

Broadleaved Upland Forest

VEGETATION ASSOCIATION: BROADLEAVED UPLAND FOREST

MAPPED SUBASSOCIATIONS: None

DATA CHARACTERIZATION

Broadleaved upland forest is a general classification for several different vegetation types that occur within California (Holland 1986). Within the Plan Area, these may include canyon live oak, interior live oak and big-cone Douglas-fir Habitats. This general classification likely was applied to vegetation that was differentiated by patterns on topography from the aerial photography, but that was not field-checked for species composition.

BIOGEOGRAPHY

The discussion of biogeography is based on species ranges and distribution known from the Plan Area because of the wide range of Habitats within broadleaved upland forest in California. Canyon live oak ranges from Siskiyou County, in extreme northern California, to San Diego County, in the extreme south (Finch and McClerry 1980). Sawyer and Keeler-Wolf (1995) describe the species in Baja California as well. The species occurs in the Cascade, Sierra Nevada and Coast Ranges and may range from sea level to 2740 m (Finch and McClerry 1980). Interior live oak may occur in monotypic stands or as a dominant canopy species between 500 and 4500 m in the Klamath, Cascade, Coastal, Sierra Nevada, Transverse and Peninsular Ranges of California (Sawyer and Keeler-Wolf 1995). The big-cone Douglas-fir component of this Habitat is limited to the Transverse and Peninsular ranges of southern California only (McDonald 1990).

RANGE AND DISTRIBUTION WITHIN WESTERN RIVERSIDE COUNTY

Keeler-Wolf described stands dominated by interior live oak at Millard Canyon, Hall Canyon, and Fern Canyon (Sawyer and Keeler-Wolf 1995). A location in the Cahuilla Mountain Research Natural Area (RNA) contains vegetation which fits the interior live oak - canyon live oak series (Sawyer and Keeler-Wolf 1995). This Habitat was mapped in the GIS database to include 2,762 acres including populations near Poppet Flats, San Gorgonio and in the Santa Ana Mountains. The Poppet Flats area contains broadleaved upland forest in linear strips, west of the Banning-Idyllwild Highway and northwest of Lake Fulmor. A population is mapped south of Mount San Gorgonio in the northeast corner of the Plan Area, mostly within the San Bernardino National Forest adjacent to the Morongo Indian Reservation. The largest populations are mapped in the Santa Ana Mountains, on the western edge of the Plan Area.



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This population is mainly on the eastern slope of Santiago Peak but generally occurs between Trabuco Peak and Buds Peak within the Cleveland National Forest.

VEGETATION CHARACTERISTICS

Classification of broadleaved upland forest varies widely in descriptions of Habitats within California and the continent. Provided here is a discussion of associations either dominated by canyon live oak (*Quercus chrysolepis*) or interior live oak (*Quercus wislizenii*) or a combination of both. Also included in this description is a discussion of big-cone Douglas-fir (*Pseudotsuga macrocarpa*) and various oaks.

The canopy in a broadleaved upland forest, where dominated by interior live oak, can reach 15 m and varies from continuous to intermittent and even savanna-like (Sawyer and Keeler-Wolf 1995). Shrubs generally are infrequent to common and ground cover is sparse (Sawyer and Keeler-Wolf 1995). Vegetation composition varies within California including woodlands and forests and areas composed mainly of shrubs (Sawyer and Keeler-Wolf 1995).

The canopy, where dominated by canyon live oak, can reach 30 m in a continuous cover and may be two-tiered (Sawyer and Keeler-Wolf 1995). The upper tier consists of conifers and the lower tier of canyon live oak. Other species present include black oak (*Quercus kelloggii*), California bay, (*Umbellularia californica*), big-cone Douglas-fir, Coulter pine (*Pinus coulteri*), ponderosa pine (*Pinus ponderosa*) and/or white fir (*Abies concolor*) (Sawyer and Keeler-Wolf 1995).

Cooper (1922) identifies a *Quercus chrysolepis-kelloggii* association, where the important tree species are canyon live oak and black oak (*Quercus kelloggii*) with the understory varying widely throughout the state. Other common trees are Pacific madrone (*Arbutus menziesii*), California bay (*Umbellularia californica*), bigleaf maple (*Acer macrophyllum*), and buckeye (*Aesculus*) (Cooper 1922). Coulter pine may be a component of this Habitat on mesic sites (Holland 1986). These species also may form the understory beneath big-cone Douglas-fir (Cooper 1922). The Habitat has broad transition areas to adjacent Habitat types. The overstory of these woodlands generally has a mix of deciduous and evergreen hardwoods with a typical canopy height of 4 to 21 m tall (Holland 1988).

In the Santa Ana and San Jacinto Mountains, Vogl (1976) identified an association of evergreen groves of interior live oak or canyon oak. The trees are physically small and crowded, reducing the presence of understory vegetation. The two most commonly found subdominant species are hybrid oaks and California bay (Vogl 1976).



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An alternate form of broadleaved upland forest was described in McDonald and Littrell (1976) where big-cone Douglas-fir is part of oak woodland communities, often on north slopes where canyon live oak predominates. The bulk of the big-cone Douglas-fir distribution occurs in mixed hardwood forest and chaparral (Sawyer *et al.* 1977). Big-cone Douglas-fir also may occur as the sole or dominant tree species in the canopy of many north-facing slopes (Sawyer and Keeler-Wolf 1995). The canopy height generally is less than 30 m and continuous with infrequent shrubs and a sparse ground layer (Sawyer and Keeler-Wolf 1995). Percent cover of big-cone Douglas-fir also depends on elevation. At lower occurrences (below 700 m) the trees are scattered above a closed canopy of canyon live oak (Barbour and Minnich 2000). Big-cone Douglas-fir cover increases to equal that of canyon live oak at around 1500 m (Barbour and Minnich 2000).

McDonald (1990) notes that canyon live oak and big-cone Douglas-fir are strongly associated and may be considered a climax community. At higher elevations, tree associates may include ponderosa pine, Jeffrey pine (*Pinus jeffreyii*), singleleaf pinyon (*Pinus monophylla*), sugar pine (*Pinus lambertiana*), incense-cedar (*Calocedrus decurrens*) and California white fir (*Abies concolor*) (McDonald 1990). At middle elevations, Coulter pine, California walnut (*Juglans californica*), California black oak, California ash (*Fraxinus dipetala*) and California-laurel are common associates (Sawyer and Keeler-Wolf 1995, McDonald 1990). At lower elevations species such as coast live oak (*Quercus agrifolia*), toyon (*Heteromeles arbutifolia*), Nuttall's scrub oak (*Quercus dumosa*), mountain-mahogany (*Cercocarpus minutiflorus*), laurel sumac (*Malosma laurina*), sugar bush (*Rhus ovata*), big-leaf maple and white alder (*Alnus rhombifolia*) may co-occur with bigcone Douglas-fir (McDonald 1990). Shrub associates are many and also vary with elevation; typical genera associated with big-cone Douglas-fir include, chamise (*Adenostoma* spp.), sagebrush (*Artemesia*), California-lilac (*Ceanothus* spp.), buckwheat (*Eriogonum*), manzanita (*Arctostaphylos* spp.), and buckthorn (*Rhamnus* spp.) (McDonald 1990).

In the Santa Ana Mountains, Vogl (1976) observed big-cone Douglas-fir growing with chamise, manzanita, coast live oak, canyon oak and interior live oak.



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PHYSICAL ENVIRONMENT

Broadleaved upland forest typically occurs on steep mesic sites, intermediately between chaparral and Coulter pine (*Pinus coulteri*) in the Santa Ana and San Jacinto Mountains. In California, the Habitat occurs between 500 and 4500 m.

Where dominated by canyon live oak, this Habitat can occur on all aspects, on stream sides, canyon bottoms or near streams (Sawyer and Keeler-Wolf 1995). Canyon live oaks prefer shallow, well-drained soils (Sawyer and Keeler-Wolf 1995). The range for this association is between 450 and 2000 m (Sawyer and Keeler-Wolf 1995).

The interior live oak - canyon live oak series occurs mainly on north-facing slopes, often very steep areas, between 700 and 1900 m on alluvial or bedrock-derived soils, often with rocks (Sawyer and Keeler-Wolf 1995).

The apparent aspect preferences of big-cone Douglas-fir vary with elevations: at low elevations, as low as 300 m, it occurs mainly on northern aspects and canyon bottoms; at middle elevations it may occur in a variety of aspects; and at high elevations (above 2400 m) on west and south aspects (Sawyer *et al.* 1977). Big-cone Douglas-fir may grow in areas with a precipitation range from 250 to 1270 mm per year, with the majority of it being provided by rain (McDonald 1990). Soils supporting big-cone Douglas-fir vary although inceptisols were frequently found and alfisols occasionally found (McDonald 1990). When associated with canyon live oak, big-cone Douglas-fir occurs on steep north-facing slopes, in ravines, and on bedrock surfaces with sandstone or schist-derived, shallow, well-drained soils (Barbour and Minnich 2000; Sawyer and Keeler-Wolf 1995). The big-cone Douglas-fir component of this community in the Santa Ana mountains is present mainly on steep, unstable and rocky north-facing slopes (Vogl 1976).

ECOSYSTEM PROCESSES

Because of the wide variety of Habitats within broadleaved upland forest, no literature specific to the type was available. Information on the effects of fire or regeneration in broadleaved upland forest was not reviewed. Ecosystem processes for oak-dominated Habitats are discussed within the oak woodlands discussion. The effects of fire on big-cone Douglas-fir has been well-studied and a summary is presented below.

Repeated fires are most often found in lower elevations and are likely to extirpate big-cone Douglas-fir, leaving oaks or chaparral. Less frequent intense fires, on the other hand, result



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in a scattered distribution of big-cone Douglas-fir trees of several age classes (McDonald 1990). Steep slopes act to protect these trees from fire damage (McDonald 1990). Regeneration of big-cone Douglas-fir will occur only where fire is absent because the trees generally regenerate best in post-burn conditions and with above-average rainfall by producing trunk resprouts (Vogl 1976; McDonald 1990). Others contend that the big-cone Douglas-fir phase is not adapted to fire but also seems to be suffering the effects of fire suppression (Barbour and Minnich 2000). Between 1938 and 1983, fires occurred on the average every 65 years and the overall stand area decreased; *i.e.*, afforestation occurred more frequently than deforestation because of the inability of small patches to recover from fires (Barbour and Minnich 2000). Other studies have hypothesized that big-cone Douglas-fir dominated areas are reduced by fire, invaded by oak woodland or oak chaparral, and that recolonization by big-cone Douglas-fir requires hundreds of years (McDonald and Littrell 1976).

THREATS

The Land and Resources Management Plan for the Cleveland National Forest (USDA 1986) identified the gradual reduction of grazing within this community to allow for oak regeneration and the development of shrub and herbaceous layers. *Armillaria* root disease (*Armillaria mellea*) infects dead, dying or felled oaks, eventually infecting nearby or planted conifers (Stephenson and Calcarone 1999). Fire is the greatest threat to big-cone Douglas-fir as damage from insects and disease are not well reported (McDonald 1990).

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