Ecological site group F004BI102CA
Fluventic, Rarely Flooded, Marine Terraces and Floodplains

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Key Characteristics

- Heavy coastal fog dominates the landscapes below 1500 ft.
- Soil moisture is udic – LRU I
- Rarely flooded, fluventic alluvial floodplains

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 covers the stable, rarely flooded, yet mostly fluventic soils along the valley bottom stream terraces of LRU I. It occurs on moist stream terraces adjacent to creeks and rivers on slopes that are nearly level to gently sloping, and low elevation slopes that are within 5-6 miles of the ocean and under 500 ft. in elevation.

Climate

This ESG is limited to areas of high annual precipitation, and a cool, maritime climate that provides fog drip and sufficient summer moisture to mollify evapotranspiration rates in the summers. 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, and 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 low mountains of the Northern Franciscan Redwood Forest LRU I, lie entirely within the coastal fog zone and are characteristically covered by fog-dependent coast redwoods and Douglas-fir. Historically, unbroken redwood forests occurred and moderated local climate by trapping coastal fog and producing shade. The combination of shade, root competition, young soils with a deep organic debris layer on the soil surface, occasional fire, and silting by floods limits the number of plant species that occur here. The region extends north only about 10 miles into Oregon near Brookings. Dominated by conifers, the region also includes Sitka spruce, western hemlock, western redcedar, Port Orford cedar, and grand fir. Hardwoods such as red alder, Pacific rhododendron, and tanoak commonly occur. This LRU also includes the areas known as the Bald Hills that have been maintained for over 100 years as prairies and oak woodlands through prescribed fire. These hills are dominated by Oregon white oak and perennial and annual native and non-native grasses and forbs but are actively encroached by Douglas-fir and redwood. Fine and fine-loamy, udic, isomesic, Ultisols and Alfisols are typical. In some factors, this region has more similarities to the temperate rain forests of the Oregon and Washington Coast Ranges, however since it does not receive winter snow and colder temperatures and still maintains the distinct presence and dominance of coast redwood make this LRU unique to MLRA 4B.

Winter storms in this ESG 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 the establishment of redwood and other shade tolerant conifers. On alluvial sites with periodic flooding, redwood may dominate, along with other colonizing hardwoods (Veirs, 1996). Where existing redwoods are inundated, new roots develop in newly deposited silt (Veirs,

1996).

Soil features

Although coast redwood can grow on a variety of soils, the soils most associated with this floodplain-centered concept are primarily found on alluvium derived from sandstone, with very deep soils that range from very poorly drained to well-drained and are slightly acidic at 40 inches. They have a dominantly loamy subsurface rock content ranging from non-gravelly to gravelly.

Vegetation dynamics

This provisional ecological site concept attempts to describe the somewhat “iconic” coast redwood dominated stream terrace forests that can be found within this LRU. This concept is primarily supported through literature and available information from Redwood National and State Park Soil Survey. 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.

Sequoia sempervirens (coast redwood) forests are unique in this LRU in their ability to dominate the low elevations of LRU I that are solidly within the coastal fog influence.

Primary Disturbances

Fire and occasional flooding events are the most dominant disturbances to this ecological site concept, however, the historical origin of fires and flooding regimes within the Northern Redwood Region remains enigmatic (Varner and Jules, 2016). Lightning-ignited fires would likely spread due to the winds that are frequent within this LRU. However, Native American burning is thought to have played a major role by burning fires from the interior into the redwood zone (Veirs, 1996). Natural fire intervals were frequent as the northern range of redwoods evolved within a low to moderate natural disturbance regime (Veirs, 1996). Overall, the fire history studies conducted in redwood forests consistently show frequent fires that contrast sharply with the notion of a rainforest ecosystem (Varner and Jules, 2016).

Surface fires likely modified the tree species composition by favoring the thicker-barked redwood and killing western hemlock (*Tsuga heterophylla*), tanoak (*Notholithocarpus densiflorus*) and grand fir (*Abies grandis*) (Veirs, 1996). Western hemlock's shallow roots and thin bark make it susceptible to fire damage (Arno, 2002). The establishment of a western hemlock understory is increased by surface fires. This is due to the exposure of mineral-rich soil and the reduction of other plant competition (Veirs, 1996). Tanoak seedlings and sapling-sized stems are often top-killed by surface fire, though larger stems may survive with only basal wounding (Fryer, 2008).

A moderate fire could lead towards more of a mosaic in regeneration patterns. Patches of trees would be killed leaving others slightly damaged or unharmed. Douglas-fir (*Pseudotsuga menziesii*) regeneration would be favored in the large gaps that are created following a moderate fire, potentially leading to a larger proportion of Douglas-fir to redwood for several centuries (Agee, 1996). Without these gaps caused by fire, Douglas-fir regeneration is unsuccessful, and with continued lack of disturbance it may slowly be replaced by redwood as the dominant canopy species (Veirs, 1996).

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Major Land Resource Area

MLRA 004B
Coastal Redwood Belt

Stage

Provisional

Contributors

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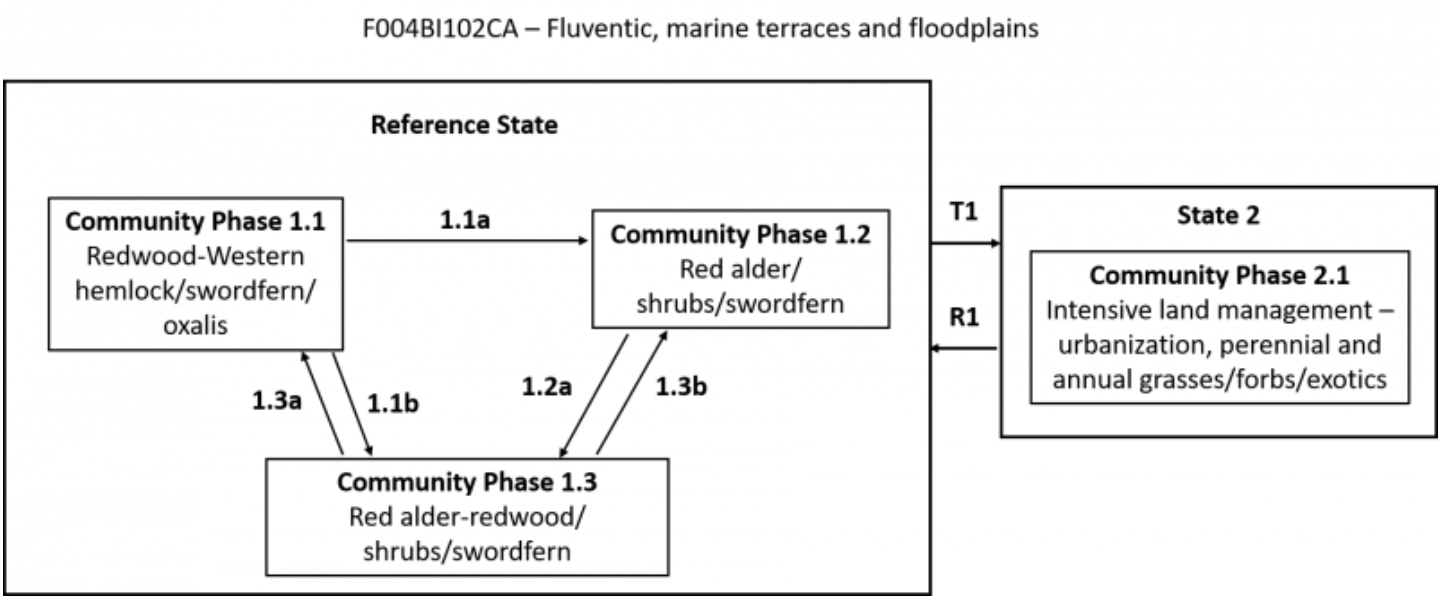
State and transition model



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) – 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

Figure . Reference Community Phase

Figure 1. Redwood sorrel (Oxalis oregana)

The reference plant community for this site is considered to be the most iconic expression of redwood forest, with some of the biggest coast redwoods in the state dominating the overstory canopy. *Sequoia sempervirens* (redwood) dominates the overstory, with *Tsuga heterophylla* (western hemlock) as a significant associate. The estimated tree age for this site ranges from 75 to 200+ years. *Picea sitchensis* (Sitka spruce) and *Abies grandis* (grand fir) occasionally occur in the understory canopy. The understory is dominated by *Polystichum munitum* (western swordfern) and *Oxalis oregana* (redwood-sorrel) and on some sites *Blechnum spicant* (deerfern) may also be common. Western hemlock and redwood seedlings are also commonly found in the understory. Windthrow from winter storms or small partial cuts can create small gaps which will maintain the redwood dominance and increase the swordfern cover and potentially increase the cover of shrubs as well, which may include *Vaccinium ovatum* (California huckleberry), *Rubus spectabilis* (salmonberry), *Vaccinium parvifolium* (red huckleberry), and *Gaultheria shallon* (salal).

Community 1.2

Red alder, salmonberry, and western swordfern may rapidly establish the site after a disturbance with redwood seedlings present. Redwood-sorrel may also increase in cover. The red alder/redwood plant community evolves after the initial red alder invasion. Redwood sprouts may be dominated by alder for a period of 25 years or more. The estimated tree age for this site ranges from 0 to 40 years. Salmonberry, western swordfern, and redwood-sorrel persist in the understory.

Community 1.3

The red alder-redwood community evolves after the initial red alder establishment. Redwood sprouts may be dominated by alder for a period of 25 years or more. The estimated tree age for this site ranges from 20 to 40 years. Salmonberry, western swordfern, and redwood-sorrel persist in the understory. Over time, redwood continues to grow and responds by filling in canopy gaps. The estimated tree age for this site ranges from 35 to 70 years. Remnants of salmonberry remain, but have less cover due to canopy closure. Western swordfern and redwood-sorrel remain the dominant forb cover.

Pathway 1.1a
Community 1.1 to 1.2

The reference phase may transition to Community Phase 1.2 following a significant windthrow event, a substantial fire or large acreage block harvest.

Pathway 1.1b
Community 1.1 to 1.3

Following a smaller windthrow event or timber harvest practice that selectively removes some but not all redwoods, red alder rapidly establishes where the canopy has opened transitioning this community to Community Phase 1.3. Western swordfern will also infill.

Pathway 1.2a
Community 1.2 to 1.3

With no management, red alder dominates this site for 25 years or more, redwood sprouts slowly grow in height to become part of the canopy along with red alder.

Pathway 1.3a
Community 1.3 to 1.1

With continued growth and no significant disturbance over several hundred years, this community phase could be expected to return to the multi-storied redwood reference community seen in Community Phase 1.1.

Pathway 1.3b
Community 1.3 to 1.2

Smaller windthrow events or a partial cutting of Sitka spruce and/or redwood may cause red alder to re-dominate the openings for a time, moving the community back to Community Phase 1.3.

State 2

This state represents the intensive land uses that have significantly altered this ecological site due to urban developments, recreational activities, and 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 better manage of these areas or potentially attempt restoration of these areas where possible.

Community 2.1
Intensive disturbance

This community phase represents all the varied land uses that significantly alter this ecological site. 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.

Transition T1
State 1 to 2

This transition is caused by significant human alterations that force this ecological site over a threshold and change the function and structure of this site in extensive ways.

Restoration pathway R1
State 2 to 1

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 may not be a feasible transition due to the specific growing conditions required that may not be replicable due to the alterations to the site that had occurred.

Citations