

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

---

## Sierran Mixed Conifer

Barbara H. Allen

Updated by: CWHR Staff, April 2005

### Vegetation

**Structure.** The Sierran mixed conifer habitat is an assemblage of conifer and hardwood species that forms a multilayered forest. Historically, burning and logging have caused wide variability in stand structure, resulting in both even-aged and unevenaged stands (Rundel et al. 1977). Virgin old-growth stands where fire has been excluded are often two-storied, with the overstory comprised of mixed conifer and the understory white fir and incense-cedar (Tappeiner 1980).

Forested stands form closed, multilayered canopies with nearly 100 percent overlapping cover (Rundel et al. 1977). When openings occur, shrubs are common in the understory (Kosco 1980). Closed canopy stand distribution is both extensive and patchy depending on scale, site, slope, soils, microclimate, and history.

At maturity, the dominant conifers range from 30 to 60 m (100 to 200 ft) tall with a highly variable basal areas of about 17 to 26 sq m (180 - 280 sq ft). Diameter breast height at maturity for pines and Douglas-fir is commonly greater than 1 m (40 in); white fir greater than 0.9 m (35 in) is common (Laake and Fiske 1983b). Fuel loading in stands heavy with pine may reach 27,000 kg/ha (70 to 80 t/ac) in natural stands; whereas fuel loading in stands heavy with fir may reach 16,000 kg/ha (40 to 50 t/ac).

**Composition.** Five conifers and one hardwood typify the mixed conifer forest white fir, Douglas-fir, ponderosa pine, sugar pine, incense-cedar, and California black oak. White fir tends to be the most ubiquitous species (though most often a minor overstory component) because it tolerates shade and has the ability to survive long periods of suppression in brush fields Douglas-fir dominates the species mix in the north, but is absent south of the Merced River (Tappeiner 1980). Ponderosa pine dominates at lower elevations and on south slopes. Jeffrey pine commonly replaces ponderosa pine at high elevations, on cold sites, or on ultramafic soils (Rundel et al. 1977). Red fir is a minor associate at the highest elevations. Sugar pine is found throughout the mixed conifer type. Black oak is a minor, but widespread, component in mixed conifer stands. Though black oak does best on open sites, it is maintained under adverse conditions such as shade, ridge tops, and south slopes where conifers may regenerate in its shade (Tappeiner 1980). In the central and particularly southern Sierra Nevada, giant sequoia is a striking associate of the mixed conifer type (Rundel et al. 1977). White fir, incense-cedar and sugar pine are associated with the mesic giant sequoia sites (Tappeiner 1980).

Deerbrush, manzanita, chinquapin, tan oak, bitter cherry, squawcarpet, mountain whitethorn, gooseberry, rose, and mountain misery are common shrub species in the mixed conifer understory (Kosco and Bartolome 1983). Grasses and forbs associated with

this type include mountain brome, *Carex*, bull thistle, iris, *Juncus*, and needlegrass. In all, over 100 species of grasses, forbs and shrubs contribute to the flora of the mixed conifer habitat (Tappeiner 1980).

**Other Classifications.**- Other names for the Sierran mixed conifer habitat include yellow pine forest (Munz 1973). Parker and Matyas (1981) divide Sierran mixed conifer into five series: mixed conifer-fir, mixed conifer-pine, ponderosa pine, white fir and Jeffrey pine. Rundel et al. (1977) describes the mixed conifer as part of a White fir-mixed conifer forest and Cheatham and Haller (1975) call this habitat Sierran coniferous forest (8.42), a major subdivision of the lower montane coniferous forest habitat (8.4). Sierran mixed conifer is SAF type 243 (Tappeiner 1980). Where ponderosa pine or Douglas-fir predominates without significant amounts of white fir or incense-cedar, the forest is typed as Pacific ponderosa pine or Pacific ponderosa pine-Douglas-fir (SAF types 245 and 244, respectively) (McDonald 1980).

## Habitat Stages

**Vegetation Changes** 1;2-5:S-D;6. After logging or burning, succession proceeds from an ephemeral herb to perennial grass-herb, through a shrub-perennial grass stage, to conifers (Burcham 1964). In many areas, however, shrubs appear in the first year after disturbance (Kosco 1980). The habitat stages are stage 1, grass-forb, with bedstraw, plantain, mountain brome, and needlegrass as common early succession species; stage 2, shrub-seedling-sapling, characterized by manzanita, *Ceanothus*, cherry, gooseberry, and mountain misery. In the seedling tree stage through the sapling tree, pole tree, small tree, and medium/large tree stages, the five conifers gain dominance of the site.

**Duration of Stages.** Stage duration has been described by Verner (1980). The grass-forb stage, generally is short-lived (less than 2 years). The shrub-seedling-sapling stage is usually evident by yr 2 and lasts 10 to 40 yr; this stage is a mixture of shrubs and saplings up to 6 m (20 ft) tall depending on the site, degree, and type of disturbance. If tall shrubs capture the site, it may take 10 to 15 plus yr for trees to dominate the site. The pole-medium tree stage supports trees up to 15 m (50 ft) tall and may last from 15 to 90 yr on poor sites. The mature and overmature stages include stands greater than about 30 m (100 ft) in height.

## Biological Setting

**Habitat.** The type adjoins Ponderosa Pine (PPN) at lower elevations and drier slopes, and White Fir (WFR) and Red Fir (RFR) at higher elevations. Wet Meadow (WTM) and Montane Riparian (MRI) are found within the Sierran Mixed Conifer type. Blue Oak - Foothill Pine (BOP) and Mixed Chaparral (MCH) may adjoin this type at drier, and lower, elevations.

**Wildlife Considerations.** The mixed conifer forest supports some 355 species of animals (Verner and Boss 1980). Sensitive species inhabiting mixed conifer include spotted owl, fisher and pine marten. Endangered species include bald eagle and peregrine

falcon (Verner and Boss 1980). Variety in plant species composition provides diversity in food and cover. Black oak acorns, berries from a variety of shrubs (e.g., deerbrush), and a great number of grasses and forbs provide the forage resource essential for wildlife (Kosco and Bartolome 1983).

## Physical Setting

Soils supporting the Sierran mixed conifer habitat are varied, derived primarily from Mesozoic granitic, Paleozoic sedimentary and volcanic rocks, and Cenozoic volcanic rocks. Serpentine soils, found primarily in the northern mixed conifer zone, support a number of endemic plants. Soils are deep to shallow. Fissures and cracks in granitic parent material often support forest growth, even where soil development is shallow. Temperatures range from 24 to 58 C (40 to 96 F) in summer and 4 to 36 C (10 to 60 F) in winter and decrease with elevation (Major 1977). The growing season ranges between 90 and 330 days in the north with 40 to 200 frost-free days, and 180 to 365 days in the south with 180 frost-free days. Precipitation ranges from 76 to 229 cm (30 to 90 in) per year, from October to May, with increasing snowfall as elevation increases.

## Distribution

The Sierran mixed conifer habitat generally forms a vegetation band ranging 770 to 1230 m (2500 to 4000 ft) in the north to 1230 to 3076 m (4000 to 10,000 ft) in the southern Sierra Nevada (Griffin and Critchfield 1972). The Sierra Nevada mixed conifer forest occupies between 1.8 to 3.2 million ha (4.5 to 7.8 million ac) in southern Oregon and California, dominating western middle elevation slopes of the Sierra Nevada. Disjunct populations of mixed conifer are found in the Peninsular, Transverse, and Coast ranges of California.

## Literature Cited

- Burcham, L. T. 1964. Post fire succession and phenology in Sierran pine forests. 11th Int. Grassland Conf., Brazil.
- 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
- Kosco, B. H. 1980. Combining forage and timber production in young-growth mixed conifer forest range Ph.D. Dissertation, Univ. of California, Berkeley.
- Kosco, B. H., and J. W. Bartolome. 1983. Effects of cattle and deer on regenerating mixed conifer clearcuts. *J. Range Manage.* 36:265-268.
- Laake, R. S., and J. N. Fiske. 1983b. Sierra Nevada mixed conifers. Pages 44-47 In R. M. Burns, tech. comp. *Silviculture systems for the major forest types of the United States*. U.S. Dep. Agric., For. Serv., Handbook No.445
- Major, J. 1977. California climate in relation to vegetation. Pages 11 -74 In M. G. Barbour and J. Major, eds., *Terrestrial vegetation of California*. John Wiley and Sons New York.

- McDonald, P. M. 1980a. Pacific ponderosa pine-Douglas fir-244. Page 120 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.
- Munz, P. A., and D. D. Keck. 1973. A California flora with supplement. 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.
- 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.
- Tappeiner, J. C., II. 1980. Sierra Nevada mixed conifer 243. Pages 118-119 In F. H. Eyre, ed. Forest cover types of the United States and Canada. Soc. Amer. Foresters, Washington, D.C.
- Verner, J. 1980b. Bird communities of mixed conifer forests of the Sierra Nevada. Pages 198-223 In R. M. DeGraaf, tech. coord. Workshop proceedings: management of western forests and grasslands for nongame birds. U.S. Dep. Agric., For. Serv. (Ogden, Utah) Gen. Tech. Rep. INT-86.
- Verner, J., and A. S. Boss tech. coords. 1980. California wildlife and their habitats: western Sierra Nevada. U.S. Dep. Agric. For. Serv. (Berkeley, Calif.), Gen. Tech. Rep. PSW-37.