

Lodgepole Pine Forest

VEGETATION ASSOCIATION: LODGEPOLE PINE FOREST

MAPPED SUBASSOCIATIONS: None

DATA CHARACTERIZATION

Because lodgepole pine forest is confined to a specific climatic condition and an elevation which is present only in the San Jacinto Mountains, the mapping of the Habitat is most likely to be accurate. Additionally, the indicator species, lodgepole pine forest, is fairly conspicuous and discernable from other pines.

BIOGEOGRAPHY

Munz and Keck (1949) only described this Habitat, in California, as reaching from northernmost California to the central Sierra Nevada between 2530 and 2900 m. However, lodgepole pine forest occurs on high summits in the Transverse and Peninsular ranges as well as the Cascades and Sierra Nevada ranges (Thorne 1976). As a species, lodgepole pine forest can be found from sea level, along the Pacific Coast from Alaska to Baja California, to elevations up to 3600 m as far east as the Rocky Mountains and the Black Hills of South Dakota (Holland and Keil 1995). Lodgepole pine forest has a wide latitudinal range from 63° to 36° north (Pfister and McDonald 1980).

RANGE AND DISTRIBUTION WITHIN WESTERN RIVERSIDE COUNTY

In the Plan Area, lodgepole pine forest is known from the upper slopes of the San Jacinto Mountains (Sawyer and Keeler-Wolf 1995). Within the MSHCP database, Lodgepole pine forest is mapped in only one general area, west of San Jacinto Mountain, in the vicinity of Little Round Valley, Marion Mountain, and Marion Ridge. The total area of this Habitat is 1,654 acres.

VEGETATION CHARACTERISTICS

Lodgepole pine forest occur at slightly higher elevations than mixed coniferous forests in southern California (Holland and Keil 1995). Lodgepole pine forest (*Pinus contorta ssp. murrayana ssp. murrayana*) may grow in pure stands or as a component of other Habitat types (Lotan and Critchfield 1990). Typically, Lodgepole pine forest forms open stands with similar sized, shorter individuals and a sparse understory (Bartolome 1988). Other conifers found in these forests include western white pine (*Pinus monticola*) and mountain hemlock (*Tsuga*



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mertensiana). When located near wet meadows or ponds, quaking aspen (*Populus tremuloides*) and willows (*Salix* spp.), along with a variety of shrubs and showy perennial herbs, are occasionally present (Thorne 1976).

Where lodgepole pine forest is the dominant tree species, the canopy can range from continuous to open (Sawyer and Keeler-Wolf 1995). Typical heights range from 15 to 20 m and typical crown cover is 50 to 60 percent, but can reach 80 percent (Bartolome 1988, Barbour and Minnich 2000). Canopies may reach slightly greater heights at higher elevations where lodgepole pine forest often forms dense forest with limber pine (*Pinus flexilis*).

Shrub density varies from scarce to about 15% and may include manzanita (*Arctostaphylos* spp.), California-lilac (*Ceanothus* spp.), chinquapin (*Chrysolepis* spp.), currant (*Ribes* spp.), mountain-mahogany (*Cercocarpus minutiflorus*), spotted coralroot (*Corallorhiza maculata*), pinedrops (*Pterospora andromedea*), snowplant (*Sarcodes sanguinea*), and wintergreen (*Pyrola* spp.) (Barbour and Minnich 2000, Holland and Kiel 1995, Thorne 1977). Understory plants typically are sparse to abundant and include species such as sandwort (*Arenaria* spp.), mariposa lily (*Calochortus invenustus*), fleabane daisy (*Erigeron breweri* ssp. *jacinteus*), gray monardella (*Monardella cinerea*), and campion (*Silene verecunda* ssp. *platyota*) (Sawyer and Keeler-Wolf 1995). Munz and Keck (1949) list these additional species: rothrock sagebrush (*Artemisia rothrockii*), cinquefoil (*Potentilla breweri*), owl's-clover (*Castilleja lemmonii*), little elephant's head (*Pedicularis attolens*), and groundsel (*Senecio lugens*). In southern California huckleberry (*Vaccinium* spp.) and mountain-heather (*Phyllodoce* spp.) are common (Bartolome 1988). In drier areas, Jeffrey pine and lodgepole pine forest may be associated with montane chaparral species or mycotrophic plants such as wintergreen, snowplant (*Sarcodes sanguinea*), pinedrops and spotted coralroot. Only where lodgepole pine forest occurs near a meadow is herb cover significant and comprised of hydrophytic species (Holland and Keil 1995, Barbour and Minnich 2000). Other areas may be composed of dry, glacial scoured areas where herbs are sparse (Holland and Keil 1995).

In the San Jacinto Mountains lodgepole pine forest occurs in clusters on upper slopes. The large trees have many small and open cones and usually show conspicuous spiral sapwood splits caused by lightning (Vogl 1976).

PHYSICAL ENVIRONMENT

In southern California, lodgepole pine forest occurs from 2,450 to 3,600 m, but also may be present at lower elevations in stands around saturated soil conditions; *i.e.*, bogs and meadows (Holland and Keil 1995). Average precipitation is between 75 and 150 cm, most (70-90%)



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being received as snow in the winter (Holland and Keil 1995, Barbour and Minnich 2000). The mean annual temperature in lodgepole pine forest Habitat is about 5°C (Barbour and Minnich 2000).

Lodgepole pine forest stands may occur in wet, flat areas or dry, steep slopes. The soils within this Habitat may be seasonally flooded and become saturated or are well-drained and on slopes (Sawyer and Keeler-Wolf 1995).

As part of Barbour and Minnich's (1995) "upper montane forests" classification, this Habitat generally occurs on shallow, rocky inceptisols or entisol soils (Barbour and Minnich 2000). Within California, lodgepole pine forest can dominate areas that are arid and windy on shallow soils or flat, wet sites adjacent to meadows or lakes (Barbour and Minnich 2000).

Lodgepole pine forest in the San Jacinto Mountains occurs from 2600 m to the peak at 3234 m, although it may be found as low as 2440 m on moist, shaded north-facing slopes (Thorne 1977). Within southern California, the Habitat most often occurs in upland areas interspersed with subalpine meadows (Sawyer and Keeler-Wolf 1995).

Lodgepole pine forest, as a species, grows in a variety of environmental conditions, with extreme recorded temperatures between from -57°C to 38°C and precipitation ranging from 25 to 500 cm (Lotan and Critchfield 1990). Lodgepole pine forest is intolerant of the shade, growing best in full sunlight, and most often in moist soils (Lotan and Critchfield 1990). On the other hand, soils with underlying hardpan also support lodgepole pine forest and exclude other common trees (Lotan and Critchfield 1990).

ECOSYSTEM PROCESSES

There are varying opinions expressed in the literature as to the effects of fire on lodgepole pine forest. A study of fire within the San Jacinto Mountains showed that lightning-caused fires occurred every few years but were small and of low intensity (Stephenson and Calcarone 1999). This presumably matches historical trends, however, the cycle of large-scale fires is not known. Some stands have been fire free for 350 years whereas others appear to have cycle of 60 to 80 years (Barbour and Minnich 2000).

According to Holland and Keil (1995), fire is important in the regeneration of lodgepole pine forest and result in even-aged stands. But fire is not essential for cones to open and seeds to be released. Lodgepole pine forest cones quickly mature, open and fall in the absence of fire (Sawyer and Keeler-Wolf 1995). According to Sawyer and Keeler-Wolf (1995), the stands are self-replacing and do not appear to be closely associated with or dependent on fire.



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Where fire has not occurred and soils are favorable, e.g., well-drained, red fir (*Abies magnifica*) may succeed this community (Holland and Keil 1995). Conversely, lodgepole pine forest may be invading montane meadows where, historically, fire kept seedling trees from reaching maturity (Holland and Keil 1995). Fire may allow lodgepole pine forest to overwhelm a site because seeds may be stored in a serotinous cone (Lotan and Critchfield 1990). Without fire, lodgepole locations may give way to common surrounding Habitats (Lotan and Critchfield 1990). Drought-tolerant species may also outcompete lodgepole pine forest in some settings (Holland and Keil 1995).

There is debate as to whether lodgepole pine forest occurs as a climax state, evidenced by age structure, or whether it is regulated by fire, precipitation, or even episodic infections of the needle miner (*Coleotechnites milleri*) (Barbour and Minnich 2000). Either by fire, insect infestation, or logging, gaps in the lodgepole pine forest occur and undergo succession. Initially, herbaceous species quickly colonize the gaps, but lodgepole pine forest, with its large seed output, soon closes the gap (Bartolome 1988). Stands may become overcrowded, leaving them susceptible to insect infestation which may increase fuel availability for wildlife (Bartolome 1988). According to Pfister and McDonald (1980) the majority of extant stands of lodgepole pine forest are the result of catastrophic fires.

THREATS

Several fungal-infecting species threaten lodgepole pine forest growth and survivability. Lodgepole pine forest may be susceptible to pitch canker fungus (*Fusarium subglutinans* ssp. *pini*), a relatively new fungal pathogen in the southwestern region of the United States (Stephenson and Calcarone 1999). Pine engraver (*Ips emarginatus*) is another bark beetle known to attack lodgepole pine forest (Stephenson and Calcarone 1999). Lodgepole pine forest needle miner (*Coleotechnites milleri*) has been known to occur in outbreaks and result in stand replacement (Sawyer and Keeler-Wolf 1995). Lodgepole pine forest needle miner has always been a part of lodgepole pine forest Habitat; however, the insect population was regulated by natural predators and infestation caused forest openings which quickly regenerated (Holland and Keil 1995). DDT spraying allowed for outbreaks of needle miner which continue to be a problem (Holland and Keil 1995); today many natural predators have been eliminated resulting in larger infestations which threaten the regeneration of these forests. The most severe pest of lodgepole pine forest is the mountain pine beetle (*Dendroctonus ponderosae*) which often results in the thinning of the infected tree (Lotan and Critchfield 1990). The most serious parasite of lodgepole pine forest is dwarf mistletoe (*Arceuthobium campylopodum*), which severely damages its host plant (Lotan and Critchfield 1990).



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Historically, sheep grazing threatened lodgepole pine forest reproduction, however the removal of this pressure in areas such as Yosemite National Park has resulted in re-colonization of lodgepole pine forest (Holland and Keil 1995).

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