

10970

California Mesic Chaparral

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Shrubland

Map Zones

4, 5

Geographic Range

This system occurs throughout Mediterranean California away from the coastal fog belt.

Biophysical Site Description

Commonly occurs in mesic site conditions (deep, well-drained soils) on north-facing slopes up to ~1,500m (4,550ft) in northern California and up to 1,830m (6,000ft) in southern California.

Average rainfall 14-25in.

Vegetation Description

Mesic chaparral is composed of woody, sclerophyllous shrubs that generally vary from 1-5m (3-15ft) in height. Shrub cover is usually dense and continuous. Chaparral species tend to be fire-resilient, at least within certain parameters of fire return interval (FRI) and burning season, by either resprouting vigorously after fire or by producing fire-resistant seeds that germinate after fire has passed. Common species include *Adenostoma fasciculatum*, *Arctostaphylos* spp., *Quercus berberidifolia*, *Q. wislizeni* v. *frutescens*, *Ceanothus leucodermis*, *Fraxinus dipetala*, *Garrya* spp., *Lonicera* spp., *Prunus ilicifolia*, *Ribes* spp., *Sambucus* spp., *Umbellularia californica*, and *Aesculus californica*. In the most mesic, low-solar-insolation settings, common dominants are *Heteromeles arbutifolia*, *Toxicodendron diversiloba*, *Rhamnus* spp., and *Prunus* spp. At the high end of the type (above ~4,000ft), *Arctostaphylos glandulosa*, *Quercus wislizeni*, *Cercocarpus montanus* var. *glaber*, and *Quercus chrysolepis* are common associates. Most of these species readily resprout after fire.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ADFA	<i>Adenostoma fasciculatum</i>	Chamise
QUBE5	<i>Quercus berberidifolia</i>	Scrub oak
QUWIF	<i>Quercus wislizeni</i> var. <i>frutescens</i>	Interior live oak
CELE2	<i>Ceanothus leucodermis</i>	Chaparral whitethorn
CEMOG	<i>Cercocarpus montanus</i> var. <i>glaber</i>	Birchleaf mountain mahogany
ADSP	<i>Adenostoma sparsifolium</i>	Redshank
HEAR5	<i>Heteromeles arbutifolia</i>	Toyon

TODI	<i>Toxicodendron diversilobum</i>	Pacific poison oak
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Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Chaparral burns in high-intensity, stand-replacing crown fires that can burn 1,000s of acres in a single event. Historic mean FRIs are highly variable across the state, depending on species composition and other factors; they tend to be longer in coastal northern California than in southern California, where summer lightning is more common. Season of burning can play a part in species composition. Occasionally, frost affects mortality and increases fuel buildup. In the last century, the high frequency of human ignitions has reduced the FRI interval to 30-35yrs in southern California, with some areas burning much more frequently than that.

Sediment cores taken from the Santa Barbara Channel in central California dating from the 16th and 17th centuries showed two major peaks in charcoal deposition about a century apart, suggesting historic presence of large fires (Mensing 1998; Mensing et al. 1999). Mensing (1998) and Mensing et al. (1999) found that the frequency of large charcoal peaks appeared fairly constant over the ~560yr period documented in the cores. Their foremost conclusion was that their sediment stratigraphy did not document any strong change in frequency of charcoal peaks over the entire period or during any of the major land use periods (Native American, Spanish and early American, or modern American). They concluded that the frequency of really large fires (at least in southern Santa Barbara County) is controlled by decadal (and longer) drought cycles and by the annual fall occurrences of extreme fire weather, then as now. Season of burning may play a role in species composition. The largest fires are often the product of strong off-shore winds (such as the Santa Anas in southern California).

A reviewer commented that there is little research that reports historic FRIs for this system. However, there are a number of old-growth mesic chaparral stands that have existed for 100s of years. These old-growth stands are not the result of fire suppression activity but a natural process. Tom Swetnam is currently working on a tree ring/fire scar project that may help us understand what the past fire regime was in mesic systems, but at the present moment all we know is that old-growth (100yrs+) mesic chaparral stands are being slowly eliminated by increasing fire frequency.

Another reviewer recommended a 40yr return interval as this is the low end of the Byrne et al. (1977) estimates. After considering review comments, modelers felt that an 80yr return interval better reflected the longer return interval that this type would have relative to the xeric (Biophysical Setting [BpS] 1110 and 1105) types. One line of argument for the length of the FRI was that it is very difficult to initiate fire in mesic chaparral today in anything less than extreme fire weather and that fuel moisture is quite important in determining the resulting fire behavior. This condition presumably also constrained any historic Native American who may have been trying to manage shrublands with prescribed fire. Mensing's data (1998; Mensing et al. 1999) also show that the occurrence of large fires has not changed much since Chumash times and that, then as now, big fires were correlated with drought cycles. Mensing's data also suggest that the relative abundance of chaparral (on a landscape scale) has not changed much since Chumash times and that no one (not Chumash, not Spanish, not American) has been successful at substantially altering the amount of chaparral in the south coast area. So the charcoal and

sediment record support what we might conclude from modern observations of fire behavior in this vegetation: that the Chumash probably didn't light off big patches of mesic chaparral often.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	77	100		
Moderate (Mixed)				
Low (Surface)				
All Fires	77	100		

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Mesic chaparral typically burns in large wildfires that consume 1,000s and 10,000s of acres; a small percentage burn >100,000ac. Mesic chaparral tends to ignite only under more extreme weather conditions than xeric chaparral, and patches may remain unburned within a large fire that consumes mostly the south-facing stands. Some mesic chaparral may not burn for 100yrs or more.

Fire ecologists disagree about the size distribution of fires prior to European settlement in California. A reviewer pointed to studies of fire distribution in Baja California, Mexico, which show small patch sizes (100s of ha); summer ignitions there result in fires that burn until they reach younger, less-flammable vegetation and then go out. Fire suppression is generally not practiced, and these studies maintain that this pattern existed in southern California before and even for a while after European settlement (see Minnich 1983; Minnich 2001; Minnich 2006; Minnich and Chou 1997; Minnich et al. 2000). Other studies conducted in California have shown that large fires (1,000s of ha) driven by Santa Ana or “sundowner” winds occurred throughout the 20th century, even before the era of effective fire suppression. These authors suggest that very large fall fires have always been characteristic of southern California chaparral. Both contingents base their analysis on relatively recent records -- since the 1920s in general, a time when most fire starts were probably anthropogenic in both areas. They disagree on the extent to which large wind events occur in Baja California compared to Alta California. We can probably never resolve this debate.

Adjacency or Identification Concerns

Below ponderosa and sugar pine forests on the western slopes of the Sierra Nevada and more southern mountains; adjacent to mixed evergreen forests or woodlands in the coast ranges. Protected stands of mesic chaparral that have not burned in many years may contain individuals that reach tree-like stature, making identification more difficult from remotely sensed data.

Issues or Problems

With increasing fire frequency from human ignitions, mesic chaparral can be degraded. Widespread nonnative grasses (e.g., *Bromus* spp., *Avena* spp.) may invade recently burned chaparral stands and increase the probability of an early reburn, before obligate-seeders have begun to set seed and before sprouting species have accumulated much stored reserves. An open stand or even type-conversion may result from repeated anthropogenic fires.

Native Uncharacteristic Conditions

Comments

Map zones (MZs) 04 and 05 were combined during 2015 BpS Review.

This model in other zones uses a 50yr return interval. This is the mid-point between 40-60yrs given by Byrne et al. (1977). This represents the average interval between large fires that appeared in the sediment cores. The interval may have been somewhat shorter if smaller fires (i.e., those that did not show up in the cores) had been included. For MZs 04 and 05, this interval was actually lengthened to ~80yrs to reflect the relative differences in FRIs between the xeric (BpS 1110 and 1105) and the mesic (BpS 1097) models.

Reviewer comments suggested that a longer FRI is more appropriate for mesic chaparral. Alexandra Syphard (asyphard@yahoo.com) also helped author this model for MZs 04 and 05. Zach Principe (zprincipe@tnc.org), Hugh Safford (hughsafford@fs.fed.us), and Dave Schmidt also reviewed this model for MZs 04 and 05.

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	A	A	A	A	A	A	A	A	A	A
Herb	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Herb	>1.0	A	A	A	A	A	A	A	A	A	A
Shrub	0-0.5	A	A	A	A	A	A	A	B	B	B
Shrub	0.5-1.0	A	A	A	A	A	A	A	B	B	B
Shrub	1.0-3.0	A	A	A	A	A	A	A	B	B	B
Shrub	>3.0	A	A	A	A	A	A	A	B	B	B
Tree	0-5	B	B	B	B	B	B	B	B	B	B
Tree	5-10	B	B	B	B	B	B	B	B	B	B
Tree	10-25	B	B	B	B	B	B	B	B	B	B
Tree	25-50	B	B	B	B	B	B	B	B	B	B
Tree	>50	B	B	B	B	B	B	B	B	B	B

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 10 Early Development 1 - Open
Upper Layer Lifeform: Shrub

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
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LOSC2	Lotus scoparius	Common deerweed	Lower
PHACE	Phacelia	Phacelia	Lower
CRYPT	Cryptantha	Cryptantha	Lower
EMMEN	Emmenanthe	Whisperingbells	Lower

Description

Above-listed shrub seedlings and sprouts fill the stand vigorously, in addition to fire annuals, perennial geophytes, and short-lived perennials.

Herb species include common deerweed (*Lotus scoparius*), *Phacelia* spp., *cryptantha* spp., and *Emmenanthe* spp.

Class B 90 Late Development 1 - Closed

Upper Layer Lifeform: Tree

Upper-layer lifeform is not the dominant lifeform. Upper layer can be the emerging trees through the canopy of shrubs. The dominant shrub canopy closure is 70-100%. The sporadic tree canopy can be 0-50% closure, less than ~10m. Split these two classes on canopy closure of the shrub layer, rather than the tree layer.

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ADFA	Adenostoma fasciculatum	Chamise	Middle
QUBE5	Quercus berberidifolia	Scrub oak	Mid-Upper
CELE2	Ceanothus leucodermis	Chaparral whitethorn	Middle
CEMOG	Cercocarpus montanus var. glaber	Birchleaf mountain mahogany	Lower

Description

Resprouting shrubs, shrubs growing from seedlings. Herbs only in openings. Greater than 8yrs of age. Species include chamise (*Adenostoma fasciculatum*), *Quercus berberidifolia*, *Cercocarpus montanus* var. *glaber*, and *Ceanothus leucodermis*.

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:OPN	0	Late1:CLS	8
Late1:CLS	9	Late1:CLS	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
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Replacement Fire	Early1:OPN	Early1:OPN	0.0066	152	Yes	0
Replacement Fire	Late1:CLS	Early1:OPN	0.0133	75	Yes	0

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