

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

Jeffrey Pine

Joe R. McBride

Vegetation

Structure-- The structure of the Jeffrey pine forest varies over its distribution. A single tree layer is characteristic of Jeffrey pine stands on moderately dry sites, giving an impression of openness, limited leaf area, light, and heat. On moist and mesic sites a second tree layer exists which is composed of deciduous hardwood species, whereas on dry sites evergreen hardwood species form the second tree layer. Conifer species provide the second tree layer on xeric sites. The single (or upper) tree layer ranges from 30 to 50 m (98 to 164 ft) in height, but in some stands this layer may exceed 65 m (213 ft) (Fowells 1965). The second tree layer, where it exists, varies from 5 to 10 m (16 to 33 ft) in height. Complete (100 percent) crown cover is seldom encountered in Jeffrey pine habitats. Most stands have typically between 40 and 70 percent crown cover in the uppermost tree layer and usually less than 50 percent crown cover in the second layer, except on moist sites where Aspen cover may approach 100 percent. In southern California a krummholz form, where trees are only a few meters tall, is found at higher elevations near timberline.

A sclerophyllous shrub layer is common to most Jeffrey pine stands except on serpentine soils, extremely xeric sites where the shrub layer is absent (Jenkinson 1980), and where the krummholz form exists. Height and crown cover of the shrub layer varies with site characteristics. For example, taller shrub layers up to 2 m (6 ft) with significant crown (>70 percent) are common on more mesic sites.

Composition-- Jeffrey pine is the dominant species found in the upper tree layer. It usually forms pure stands but may have as its associates ponderosa pine, Coulter pine, sugar pine, lodgepole pine, timber pine, white fir, red fir, incense-cedar, and black cottonwood. Jenkinson (1980) suggests that any stand in which Jeffrey pine makes up the majority of the stocking should be recognized as Jeffrey pine. Dominant species composition of the second tree layer consists of aspen on moist sites, California black oak on mesic sites, and pinyon pine and western juniper on dry sites. Shrub species composition varies between geographical regions. In the Klamath Mountains, huckleberry, scrub oak, manzanita, Fremont silktassel and coffeeberry dominate the shrub layer. Shrubs common to the Jeffrey pine type on the western slope of the Sierra Nevada include huckleberry oak, manzanita, and mountain misery. East of the Sierra-Cascade crest, the dominant shrub layer species include squaw currant, snowbush, and greenleaf manzanita at higher elevations, and antelope bitterbrush, rabbitbrush, and sagebrush at lower elevations. The shrub layer of Jeffrey pine stands in southern

California is dominated by scrub oak, ceanothus, Sierra chinquapin, manzanita, Parish snowberry, and cherry. Herbaceous species common to the Jeffrey pine type in southern California include rockcress, birdbeak, buckwheat, fritillary, groundsmoke, ivesia, lupine, rock melic, Bridge's penstemon, penstemon and needlegrass (Thorne 1977). Species common to Jeffrey pine stands along the east slope of the Sierra Nevada include squirreltail, blue wildrye, slender hairgrass, western needlegrass, woolly wyethia, and pennyroyal.

Other Classifications-- Jeffrey pine has been included in the broad yellow pine forest type of Munz and Keck (1949-50); pine-Douglas-fir, pine-fir, and pine-Douglas-fir-fir of Jensen (1947); Jeffrey pine of Parker and Matyas (1981), SAF (Eyre 1980), and Cheatham and Haller (1975); the upper montane mixed conifer forest of Cheatham and Haller (1975); and type 42 - evergreen forest land of Anderson et al. (1976). Jeffrey pine is divided into two classes -northern Jeffrey pine forest and southern Jeffrey pine forest - by Küchler (1977). Paysen et al. (1980) includes Jeffrey pine in the Ponderosa/Jeffrey Pine Series of the Conifer Forest Subformation. Horton (1960) divides it between the pine forest type and the sugar pine-white fir forest type, while Thorne (1975)(No Thorne 1975 Cite. There is a 1976 Cite. None placed in Lit Cite at end.) includes it in the yellow pine forest.

Habitat Stages

Vegetation Changes-- 1;2-5:S-D. Old-growth Jeffrey pine stands exhibit an uneven-aged structure. Analysis of fire scars and age structure suggests that prehistoric fires played an important role in regeneration without destroying the overstory (McBride and Laven 1976); however, in southern California fires have recently eliminated large areas of Jeffrey pine forest overstory because of accumulated surface fuels. The successional pattern following these fires involves an initial fireweed stage, followed by a shrub stage dominated by ceanothus and manzanita. Where canyon live oak is present in the second tree layer, an oak stage develops instead of the more common shrub stage (Minnick 1976). In time, Jeffrey pine succeeds the shrub or oak stage to restore the original vegetation.

Duration of Stages-- Jeffrey pine stands are self-perpetuating under a regime of periodic surface fires. Typical old-growth stands in southern California support trees up to 450 years old. The age structure of these stands suggests that regeneration has occurred about every 40 to 60 years (Laven 1982). Where crown fires have created openings, the fireweed stage lasts for 2 to 3 years, followed by the shrub stage which persists for 15 to 20 years. Extensive areas of ceanothus and manzanita (i.e., montane chaparral) and canyon live oak woodland, resulting from large crown fires occurring in the last 70 years in the San Bernardino Mountains, show no evidence of reestablishment of Jeffrey pine, and further succession of these areas to Jeffrey pine is problematical. Forest harvesting using selective cutting and sanitation-salvage methods has converted Jeffrey pine stands to oak woodlands or montane chaparral in the San Bernardino Mountains (Minnick 1976)(Listed as Minnick in Lit Cite?). Where clearcutting or group selection cutting was

followed by planting Jeffrey pine, the type has been successfully maintained.

Biological Setting

Habitat-- The Jeffrey pine habitat is associated with Douglas-fir at its lower elevations and subalpine conifer at its higher elevations in the Klamath Mountains. East of the Sierra-Cascade crest it occurs between subalpine conifer at higher elevations and pinyon-juniper or sagebrush at lower elevations. On the west side of the Sierra Nevada, Jeffrey pine is generally found above Sierra Nevada mixed conifer and below the subalpine conifer or alpine dwarf shrub. On ultramafic soils at mid-elevations, Jeffrey pine is surrounded by mixed conifer (Sierra Nevada and Klamath-enriched). In southern California, Jeffrey pine is situated above ponderosa pine or blue oak-foothill pine on the southern side of the Transverse and the southwestern side of the Peninsular Ranges. At higher elevations in these mountains it gives way to subalpine conifer. At lower elevations on the northern side of the Transverse Range it adjoins pinyon-juniper. On the northeastern side of the Peninsular Range, it is adjacent to the desert scrub or pinyon-juniper. Areas of Jeffrey pine forest in the Peninsular Range east of San Diego are surrounded by chamise (redshank) or are adjacent to pinyon-juniper type.

Wildlife Considerations-- Jeffrey pine is intermediate in species richness between warmer forests- at lower elevations and colder forests at higher elevations in the Klamath Mountains and on the west side of the Sierra Nevada. Its species richness exceeds that of the adjacent upper elevation forests and lower elevation woodland and scrub types in both the Transverse and Peninsular Ranges.

The value of the Jeffrey pine forest type as a habitat for wildlife is due in large part to the food value of the Jeffrey pine seeds. Pine seeds are included in the diet of more wildlife species than any other genus except oak (Light 1973). The bark and foliage also serve as important food sources for squirrels and mule deer. Jeffrey pine provides vital nesting cover for several species such as nuthatch, brown creeper, woodpecker, and northern flying squirrel. The southern rubber boa, a species listed as rare by the State of California and sensitive by the U.S. Forest Service, is reported to occur in the Jeffrey pine forest type in southern California (Cunningham 1966).

Physical Setting

Jeffrey pine occurs in a variety of physical settings throughout its extensive range. The tolerance of its dominant species to low temperatures allows the type to occupy the borders of topographic frost pockets and high cold ridges (Haller 1959). It is commonly found on soils developed from granite and lava flows, but can also develop as a type on ultramafic soils (Walker 1954). Its distribution in northern California west of the Sierra-Cascade crest is limited to such soils (Jenkinson 1980). Jeffrey pine is not restricted by aspect or slope.

Distribution

Jeffrey pine ranges from 150 to 2900 m (500 to 9500 ft), the actual range depending upon latitude. The habitat covers extensive areas in the Klamath Mountains, North Coast Range, Cascade Range, Modoc Plateau, Sierra Nevada, Transverse Range, and the Peninsular Range in California. It also occurs in Oregon, Nevada, and Baja California.

Literature Cited

- Anderson, J. R., E. E. Hardy, J. T. Roach, and R. E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Dep. Interior, Geol. Surv., Prof. Pap. 964.
- 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
- Cunningham, J. D. 1966. Observations on the taxonomy and natural history of the rubber boa (*Charina bottae*). *Southwest Nat.* 11:298-299.
- 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.
- Haller, J. R. 1959. Factors affecting the distribution of ponderosa and Jeffrey pines in California. *Madroño* 15:65-71.
- Horton, J. S. 1960. Vegetation types of the San Bernardino Mountains, California. U.S. Dep. Agric., For. Serv. (Berkeley, Calif.), Tech. Pap. No. 44.
- Jenkinson, J. L. 1980. Jeffrey pine 247. Page 123 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.
- Jensen, H. A. 1947. A system for classifying vegetation in California. *Calif. Fish and Game* 33:199-266.
- Kuchler, A. W. 1977. Appendix: the map of the natural vegetation of California. Pages 909-938 In M. G. Barbour and J. Major, eds, *Terrestrial vegetation of California*. John Wiley and Sons, New York.
- Laven, R. D. 1982. Establishing homogeneity in studies of forest succession. *Forest Ecol. and Manage.* 4:161-177.
- Light, J. T. 1973. Effects of oxidant air pollution on the forest ecosystem of the San Bernardino Mountains. Pages B1-B14 In O.C. Taylor, ed. *Oxidant air pollutant effects on a western coniferous forest ecosystem*. Statewide Air Pollution Res. Center, Univ. of California, Riverside.
- McBride, J. R., and R. D. Laven. 1976. Scars as an indicator of fire frequency in the San Bernardino Mountains, California. *J. Forestry* 74:439-442.
- Minnich, R. A. 1976. Vegetation of the San Bernardino Mountains. Pages 99-124 In J. Latting, ed. *Plant communities of southern California*. Calif. Native Plant Soc. Spec. Publ. No. 2.
- Munz, P. A., and D. D. Keck. 1949. California plant communities. *Aliso* 2:87-105.
- Munz, P. A., and D. D. Keck. 1950. California plant communities. *Aliso* 2:199-202.

- 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.
- Thorne, R.F. 1977. Montane and subalpine forests of the Transverse and Peninsular Ranges. Pages 537-557 In M. G. Barbour and J. Major, eds. Terrestrial vegetation of California. John Wiley and Sons, New York.
- Walker, R. B. 1954. The ecology of serpentine soils. *Ecol.* 35:259-266.