

11120

California Central Valley Mixed Oak Savanna

BpS Model/Description Version: Aug. 2020

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Vegetation Type

Steppe/Savanna

Map Zones

4, 5

Geographic Range

Historically, this system was found throughout the California Central Valley from Lake Shasta south to Los Angeles County, usually <732m (2,400ft) elevation. Recent statewide range estimates of this habitat are incomplete because most vegetation map and classification systems have only registered canopy cover of *Q. lobata* when it is >10% across 40-100+ac. *Q. lobata* may occur at <10% cover across much of its range.

Biophysical Site Description

Valley oak communities generally occur on alluvial terraces and flat plains, often with deep, well-drained, fertile soils <732m (2,400ft) elevation. Annual precipitation ranges from 13-102cm (5-40in).

Vegetation Description

Quercus lobata is the characteristic and usually dominant species in the tree canopy, ranging in height from 15-37m (49-120ft) at maturity. Trees are widely spaced and cover typically does not exceed 20%. Other common tree species include *Quercus douglasii*, *Q. wislizeni*, *Q. agrifolia*, and *Aesculus californica*; shrub species that may be present in moister or fire-suppressed settings include *Toxicodendron diversilobum*, *Heteromeles arbutifolia*, and *Rhamnus* spp. Prior to the invasion of non-native annual grasses, the understory may have been dominated by native perennial bunchgrasses and native annuals including *Nassella*, *Hemizonia*, *Eriogonum*, *Trifolium*, *Gilia*, *Navarretia*, *Lupinus*, *Calycadenia*, and *Lessingia*. Today, ground cover consists of a well-developed carpet of non-native annual grasses and forbs, including *pulchra*, *Avena* spp., *Bromus* spp., *Hordeum*, and *Lolium* spp.

This habitat often has a sparse shrub layer and a well-developed herbaceous layer of valley grassland or vernal pool-grassland. The shrub layer becomes more well developed after fire suppression.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
QULO	<i>Quercus lobata</i>	California white oak
QUDO	<i>Quercus douglasii</i>	Blue oak

QUWI2	<i>Quercus wislizeni</i>	Interior live oak
QUAG	<i>Quercus agrifolia</i>	California live oak
AECA	<i>Aesculus californica</i>	California buckeye
RHAMN	<i>Rhamnus</i>	Buckthorn
TODI	<i>Toxicodendron diversilobum</i>	Pacific poison oak
HEAR5	<i>Heteromeles arbutifolia</i>	Toyon

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

Disturbance Description

Valley oak regeneration to replace mature trees is lower than in other deciduous oak species. Some studies indicate that this is due to a rare occurrence of necessary climate conditions, such as a warm summer followed by several wet years. Other studies suggest that low levels of recruitment may be related to competition from exotic grasses and forbs, drought, rodent and insect damage, grazing by cattle, and seedling and acorn predation by wild and domestic animals. *Q. lobata* is dying in some areas due to lower water tables and the accumulation of saline irrigation runoff.

Historically, valley oak woodlands probably maintained themselves with natural disturbances such as fire and flooding. Repeated burning would have promoted more open savanna-like stands with widely spaced valley oak and relatively little shrub cover. However, in the last century, suppression of fire and flooding has adversely affected sustainability of valley oak woodlands. Historic occurrences of fire have changed from frequent, fast-moving large fires to infrequent, small fires, or fire has been mostly excluded due to conversion to irrigated agriculture and urban development. For example, it is estimated that 40,000ac of valley oak woodland were converted to development/rangeland between 1973 and 1987 (Bolsinger 1988).

Valley oak has strategies that enable it to survive fire. Mature trees are fire-resistant, while top-killed seedlings and saplings sprout from the root crown. Acorns that are stored underground by animals are more likely to regenerate after fire. Historic lightning fires usually started in taller, older oaks, which were frequently the source of fire ignition once hit.

Moderate-severity fire top-kills seedlings and saplings. Larger *Q. lobata* are resistant to such fire. Trees suffering basal burning are most likely to be killed. Hot surface fire may kill large trees with extensive internal rot. Trees <20in are usually killed by hot surface fires. Crown fire will kill a large number of valley oak of all size classes. Fire severity is higher in stands with higher shrub cover and moderate or low in open woodlands/savannas with an herbaceous understory. A reviewer noted that soil productivity has a major effect on fire severity.

Oak diseases cause low level of mortality under natural conditions. Most *Q. lobata* are infected with the heart-rot fungus *Armillaria mellea*, but it is usually only fatal to mature trees. Acorns are frequently infested with worms and weevils that decrease germination. Fire-scarred trees are more susceptible to windthrow and heart-rot fungi.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	177	6		
Moderate (Mixed)	94	12		

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	A	A	A	A	A	A	A	A	A	A
Tree	10-25	B	B	B	B	B	B	B	B	B	B
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 5 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QULO	Quercus lobata	California white oak	Upper
QUDO	Quercus douglasii	Blue oak	Upper
AECA	Aesculus californica	California buckeye	Upper
QUWI2	Quercus wislizeni	Interior live oak	Upper

Description

Comprised of fire-following herbs, resprouting bunchgrasses, and resprouting tree saplings.

Replacement fire severe enough to kill most overstory oaks, but this is unlikely at this stage due to lack of enough fuel to generate fire severe enough to kill fire-tolerant oaks. Surface fire will tend to promote open woodland/savanna of older/larger fire-tolerant oaks by stimulating resprouting of trees. Surface fire influences the shrub/seedling/sapling layer by thinning and removing above-ground shrub and herbaceous material.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B 63 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QULO	Quercus lobata	California white oak	Upper
QUDO	Quercus douglasii	Blue oak	Upper
AECA	Aesculus californica	California buckeye	Upper
QUWI2	Quercus wislizeni	Interior live oak	Upper

Description

Comprised of mixed size classes of trees. Stand understory is generally dominated by grassland with intermixed vernal pool systems. Shrub layer is open.

Replacement fire severe enough to kill most overstory oaks, but this is unlikely at this stage due to lack of enough fuel to generate a severe fire. Mixed fire or surface fire will tend to promote open woodland/savanna and resprouting oaks of moderate density. Mixed fire can remove shrub, tree seedling, and sapling component.

Maximum Tree Size Class

Large 21-33" DBH

Class C 32 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
QULO	Quercus lobata	California white oak	Upper
QUDO	Quercus douglasii	Blue oak	Upper
AECA	Aesculus californica	California buckeye	Upper
QUWI2	Quercus wislizeni	Interior live oak	Upper

Description

Comprised of mixed size classes of trees. Stand understory is generally herb-dominated while shrub layer is denser than in previous classes.

Replacement fire severe enough to kill most overstory oaks, but this is unlikely at this stage due to lack of enough fuel to generate a severe fire. Mixed fire can transition to Class B in higher-severity fires because the larger trees would be susceptible to mortality. Surface fires are less likely than in Class B because understory is generally less dense. Surface fires will maintain open woodland/savanna of older/larger fire-tolerant oaks by stimulating sprouting of trees and shrubs. Surface fire influences the shrub/seedling/sapling layer by thinning and removing above-ground shrub and herbaceous material.

Fungal disease (modeled as insects/disease) can be fatal to very old trees; though this class would maintain in Class C, the stand would become more open.

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:OPN	9
Mid1:OPN	10	Late1:OPN	89
Late1:OPN	90	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
Surface Fire	Early1:ALL	Early1:ALL	0.1	10	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.1	10	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.007	143	Yes	0
Surface Fire	Late1:OPN	Late1:OPN	0.0125	80	No	0
Mixed Fire	Late1:OPN	Mid1:OPN	0.013	77	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.02	50	No	0

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