Ecological site group F004BM102CA
Inland Coastal Mountain Slopes

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Key Characteristics

- West of the San Andreas fault line on the Pacific Plate – LRU M
- Other mountain slopes

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 provisional ecological site concept covers the mountains within LRU M that are furthest from the coast and receive the least amount of fog-influence. It occurs on uniform to convex summits and shoulders of broad ridges; and concave to convex positions of mountain slopes. These mountain slopes are sloping to very steep.

Climate

The average annual precipitation in this MLRA is 23 to 98 inches (585 to 2,490 millimeters), increasing with elevation inland. Most of the rainfall occurs as low-intensity, Pacific frontal storms. Precipitation is evenly distributed throughout fall, winter, and spring, but summers are dry. Snowfall is rare along the coast, but snow accumulates at the higher elevations directly inland. Fog is a significant variable that defines this MLRA from other similar MLRAs. Summer fog frequency values of greater than 35% are strongly correlated to the extent of coast redwood distribution, which is a primary indicator species in this MLRA. Nighttime fog is approximately twice as common as daytime fog and seasonally, it reaches its peak frequency in early August, with the greatest occurrence of fog from June through September (Johnstone and Dawson 2010). The average annual temperature is 49 to 59 degrees F (10 to 15 degrees C). The freeze-free period averages 300 days and ranges from 230 to 365 days, decreasing inland as elevation increases.

The Point Reyes/Farallon Islands LRU M, includes the Point Reyes Peninsula, Bodega Head and the sand spit at the north end of Bodega Bay, and the offshore Farallon Islands. The maritime climate is temperate and humid, and fog often occurs. Heavy coastal winds are an influential factor in vegetation expression in this LRU that occur primarily in the summer months, explaining the large extent of coastal prairies and coastal scrub species along much of the coastline. Where trees are present along or near the coastline and within the reach of these heavy winds, the tree canopies form unidirectional windswept crowns.

This ESG will be found in areas that receive over 30 inches of precipitation and experience very limited exposure to the coastal fog typical in other LRUs within MLRA 04B. Winter storms that can cause top breakage. This breakage may kill individual or groups of trees and create small openings from windfall (Noss, 2000). This would likely favor an infill of tanoaks. Tanoak seedlings and sapling-sized stems are often top-killed by surface fire, though larger stems may survive with only basal wounding (Fryer, 2008).

Soil features

Representative soils for this ESG include Palomarin and Wittenberg, which are isomesic Typic Dystropepts that can be fine-loamy or loamy-skeletal.

Vegetation dynamics

This ESG attempts to describe the Douglas-fir dominated mountain slopes that can be found within this LRU. This concept is primarily supported through literature and available soil survey descriptions. Future work will need to be done to better understand the soil and site characteristics that drive the vegetation expression for this provisional ecological site concept.

Pseudotsuga menzeisii (Douglas-fir) forests are significant in this LRU due to the competitive advantage of the Douglas-fir in areas that receive less coastal fog. Douglas-fir is a large, coniferous, evergreen tree. Adapted to a moist, mild climate, it grows bigger and more rapidly than the inland variety. Trees 5 to 6 feet (150-180 cm) in diameter (150-180 cm) and 250 feet (76 m) or more in height are common in old-growth stands. These trees commonly live more than 500 years and occasionally more than 1,000 years. Old individuals typically have a narrow, cylindric crown beginning 65 to 130 feet (20-40 m) above a branch-free bole. It often takes 77 years for the bole to be clear to a height of 17 feet (5 m) and 107 years to be clear to a height of 33 feet (10 m). In wet coastal forests, nearly every surface of old-growth Douglas-fir in this ecological site is often covered by epiphytic mosses and lichens (Uchytil, 1991). This tree's rooting habit is not particularly deep. The roots of young Douglas-fir tend to be shallower than roots of many of the same aged conifers like ponderosa pine, sugar pine, or incense-cedar. Some roots are commonly found in organic soil layers or near the mineral soil surface.

This ecological site is dominated by a multi-tiered canopy of Douglas-fir and tanoak, with coast redwood making up less than 10% of the stands basal area and Douglas-fir and other hardwoods accounting for between 60-90%. Tanoak and/or Pacific madrone readily establishes after disturbance and may dominate the overstory for several decades post-disturbance. Fallen logs are an essential part of this ecological site, providing significant habitat for wildlife species and conifer recruits.

Primary Disturbances

Fire is the principal disturbance agent in both young-growth and old-growth stands, however, fire regimes within the Redwood Region are recognized as enigmatic (Varner and Jules 2016). Lightning and tribally ignited fires played a major role in the dynamics of vegetation in the redwood zone and were typically quite frequent (Jacobs et al. 1985, Stuart 1987, Varner and Jules 2016).

Fire exposes mineral soil which aids the regeneration of many species, especially Douglas-fir, and also initiates a vegetative re-sprouting response from many hardwoods and redwood. Tanoak seedlings and sapling-sized stems are often top-killed by surface fire, though larger stems may survive with only basal wounding (Fryer, 2008). More intense fires that create large patches of complete canopy loss typically result in widespread areas of tanoak and other hardwood resprout dominance as hardwoods utilize root reserves to attain impressive height and cover within a very short time after fire (McDonald and Tappeiner, 1987). This can result in tanoak or other hardwood dominance of the site for many decades until conifers are able to find niche micro-environments to regain a foothold.

Fires will also alter the composition of shrubs and forbs in the understory community. *Vaccinium ovatum* (evergreen huckleberry) is a common species in both moist and dry Douglas-fir and redwood environments. It is normally a fire-dependent shrub species, but little is known concerning it's adaptation to fire under low to moderate fire return intervals (Tirmenstein, 1990). Following a fire, evergreen huckleberry will often re-sprout and recover rapidly. After a disturbance such as fire, a decrease in plant cover is common, and will be followed by a gradual increase in cover over time.

Other potential disturbances in the Douglas-fir zone include winter storms that can cause top breakage and landslides. Storm damage and landslides may kill individual or groups of trees and create small openings (Noss, 1999). Smaller gaps that retain some shade would likely favor establishment of Douglas-fir, whereas larger canopy openings will promote rapid tanoak and other resprouting hardwood growth that can often overcome conifers and suppress their re-establishment for many years.

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Major Land Resource Area

MLRA 004B
Coastal Redwood Belt

Stage

Provisional

Contributors

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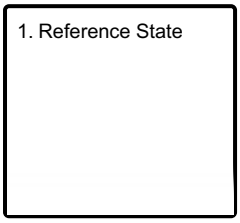
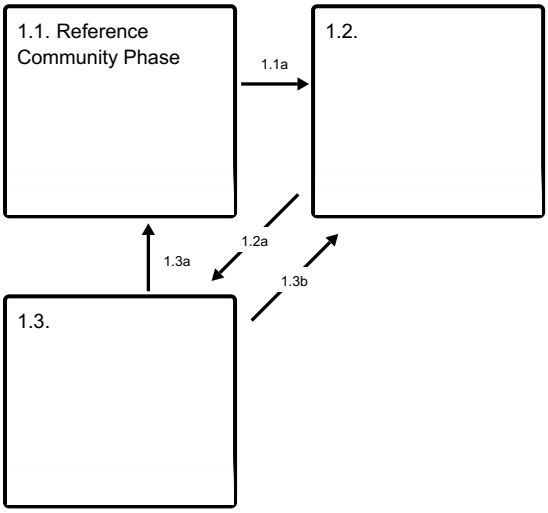
State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

The dynamics described below are general to the level that the site concept has been developed for provisional ecological site concept identification and further investigation purposes only. It is meant to give a general overview of the ecological dynamics of the system and should not be viewed as a model for a specific ecological site level management. It is supported by the current available literature that was reviewed for a general understanding of the system and basic understanding of the abiotic and biotic drivers. Further investigations and soil-site data collection and analysis should be conducted before specific land management can be applied at the ecological site specific scale. This STM only serves to explain the general ecology and dynamics. No alternative states were found during the literature review, however that does not mean they do not exist and more time should be spent determining whether or not this model captures all the dynamics of this system, especially once more is known about the soil-site characteristics of this LRU and ecological site concept. Reference State (State 1) – The reference state for this ESG is dominated by Pseudotsuga menzeisii (Douglas-fir), with a significant component of *Notholithocarpus densiflorus* (tanoak) and *Sequoia sempervirens* (coast redwood) may still be present in the canopy, in lower amounts. *Arbutus menziesii* (Pacific madrone) or *Chrysolepis chrysophylla* (giant chinquapin) can be found in the mix with tanoak in the subcanopy. The ecological dynamics represented in the reference state are driven primarily by periodic fires that create the complex dynamics and plant expressions reflected by the community phases described. Depending on the intensity, severity, timing, and weather conditions associated with each fire and which community phase is impacted by the fire, this ecological site will respond to varying degrees. At this very general

scale, this reference state only really captures the generalities related to the functional groups that are most dominant and does not capture the more specific dynamics and patterns that would be found at the more detailed and refined ecological site scale that focuses on specific abiotic factors that drive some of these various complex plant expressions. More data and refinement is needed to capture the information needed in order to make specific land management decisions at the ecological site-component scale.

Community 1.1
Reference Community Phase

The reference community phase is characterized by an overstory community dominated by Douglas-fir, with a cover of Arbutus menzeisii (Pacific madrone) and *Notholithocarpus densiflorus* (tanoak) in the sub-canopy and redwood is generally present in significantly lesser amounts. The understory is shrub-dominated and generally *Vaccinium ovatum* (California huckleberry), tanoak, and a minor amount of *Gaultheria shallon* (salal) are the dominant species. Cover of grass and forbs are very low. Douglas-fir needs needs a soil seed bed which can come about by fire, or mechanically, or by landslides. Redwood also requires a soil seedbed and is much more finicky about regeneration from seed. Tanoak relies on small animals for dispersal of acorns, but is also a prolific resprouter, like redwood.

Community 1.2

This community phase is dominated by tanoak, woody shrubs, and a variety of pioneering species. Tanoak grows rapidly in the created openings. If the site is left to develop over time, tanoak will form a tree layer and Douglas-fir will begin to infill from surrounding seed sources, through growth by DF in shaded understory, but also infill by minor disturbances that open gaps, such as background pests and disease (Armalaria fungus), windthrow, snow breakage, small landslides/slips, etc. Tanoak is fast growing and will dominate the site and compete with regenerating Douglas-fir for decades.

Community 1.3

Over several decades, Douglas-fir will successfully exceed the height of the hardwoods and become firmly established in the overstory. Following several decades of growth, Douglas-fir will dominate the overstory of this community phase and tanoak will occupy the subcanopy and understory, alongside less common, other sclerophyllous broadleaved hardwoods (madrone, bay laurel, chinquapin).

Pathway 1.1a
Community 1.1 to 1.2

The reference community may transition to Community Phase 1.2 following a significant fire that removes the conifers and hardwoods from the canopy and allows the understory shrubs and resprouting hardwoods to immediately dominate the site.

Pathway 1.2a
Community 1.2 to 1.3

With time, Douglas-fir should gradually re-establish and will eventually take over dominance once again by creating shade that eventually reduces the understory cover that requires a more open canopy to persist. Douglas-fir is shade tolerant and this creates an advantage over other species that are less tolerant of shade and therefore the Douglas-fir is able to dominate the available resources more than the other species and this creates an advantage that allows the Douglas-fir to take over the top canopy layer.

Pathway 1.3a
Community 1.3 to 1.1

As the Douglas-fir creates a heavier shaded canopy, if redwood was a part of the stand prior to the disturbance, it will begin to re-establish primarily by resprouting and will eventually become a part of the canopy again (Griffith, 1992).

Pathway 1.3b

Community 1.3 to 1.2

This community phase may transition to Community Phase 1.2 following a significant fire that removes the conifers and hardwoods from the canopy and allows the understory shrubs to dominate for a time as the hardwoods re-establish.

Citations