Ecological site group F004BK103CA
Upper slopes and higher elevation mountains

Last updated: 03/07/2025
Accessed: 05/10/2025

Key Characteristics

- Not like the previous LRUs – LRU K
- Upper slopes and higher elevation mountains

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 on the upper slopes of the steep, dissected mountainous terrain of LRU K. Slopes are gently sloping to very steep reaching elevations just over 2000 ft and are leeward of ridges that block coastal fog, or are high enough in elevation that coastal fog is limited or absent.

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. Nightime 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.

Unlike the redwood-dominated forests of LRU I to the north, these forests in LRU K are typically a mixture of conifers and broadleaved, evergreen hardwoods. Vegetation includes a multi-story canopy of Douglas-fir, tanoak, madrone, chinquapin, bigleaf maple, evergreen shrubs, and various grasses. Redwood is uncommon and only occurs in protected drainages that receive a minor influence of fog and maintain some moisture later into the summer. Dry, hot summers and lack of coastal fog limits the competitive advantage of the coastal redwoods in this ESG.

Soil features

Although Douglas-fir can grow on a variety of soils, the soils most associated with this concept are primarily found on comprised of colluvium and residuum materials derived from sandstone, metavolcanics, and sedimentary and metamorphic rocks, with soils that range from lithic and paralithic to very deep in some locations and are primarily well-drained.

Vegetation dynamics

This provisional ecological site concept attempts to describe the Douglas-fir dominated mountain slopes that can be found within LRU K. This concept is primarily supported through available literature regarding these habitats. This provisional ecological site concept covers the less-fog influenced mountain slopes within the LRU, particularly those that are furthest from the coast. Due to the type of relief in this LRU, a large proportion of mountain slopes are

dominated by this provisional ecological site concept. The ustic-isomesic soil climate regime of this LRU is mainly at elevations between 500 and 2,000 feet. It is within the zone of moderate marine influence. The fog influence is less pronounced than in the udic moisture regime, but some moisture is added to the soil where the tree canopy causes water to precipitate from fog along ridgelines. The fog is less dense and does not blanket this zone as frequently as in the wetter zone at the lower elevations and within coastal drainages. The soils are dry for part of the summer, and there is little variation between summer and winter soil temperatures at a depth of 20 inches. The first continuous north-south range of mountains inland from the coast that reaches 2,000 feet forms an effective barrier to the encroachment of marine air. In some drainages, such as the Noyo River watershed, this marine influence zone extends inland 20 miles or more. In other areas, such as along Elkhorn Ridge 7 miles north of Branscomb, the marine influence stops within 8 miles of the coast. 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) dominated forests are extensive in this LRU as you move east away from the coastline due to the steep, dissected mountainous terrain that diminishes the ability for fog and maritime climate to moderate temperatures in the summer time, thus minimizing the extent of the coastal redwoods as a dominant species. This provisional concept includes areas that may still have coastal redwoods as a component of the overstory, however the coastal redwoods will not be a dominant and will disappear from the overstory in the central and eastern portions of the LRU where the site may still receive high annual precipitation, but the cool, maritime climate that provides fog drip and sufficient summer moisture for redwoods is absent.

Douglas-fir is a large, coniferous, evergreen tree. The Douglas-fir near the coast is adapted to a moist, mild climate and 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 and other hardwoods, with coast redwood making up a small proportion of composition where it is present. Tanoak and other hardwoods readily establish after disturbance and may dominate the overstory for several decades. 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 this ESG. Fire in this LRU occurs from a mix of summer lightning storms and human ignitions. Few fire history studies have been conducted in the area of this ESG, but fire regime research in surrounding areas (Jacobs et al. 1985, Viers, 1996, Varner and Jules, 2016) and the relatively dry climate of interior upper elevations in LRU K suggests fire would have been common, akin to drier areas further inland such as the Interior Coast Ranges or Klamath Mountains. Historically, tribes in the area used fire regularly to manage resources for various purposes, but especially to maintain grasslands, tanoak and deciduous oak forests, and early seral plant communities (Anderson, 2006). Lightning-ignited fires are somewhat more common in this LRU than in the Northern Redwood LRUs I and A (Jacobs et al. 1985). Perennial montane grasslands, deciduous oak woodlands, and valley grasslands of LRU K were maintained through prescribed burning techniques implemented by native peoples for thousands of years. Without the continuation of these prescribed burns, many of these grasslands and woodlands transition to forest. Tanoak, a significant tree in this ESG, remains a critically important tree to many Native American tribes in this LRU. Groves of tanoak were tended for many centuries with fire to limit competition with other trees and prolong their presence as dominant or codominant trees in the overstory and maintain wide, open crowns suitable for heavy masting and acorn gathering (Anderson, 2006, Bowcutt, 2013).

After Euro-American settlement and displacement of native people, some burning continued on cutover logging lands, especially for the tanbark industry and in the ranching community. Fire suppression increased substantially early to mid-20th century with changes to forest policy in California and shifts in land ownership patterns that saw the breakup of many large ranches and timber holdings. This resulted in a finely parceled private ownership configuration wherein confining prescribed fires to smaller areas is challenging and differences in land management

philosophies of a more diverse land ownership base resulted in a socio-political climate less hospitable to widespread fall burning. As a result, much of this LRU has experienced a departure from the historic fire regime resulting in a fire deficit for most areas, though the time since that departure was initiated varies somewhat according to the timing of tribal displacement and land subdivision or acquisition by new owners that discontinued regular burning.

Fires in this ESG play a significant role in the development and maintenance of stand structure and composition, stimulating reproductive responses of many species and opening up canopy gaps and sometimes larger areas for young trees and young forest to develop. Fires also alter the composition of shrubs and forbs in the understory community. Fires expose soil and reduce competition from other plants, thereby increasing the establishment of many understory species, and help to facilitate the regeneration of many trees. Tanoak and other hardwood stems killed by fire resprout vigorously and outpace the growth of non-sprouting conifers such as Douglas-fir (McDonald, 1978, Fiske and DeBell, 1989). Larger stems of broadleaved trees may survive lower intensity fire with only basal wounding (Fryer, 2008). After a disturbance such as fire, a decrease in plant cover is common, but it is immediately followed by a rapid expansion of many resprouting stems by broadleaved trees and shrubs, and a gradual increase in cover of conifers over time as they infill the thick hardwood layer.

Other potential disturbances in this zone include winter storms that can cause top breakage and blowdown from wind and snow damage. This breakage may kill individual or groups of trees and create small openings from windfall (Noss, 2000). This would likely favor an infill of Douglas-fir in smaller gaps that retain some shade, and tanoaks and other hardwoods in less shaded, larger gaps.

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Major Land Resource Area

MLRA 004B
Coastal Redwood Belt

Stage

Provisional

Contributors

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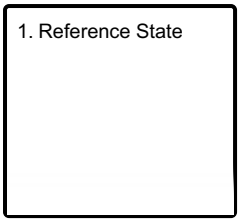
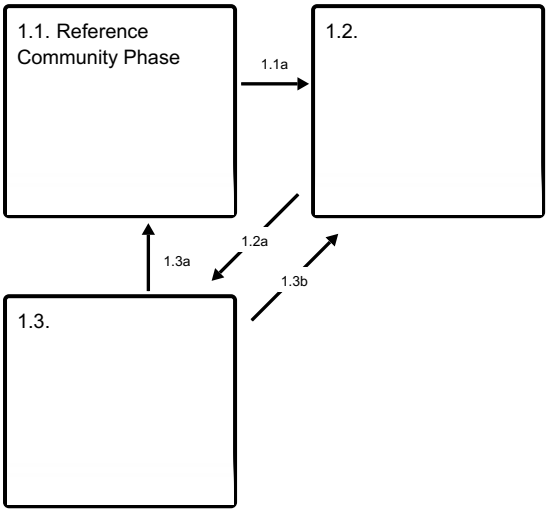
State and transition model

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 provisional ecological site concept is dominated by Pseudotsuga menzeisii (Douglas-fir), with a significant component of *Notholithocarpus densiflorus* (tanoak) and other hardwoods. *Sequoia sempervirens* (coast redwood) may still be present in the canopy, however in significantly lower amounts. *Arbutus menziesii* (Pacific madrone), *Chrysolepis chrysophylla* (giant chinquapin), and/or Umbellaria californica (California laurel) can also be found in the mix with tanoak in the subcanopy across much of this provisional ecological site concept. 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 tanoak in the sub-canopy and redwood is generally present in significantly lesser amounts in the western

portions of this provisional ecological site concept. The understory is sub canopy is also dominated by *Arbutus menziesii* (Pacific madrone), *Chrysolepis chrysophylla* (giant chinquapin), and/or Umbellaria californica (California laurel). Cover of grass and forbs are very low. Douglas-fir needs disturbance and enough sunlight to reproduce successfully.

Community 1.2

This community phase is dominated by tanoak and other hardwoods, 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. 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 begin to exceed the height of the hardwoods and however hardwoods are still the dominant canopy. As the Douglas-fir continues to grow, they will move on to Community Phase 1.1 and become firmly established in the overstory.

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 to dominate for a time as the hardwoods re-establish.

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 in the upper most canopy layer.

Pathway 1.3a
Community 1.3 to 1.1

As the Douglas-fir creates a heavier shaded canopy, redwood may begin to re-establish from nearby seed sources in the western portions of this site concept and with time and no major disturbance, become a minor part of the canopy again.

Pathway 1.3b
Community 1.3 to 1.2

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