

11130

California Coastal Live Oak Woodland and Savanna

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
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Vegetation Type

Steppe/Savanna

Map Zone

4

Geographic Range

Quercus-agrifolia-dominated forests, woodlands, and savannas occur in the Coast Ranges, Transverse Ranges, and Peninsular Ranges from Sonoma County to northern Baja California.

Biophysical Site Description

Mainly below 500m elevation in foothill environments receiving 40-80cm annual precipitation, with January mean minimum daily temperatures of 5°-10° C and July mean maximum daily temperatures of 18°-23° C.

Vegetation Description

Coast live oak is the dominant canopy species in a single tree stratum over a shrub or herb understory. Tree canopy closure ranges from 10-80%. Trees may be embedded in a shrub matrix of coastal sage scrub and chaparral shrub species such as *Salvia mellifera*, *Adenostoma fasciculatum*, *Heteromeles arbutifolia*, *Cercocarpus betuloides*, and *Ceanothus* spp., with a sparse understory of herbs and lianas such as *Salvia spathacea*, *Claytonia parviflora*, *Toxicodendron diversilobum*, and *Rubus ursinus*. Alternatively, depending mainly on disturbance history, the oaks may be embedded in a grassland matrix comprised of a diverse mix of perennial bunchgrasses (e.g., *Bromus carinatus*, *Nasella pulchra*), shrubs (e.g., *Lessingia filaginifolia*, *Baccharis pilularis*), annual grasses, and forbs.

Coast live oak is shade-tolerant and recruits into both chaparral and coastal sage scrub on many substrates as well as into more mesic settings such as north-facing slopes and areas bordering riparian areas. Coast live oak is also one of the most fire-resistant oaks in California. Seedlings and saplings can survive relatively low-intensity surface fires. Adult trees exhibit a number of fire adaptations, including dense outer bark, a thick inner bark with high insulating capacity, and an ability to resprout from the base and crown following severe wildfires. Adult survival rates exceeding 95% have been documented following severe wildfire. Mortality rates are higher for late-season fires and for oaks growing among chaparral shrubs. The oak canopy often recovers more rapidly after fire than other elements of the vegetation, contributing in part to the heterogeneous structure and composition of this type depending on fire history.

A reviewer commented that the discussion is based on a myth initiated by Fredrick Clements that coastal California was covered by perennial bunch grasslands. The reviewer suggested revising the discussion to consider the prospect that California was covered by forblands, which decompose and disarticulate more readily than grasses.

The aforementioned reviewer comment did not result in descriptive changes because the original modeler and other reviewers were comfortable with the description as written. The original modeler noted that as written the description includes a wide range of understory conditions including, but not limited to, bunchgrass-dominated understory. Based on observation of oak woodlands with understories dominated by perennial grasses, the original modeler felt confident that such communities existed historically.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QUAG	<i>Quercus agrifolia</i>	California live oak
HETER5	<i>Heteromeles</i>	Toyon
TODI	<i>Toxicodendron diversilobum</i>	Pacific poison oak
BRCA5	<i>Bromus carinatus</i>	California brome
RUUR	<i>Rubus ursinus</i>	California blackberry
NAPU4	<i>Nassella pulchra</i>	Purple tussockgrass

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Fire is the dominant disturbance mechanism. Fire severity can range from high in oak woodlands with a high shrub component to moderate or low in open woodlands and savannas with a grass understory. Lightning-ignited fires are uncommon, but human-ignited fires may occur frequently given the propensity of aboriginal cultures to burn foothill environments (Keeley 2002).

One reviewer indicated that the proportions of lightning versus human fires is skewed by fire suppression because lightning and anthropogenic fires are differentially extinguished at a small size, thereby affecting the size of large fires related to their ignition source. Since suppression skews fire starts, this concept is meaningless for modeling pre-suppression/Holocene conditions. There is no doubt that Native Americans set a lot of fires and burned a lot of landscape, largely because the landscape was herbaceous. Interannual burning rates varied with precipitation and productivity. Given Native American burning habits, burning along the California coast was extensive virtually every year except after winters of extreme drought. Over Holocene time scales, fire occurrence was highly aperiodic in response to short-term fluctuations in productivity of subshrubs and flash fuels. Fire mosaic turnover is random and unrelated to previous fire history.

The original modeler responded to the reviewer comments mentioned above, noting the following: 1) The reason that lightning was probably not a major source of ignition is because lightning is rare in central coast woodlands, not because of fuel conditions; 2) Coast live oak woodlands also occur in more interior areas not as densely settled by Native Americans. Modeler felt that there was no evidence to support the contention that burning was extensive virtually every year throughout the Coast Ranges; and 3) Original modeler generally agreed with the reviewer's comment that fire occurrence was a response to fluctuation in shrubland productivity

and flashy fuels. However, modeler clarified that fire does exert some effect on fire mosaic turnover, although the effect appears to be short-lived. Also, productivity does not seem to be as strong a control on fire occurrence as meteorology (i.e., hot, dry wind events) in these systems.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	175	8		
Moderate (Mixed)	31	42		
Low (Surface)	26	50		
All Fires	13	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

Patchy distribution controlled by geology, topography, soils, and fire (e.g., Wells 1962; Callaway and Davis 1993). Fire size can range from 10-1,000ac in this type. A reviewer noted that fires that burn these woodlands typically include many other ecosystems (i.e., grassland, sage scrub, chaparral), and in these cases the maximum fire size could be orders of magnitude larger than the listed max fire size.

Adjacency or Identification Concerns

Can be adjacent to chaparral, coastal scrub, oak forest, mixed evergreen forest, and riparian forest. Fire frequency and severity would be regulated in part by these adjacent ecosystems in the landscape.

Issues or Problems

This is an extremely heterogeneous system whose shrub and herb layers have been extensively modified by grazing, exotic species, and altered fire regimes. The historical fire regime is not well understood, as *Quercus agrifolia* cannot be reliably aged and thus is not amenable to fire scar analysis.

This type is subject to the threats of grazing, conversion of understory to exotic annual grasses, fire suppression, residential development. Livestock grazing may act as a less destructive, yet chronic disturbance mechanism. Grazing is unlikely to be responsible for stage transitions; rather, it may impact vegetation change by reducing the rate of change among stages.

Native Uncharacteristic Conditions

Comments

Julie Evens (jevans@cnps.org), Anne Klein, Hugh Safford (hughsafford@fs.fed.us), and Dave Schmidt also reviewed this model in MZs04 and 05.

A map zone (MZ) 4 and MZ05 reviewer suggested the following changes: 1) Class C should have up to 80% cover; 2) Class A max DBH should be 5-9ft; 3) Class C mixed fire transition to Class B seems illogical because it is not reducing canopy cover as the class description states; 4) Fire return interval (FRI) is too short, should be more like 20yrs. Reviewer cited Keeler-Wolf and Evans, 2006, Santa Monica Mtns. Report. The original modeler felt that there was not enough evidence to support an FRI 13yrs versus 20yrs. Because implementing the suggested change in the FRI would not change the fire regime group, the lead chose not to modify the FRI.

National QC in MZ03 (kb) changed the VDDT model in consultation w/ the regional lead (jf) to conform to modeling rules. Original model had Class C start age of 61yrs and mixed and surface fire disturbances causing a transition from Class B (21-60) to Class C. This could possibly result in a disturbance that advances age. Changed Class C age to 21yrs and modified Class C description accordingly.

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	A	A	A
Shrub	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	A	A	A
Tree	5-10	B	B	B	B	B	B	B	B	B	B
Tree	10-25	C	C	C	C	C	C	C	C	C	C
Tree	25-50	C	C	C	C	C	C	C	C	C	C
Tree	>50	C	C	C	C	C	C	C	C	C	C

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 11 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QUAG	Quercus agrifolia	California live oak	Upper

Description

Fire-following forbs, resprouting bunchgrasses and understory woody perennials, and resprouting oak saplings and trees.

Oak canopy >20%. Large, fire-tolerant oaks with low understory dominated by small shrubs. These canopies are usually 15-20m height. Most stands in this state are generally 60yrs or older.

Replacement fires unlikely given the fuel structure. Mixed and surface fire are less likely on most of the range. However, near Native American settlements, the likelihood would increase. Without fire, the stand will eventually close in.

Maximum Tree Size Class

Very Large >33" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:CLS	20
Mid1:CLS	21	Mid1:CLS	999
Late1:OPN	21	Late1:OPN	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
Replacement Fire	Early1:ALL	Early1:ALL	0.004	250	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.05	20	No	0
Surface Fire	Early1:ALL	Early1:ALL	0.1	10	No	0
Insects or Disease	Mid1:CLS	Early1:ALL	0.001	1000	Yes	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.01	100	Yes	0
Surface Fire	Mid1:CLS	Late1:OPN	0.067	15	Yes	0
Mixed Fire	Mid1:CLS	Late1:OPN	0.067	15	Yes	0
Alternative Succession	Late1:OPN	Mid1:CLS	1	1	Yes	20
Replacement Fire	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.02	50	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.02	50	No	0

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