationships of insect-

- gleaning birds in a Sierra Nevada mixed conifer forest. *Condor* 87:205-216.
- Cheatham, N. H., and J. R. Haller. 1975. An annotated list of California habitat types. Univ. of California Natural Land and Water Reserve System, unpubl. manuscript
- Eyre, F. H., ed. 1980. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington D.C.
- Fowells, H. A. 1965. Silvics of forest trees of the United States. U.S. Dep. Agric., For. Serv., Handbook No. 271.
- Franklin, J. F. and C. T. Dyrness. 1969, 1973. Natural vegetation of Oregon and Washington. U.S. Dep. Agric., For. Serv. (Portland, Ore.), Gen. Tech. Rep. PNW-80.
- Gordon, D. T. 1978. White and red fir cone production in northeastern California: report of a 16-year study. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Res. Note PSW-330.
- Griffin, J. R. 1967. Soil moisture vegetation patterns in northern California forests. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Res. Pap. PSW-46.
- Hopkins, W. E. 1979a. Plant associations of the Fremont National Forest. U.S. Dep. Agric., For. Serv. Pacific Northwest Region (Portland, Ore.), Publ. R-6-Ecol-79-004.
- Hopkins, W. E. 1979b. Plant associations of South Chiloquin and Klamath Ranger Districts, Winema National Forest. U.S. Dep. Agric., For. Serv., Pacific Northwest Region (Portland, Ore.), Publ. R-6-Ecol-79-005.
- Hopkins, W. E. 1982. Ecology of white fir. Pages 35-41 In C.C. Oliver and R. M. Kenady, eds. Proceedings of the biology and management of true fir in the Pacific Northwest. Univ. of Washington, Col. of Natur. Res. (Seattle, Wash.), Cont. No. 45.
- Laake, R. J., and J. N. Fiske. 1983a. Red fir and white fir. Pages 41-43 In R. M. Burns, tech. comp. Silvicultural systems for the major forest types of the United States. U. S. Dep. Agric., For Serv., Agric. Handbook 445.
- Munz, P. A., and D. D. Keck. 1959. A California flora. Univ of California Press, Berkeley.
- Parker, I., and W. J. Matyas. 1981. CALVEG: a classification of Californian vegetation. U.S. Dep. Agric., For. Serv., Reg. Ecol. Group, San Francisco.
- Paysen, T. E., J. A. Derby, H. Black, Jr., V. C. Bleich, and J. W. Mincks. 1980. A vegetation classification system applied to southern California. U.S. Dep. Agric., For. Serv., (Berkeley, Calif.) Gen. Tech. Rep. PSW-45.
- Riegel, G. 1982. Forest habitat types of the south Warner mountains, Modoc county, northeastern California. M. S. thesis, Humboldt State Univ., Arcata, Calif.
- Rundel, P. W., D. T. Gordon, and D. J. Parsons. 1977. Montane and subalpine vegetation of the Sierra Nevada and Cascade Ranges. Pages 559-599 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
- Schopmeyer, C. S., tech. coord. 1974. Seeds of woody plants in the United States. U. S. Dep. Agric. Handbook 450.