Ecological site group R014XG917CA
Dry Loamy Fan

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Key Characteristics

- located on alluvial fans
- loamy texture
- < 20" ppt

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

Physiography

This ESG is found primarily on floodplains, alluvial fans and terraces, old alluvial fans and both stream and marine terraces with gentle slopes from 0 to 10% from 30 to 2100 feet elevations.

Climate

The average annual precipitation in this area is 11 to 53 inches (272 to 1,353 millimeters), this site is on the lower end of the range however. The higher amounts of precipitation occur at the higher elevations in the area north of San Francisco. Most of the rainfall occurs as low- or moderate-intensity, Pacific frontal storms during winter. This area is very dry from mid-spring to mid-autumn. Snowfall is rare. The average annual temperature is 54 to 61 degrees F (12 to 16 degrees C). The freeze-free period averages 315 days and ranges from 265 to 365 days. It is longest near the coast, and it becomes shorter with elevation.

Soil features

This ESG is found on variable soils that are generally very deep, moderately well drained to well drained soils in alluvial material from alluvial sources.

Some representative soils include:

Botella, a fine-loamy, mixed, superactive, thermic Pachic Argixeroll
Campbell, a fine-silty, mixed, superactive, thermic Cumulic Haploxeroll
Danville, a fine, smectitic, thermic Pachic Argixeroll
Flaskan, a fine-loamy, mixed, superactive, thermic Typic Argixeroll
Rincon, a fine, smectitic, thermic Mollic Haploxeralf
Sorrento, a fine-loamy, mixed, superactive, thermic Calcic Haploxeroll
Zamora, a fine-silty, mixed, superactive, thermic Mollic Haploxeralf

Vegetation dynamics

This ESG is characterized by valley soils that support open stands of Valley Oak woodland that will include live oaks across alluvial fans, flood plains and terraces. The shrub layer is best developed along natural drainages, becoming insignificant in the uplands with more open stands of oaks. Valley Oak woodland occurs in a wide range of physiographic settings but is best developed on deep, well-drained alluvial soils such as those associated with this ESG, usually in valley bottoms. Most large, healthy valley oaks are probably rooted down to permanent water supplies.
The valley oak (*Quercus lobata*) woodlands are a rapidly disappearing ecosystem in California. Valley oak stands

with little or no grazing tend to develop a partial shrub layer of bird disseminated species, such as poison-oak, toyon, and coffeeberry. Ground cover consists of a well-developed carpet of annual grasses and forbs. Canopies of these woodlands are dominated almost exclusively by valley oaks. Tree associates in the Central Valley include California sycamore, Hinds black walnut, interior live oak, boxelder, and blue oak. The shrub understory consists of poison-oak, blue elder, California wild grape, toyon, California coffeeberry, and California blackberry. Various sorts of wild oats, brome, barley, ryegrass, and needlegrass dominate the ground cover. When reasonably adjacent to streams and higher water tables, Santa Barbara sedge will also be a component of the understory. Foothill pine and coast live oak are associated with valley oak woodlands along the Coast Range.
These areas were and are known to be extremely fertile land for agriculture crops and grazing lands, thus, much of the land suitable for valley oak regeneration has been lost to both habitat destruction and soil moisture availability (Meyer 2002). The valley oak is one of the largest oaks in North America that can grow trunks up to 6 or 7 feet in diameter. They are deciduous trees that require large amounts of water at rooting depth and rich soil created by spring flooding (Pavlick et al 1993). Natural regeneration of these trees has been steadily declining, due primarily, to the loss of habitat and the removal of natural yearly flooding events (Sork et al 2002). Extensive research has been done to determine what can be done to restore valley oaks to riparian woodlands, however many have found that without major changes to current land uses, there is little chance of valley oak restoration success.
Soil moisture, and in turn, soil texture, seem to be the major components in successful seedling germination and establishment for valley oaks (Adams et al 1992). The valley oak needs deep soil that is able to retain soil moisture from spring flood events, into the growing season, in order to ensure survival through the hot temperatures of summer. Flooding is especially important for valley oaks, since they prefer the higher parts of the floodplain, where the water table is further down so as not to saturate the roots, but still offers the soil moisture during the key part of the growing season (Griggs and Golet 2002). This also explains why soil texture is an important component as well. Loamy soil textures have a higher water holding capacity, and will hold water later into the year, whereas sandy soil textures have larger pore spaces, and allow water to flow through rather quickly, making the water-holding capacity very low. Thus, making floodplains with sandy soil textures a more difficult growing medium for new valley oak seedlings than loamy soil textures (Meyer 2002).

There are other factors that could play additional roles in the lack of regeneration of valley oaks including; rodent and deer predation of seedlings, lack of open niche space for new seedlings to utilize, and shading created by the older valley oak canopy. Valley oak woodlands that are highly utilized by deer, rodents, and feral pigs, will have a much more difficult time regenerating due to predation of their seedlings in the first year. It has also been speculated in the research that this is also a factor that can be solved by replacing the natural flooding regimes because the rodents drown, thus reducing the number of seedling predators significantly (Meyer 2002).

Most valley oak woodlands that still remain throughout California are filled with tall, old trees, between 100 and 300 years old, and individual valley oaks may live as long as 400 years. These annual grass and forb understory, such as bromes and wild oats, also create problems for new oak seedlings because they tie up all the available nutrients and water, leaving nothing left for the oak seedlings to begin germination (Adams et al 1992). With the addition of the shade created by the large canopy of the oaks, the seedlings have lost virtually any chance for germination or survival (Griggs and Golet 2002).

Restoration of this ecosystem would be possible; however, it would be costly and require fairly labor-intensive strategies. Without replacing the natural disturbance regime, it would be necessary to manually plant valley oak seedlings with an auger and protect them from predation either with wire-mesh cages or tubing, although tubing does constrict growth (Adams et al 1992). They would also require some sort of irrigation or additional watering, in order to ensure they live through the hot summer season in these Central Coast valleys (Griggs and Golet 2002).

Information from:
Adams Jr., T.E., P.B. Sands, W.H. Weitkamp, and N.K. McDonald. 1992. Oak Seedling Establishment on California Rangelands. Journal of Range Management. 45:93-98.
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Howard, J.L. 1992. *Quercus lobata*. Fire Information Effects System. Accessed June 30, 2006: http://www.fs.fed.us/database/feis.
Meyer, V.C. 2002. Soil Moisture Availability as a Factor Affecting Valley Oak (*Quercus lobata* Nee) Seedling Establishment and Survival in a Riparian Habitat, Cosmunes River Preserve, Sacramento County, California. USDA Forest Service General Technical Report. PSW-GTR-184.
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and Seedling to Sapling Mortality, Humboldt State University. Accessed June 30, 2006: http://www.icess.ucsb.edu/esrg/ess_sum97/Students_ESS.1998/Sam_Olson/sam_report.html.
Pavlik, B., P. Muick, S. Johnson, and M. Popper. 1993. Oaks of California. Cachuma Press: 184 pp.
Ritter, Lyman V. 2020. Valley Oak Woodland. California Wildlife Habitat Relationships System.California Department of Fish and Game, California Interagency Wildlife Task Group. Accessed https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=67342&inline.
Sork, V.L., F.W. Davis, R.J. Dyer, and P.E. Smouse. 2002. Mating Patterns in a Savanna Population of Valley Oak (*Quercus lobata* Nee). USDA Forest Service General Technical Report. PSW-GTR-184.

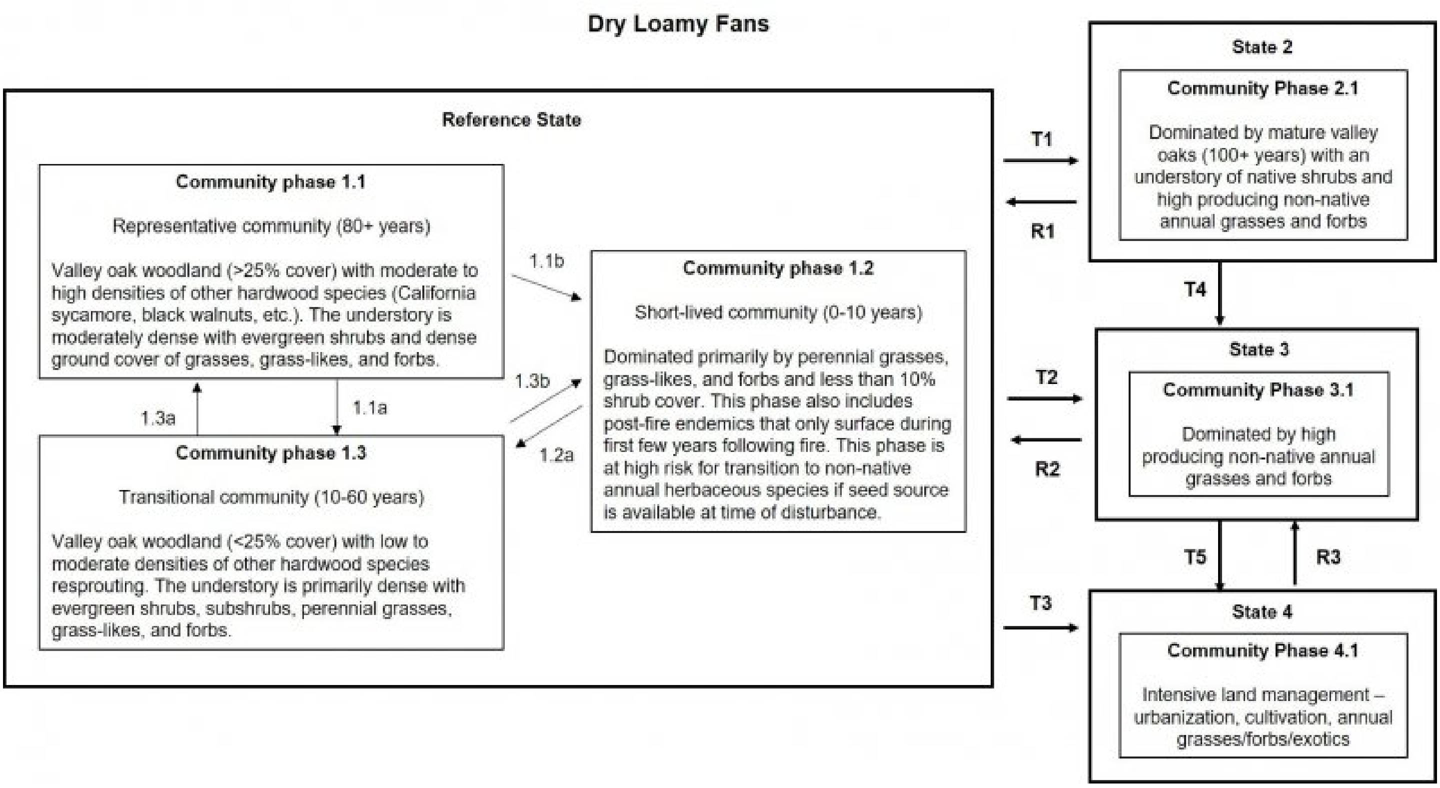
Major Land Resource Area

MLRA 014X
Central California Coastal Valleys

Stage

Provisional

State and transition model



Reference State Community Pathways (Natural disturbance regime only – no management scenarios)

Community Phase 1.1

Community Pathway 1.1a: The historical fire regime is approximately 70 to 200 years, with lightning being the primary ignition source. Low severity, surface fires were most typical with severity of the fire increasing with the density of shrubs in the understory.

Community Pathway 1.1b: Severe fires that result in full top-kill of dominant valley oak overstory where shrubs are denser in the understory.

Community Phase 1.2

Community Pathway 1.2a: The shift occurs over time as the oaks re-sprout and evergreen shrubs regenerate and begin to shade out some of the herbaceous species.

Community Phase 1.3

Community Pathway 1.3a: This occurs as the valley oaks and other species become taller and older.

Community Pathway 1.3b: This occurs when a fire takes place before the valley oaks and other species have time to create a more dense, older, closed canopy.

T1 – Permanent impacts to the hydrologic functions (irrigation, dams, other types of water table alterations) of this site draw the water table down so low that only older, mature valley oaks are able to continue accessing deep water table water. Fires that are typical in this landscape may continue to burn the understory and burn out many of the younger valley oaks that are stressed from lack of water. In areas near urban land fires are suppressed and allow development of a thick shrub layer underneath the tall, old, mature valley oaks. Once the site has lost this hydrologic functions, it has crossed a threshold into State 2 that is maintained by new feedback mechanisms.

R1 – Returning the hydrologic function to the site but removing dams, water diversions, levees, etc. that re-establish a water table accessible to young valley oak roots during crucial summer months when precipitation is limited. Valley oaks are readily germinated, they just need the long-term soil water to allow their roots to fully establish. If this is possible, this State may be restored back to a reference condition. It may require constant maintenance to ensure full establishment and protect from fires and non-native invasives.
State 2 –

Community Phase 2.1 – represents all of the expressions of the valley oak woodland ESG that have had altered hydrologic functions due to alterations from surrounding ESGs, and consequently additionally altered by non-native annual invasive plants. This sets up either moderately hot fires that maintain the tall, old valley oaks and burn out the understory shrubs and herbs, or hot and damaging fires due to winds and extended time from fire (fire suppression) allowing the shrub canopy to become very dense and tall, which creates ladder fuels, or creates increased fire frequencies that come with this drier more easily burned herbaceous vegetation.

T2 Permanent impacts to the hydrologic functions (irrigation, dams, other types of water table alterations) of this site draw the water table down so low that only older, mature valley oaks are able to continue accessing deep water table water. Fires that occur in areas that have a developed shrub layer underneath the tall, old, mature valley oaks. Once the site has lost this hydrologic functions, it has crossed a threshold into State 3 that is maintained by new feedback mechanisms.

R2 Either re-establishing the water table to a depth accessible to young valley oak roots during crucial growing stages (0-25 years) or irrigating planted valley oaks and other restoration measures, such as yearly treatments for non-native invasives and protection of frequent fires would be required.

T3 This transition is caused by repeated fires that have removed most to all of the oak and other hardwood and evergreen shrub seed sources and/or significant human alterations that force this ecological site over a threshold and change the function and structure of this site in extensive ways that serve mostly intensive agriculture or urban/housing developments.

State 3 –

Community Phase 3.1 – Once the old, mature valley oaks have been burned out of these sites and the hydrologic functions disconnected, valley oaks can no longer survive past germination and often die after the first few years of establishment due to limited water availability in the soil profile. Non-native annuals readily invade this site and compete heavily with the valley oak seedlings for resources and moisture and dominate this site in a highly resilient and resistant state. Frequent fires maintain this alternative state that produces significant annual growth due to the locations on the landscape that receive additional water.

T3 - This transition is caused by significant human alterations that remove essential topsoil horizons, alter hydrologic functions, and/or add significant inputs that change soil chemistry and soil properties for housing developments, urban infrastructures or intensive cropping systems and force this ecological site over a threshold and change the function and structure of this site in extensive ways.

R3 - this restoration pathway occurs only when significant time and money inputs are focused on areas that have not been permanently altered by urban developments. This restoration pathway may be more likely than R1, since most of these very altered landscapes will be more hospitable to non-native and invasive species than to the native species that are more particular and require specific growing conditions that may not be replicable due to the alterations to the site that had occurred.

State 4 - This state represents the intensive land uses that have significantly altered this ESG in a myriad of ways including removal of topsoil, fertilizer additions and other topsoil manipulations, hydrologic alterations that remove native soil fauna, among many other things and is typically due to urban developments, recreational activities, and intensive agriculture. More information about this state is needed to flesh out the various impacts these types of land uses/alterations have had on the ecological site in order to better understand how to manage these areas or potentially attempt restoration of these areas where possible.

Community Phase 4.1 - This community phase represents all the varied land uses that significantly alter this ecological site group. This is an extremely varied community phase that includes all types of alterations that so significantly alter the ecological site that it is permanently changed and no longer has typical or even representative ecological dynamics. Land use models would be an appropriate option to develop these types of variations in altered landscapes. At this scale of grouping, specific drivers and triggers and expressions of communities is too varied and broad to be more specific. More data collection and field verification is necessary.

Transitions

T4 Winds and high amounts of understory ladder fuels develop into crown fires, completely burning out remaining old, mature valley oaks. Since they have long been disassociated with the water table that allowed them to germinate and establish, valley oaks are lost from this site and transition to an alternative state. Non-native annual invasive seed sources readily invade and compete with valley oak seedlings reducing their ability to re-establish, forcing this site over a threshold into a non-native invaded state, losing the oak structure.

T5 This transition is caused by repeated fires that have removed most to all of the oak and other hardwood and evergreen shrub seed sources and/or significant human alterations that force this ecological site over a threshold and change the function and structure of this site in extensive ways that serve mostly intensive agriculture or urban/housing developments.

R3 This restoration pathway occurs only when significant time and money inputs are focused on returning some ecological function and non-native plants readily reinvade these disturbed sites.

Citations