Ecological site group R004BI202CA
Loamy Uplands

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Key Characteristics

- Heavy coastal fog dominates the landscapes below 1500 ft.
- Soil moisture is udic – LRU I
- Soils supporting rangelands
- Soils supporting predominantly perennial and annual grasslands
- Soil surface textures predominantly loamy, non-skeletal

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 ecological site is generally found on ridges, knobs, and the upper elevation slopes within the forested areas of LRU I. This site is generally found above 800 ft. The primary factors that maintain these sites in either coastal prairies, oak woodlands, coyotebrush shrublands, and Douglas-fir and/or redwoods are related to time without fire and seed source availability.

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.

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.

Soil features

Although the soils of this provisional site concept are highly varied, they all share the common variable of higher soil organic content in the soil rooting zone and loamy soil textures with rock fragments in the subsurface horizons that provide good growing conditions and annual production.

While this ESG includes a wide array of soil types, the most representative soils for this concept are Airstrip, Countshill, and Peaked and they are all Inceptisols. They include soils that are either typic, pachic, oxyaquic above the fragmental horizons and have moderately slow to slow permeability and high runoff.

Vegetation dynamics

This provisional ecological site concept attempts to describe the various complicated areas of coastal prairie in this LRU. They exist in a patchy dynamic of perennial and annual grasses and forbs, coyotebrush shrublands, and Douglas-fir and/or redwood forests, with a small area that also contains patches of Oregon white oak woodlands. These prairie complexes relied heavily on hundreds of years of Native American burning to maintain their dominance in an area that provided no limitations to on the growing conditions for trees that would have overtaken many of these prairies without the fires to burn them back. This concept lumps many of the unique prairie expressions into one large concept, due to limited soil mapping that successfully parses out the differences between these types and focuses primarily on the primary abiotic factors and ecological dynamics that maintain and/or alter these vegetative communities. The extent of this ecological site concept stretches primarily along the inner coastal mountain portions of LRU I. This provisional ecological site concept covers a wide variety of coastal prairie dynamics and expressions that will need to be further refined to better represent dynamics on a smaller, more ecologically specific scale.

Primary Disturbances

The primary disturbance to this ecological site concept is fire that keeps the woody species that are actively encroaching the site from establishing, allowing these grasslands to maintain the competitive advantage. When summer fog is less prevalent, tree and shrub encroachment will slow and years when summer fog is very consistent tree and shrub encroachment may be quite rapid.

Historically, prairies within the North Coast region were thought to have been dominated by native perennial bunchgrasses and numerous associated forbs. Native Americans utilized the prairies for food and cultural materials. Regular burning stimulated the growth of grasses and eliminated invading shrubs and trees, thereby attracting wildlife. The use of fire for over 5,000 years by Native Americans created a system in equilibrium that controlled the vegetative structure and composition.

With the advent of European settlements, changing land use practices significantly altered the vegetation. In the 1800s cattle and sheep grazing became widespread. Increased grazing pressure from domestic livestock and range seeding reduced the native perennials and increased the population of introduced perennials and forbs. More studies are needed to understand grazing and native plant interactions. Shifts in the annual plant community caused by grazing are difficult to document. Certain species will increase with favorable weather and grazing conditions.

Non-native grasses often outcompete natives for water, nutrients and growing space. *Arrhenatherum elatius* (tall oatgrass), an introduced perennial within these prairies, is considered an invasive exotic. One study indicates that early season burning may be more effective in eliminating flowers and developing seeds of tall oatgrass prior to their dispersal. However, spring burning has a negative effect on some of the native perennials, like *Danthonia californica* (California oatgrass). Fall burning has slowed the advance of tall oatgrass within parts of this LRU.

Prescribed burning may favor one species over another. Recent studies indicate that periodic fire may favor perennial species by reducing litter cover and eliminating other plant competition, however it may also increase the production of non-natives and exotic forbs. Long term studies are lacking to evaluate the interaction of prescribed fire, climate, and grazing on both natives and non-native species.

Historically, there was very little overlap between the prairie, oak and conifer systems within much of this LRU. Fire exclusion in the last century has allowed for the encroachment of shrubs, and in some cases trees, into the prairies. Roads established for harvesting purposes left exposed cut and fill slopes that were rapidly invaded by Douglas-fir. Invasion of prairie and oak woodland by conifers has lead to conversion to forest in a very short period of time.

Major Land Resource Area

MLRA 004B
Coastal Redwood Belt

Subclasses

- R004BX101CA–Upper prairie, mountain slopes, sandstone and mudstone, clay loam
- R004BX103CA–Lower prairie, earthflows, sandstone and mudstone, gravelly loam
- R004BX104CA–Middle prairie, mountain slopes, sandstone and mudstone, gravelly clay loam

Stage

Provisional

Contributors

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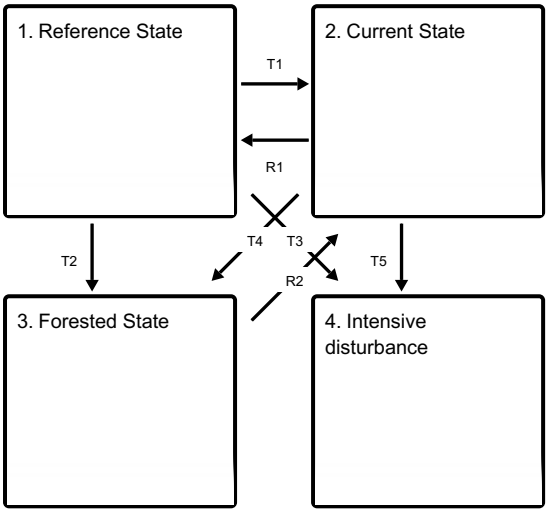
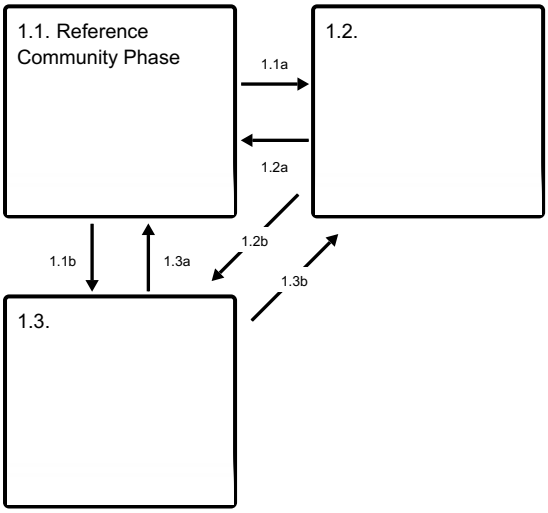
State and transition model

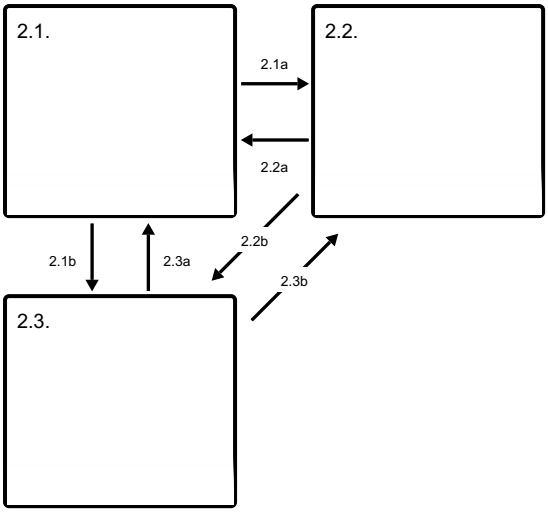
Ecosystem states



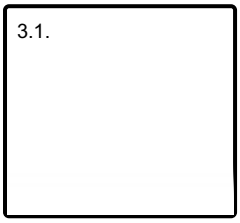
State 1 submodel, plant communities



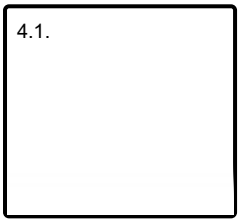
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 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 explains the general ecology and dynamics. Composition and dynamics specific to this ecological site concept are not well documented and will require more data collection and soil investigation to

properly define and describe them for land management decisions on an ecological site basis. It is possible that this site concept, along with R004BI201CA and R004BI203CA are all the same site or may need to be split differently, but for now they are recognized based on things we know about soil texture and plant response relationships—this may very well prove to be the wrong way to split out these rangeland concepts and need much more work before they are of value for land management on these sites. Reference State (State 1) – It is thought that native perennial grasses and forbs once dominated many of the grasslands throughout this LRU. Native American burning often were primarily responsible for sustaining these plant communities over several thousand years. Without fires every few years, this community phase is actively encroached by shrubs and trees depending on where it is found within the LRU. Many of these rangelands are inland from the coast and more protected from the winds and daily harsh conditions of the coast, leaving them more susceptible to encroachment and infill of shrubs and trees.

Community 1.1
Reference Community Phase

Native perennial grasses may have included *Danthonia californica* (California oatgrass), *Elymus glaucus* (blue wildrye), and Agrostis spp. (bentgrass). *Pteridium aquilinum* (Western brackenfern) is also a common native forb.

Dominant plant species

- California oatgrass (*Danthonia californica*), grass
- blue wildrye (*Elymus glaucus*), grass
- bentgrass (*Agrostis*), grass
- western brackenfern (*Pteridium aquilinum*), other herbaceous

Community 1.2

This community phase will be most prevalent in areas where *Baccharis pilularis* (coyotebrush) seed is available and time without fire has allowed the coyotebrush and western brackenfern to slowly encroach the grasslands.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- coyotebrush (*Baccharis pilularis*), shrub
- California oatgrass (*Danthonia californica*), grass
- blue wildrye (*Elymus glaucus*), grass
- bentgrass (*Agrostis*), grass
- western brackenfern (*Pteridium aquilinum*), other herbaceous

Community 1.3

This community phase is dominated by Douglas-fir and/or redwood and/or Oregon white oak with an understory of shrubs and brackenferns. Although it is not recognized in the STM at this time, there would be some areas that are just Oregon white oak and grasses and forbs and resemble a woodland. These areas were managed specifically for oak acorns and understory burns helped maintain these areas. They are very small and require more information and soils data to justify their own site concept and did not meet the standards at the larger PES scale to be individually delineated at this time.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- redwood (*Sequoia sempervirens*), tree
- Oregon white oak (*Quercus garryana*), tree

Pathway 1.1a
Community 1.1 to 1.2

Reference Community Phase

Pathway 1.1b
Community 1.1 to 1.3

Pathway 1.2a
Community 1.2 to 1.1

Reference Community Phase

Pathway 1.2b
Community 1.2 to 1.3

Pathway 1.3a
Community 1.3 to 1.1

Pathway 1.3b
Community 1.3 to 1.2

State 2
Current State

With European settlement in the mid-1800s, the use of fire largely ceased. Seeding of introduced perennials was

practiced in many areas suitable for grazing and other types pasture practices. Uncontrolled grazing of domestic livestock may have also contributed to an increase in annual grasses and forbs. Introduced perennials and annuals have out-competed native grasses and dominated the plant community in some areas. Fire may stimulate growth of native perennials by reducing competition but may also increase the amount of introduced perennials and forbs. When fire is re-introduced to the system, varying effects on vegetation may result. Climatic factors influence the effect of fire on vegetation as well as the use of livestock grazing. Burning may cause an increase in native and exotic forbs such as western brackenfern and in introduced perennials such as tall oatgrass. Timing of burning appears to be an important factor affecting the presence of the native perennial California oatgrass; cover and frequency may decline with early summer burns versus late summer burning. Spring burning may be more successful in reducing tall oatgrass than fall burning; other studies indicate that spring burning may be detrimental to established native populations such as California oatgrass. Studies indicate that the effects of fire on native grasses are variable and further study is needed.

Community 2.1

This community phase is dominated by non-native perennial and annual grasses. They include *Arrhenatherum elatius* (tall oatgrass), *Dactylis glomerata* (orchardgrass), *Anthoxanthum aristatum* (annual vernalgrass), and *Cynosurus echinatus* (bristly dogstail grass).

Community 2.2

This community phase will be most prevalent in areas where *Baccharis pilularis* (coyotebrush) seed is available and time without fire has allowed the coyotebrush and western brackenfern to slowly encroach the grasslands.

Community 2.3

This community phase is dominated by Douglas-fir and/or redwood with an understory of shrubs and brackenferns. Although it is not recognized in the STM at this time, there would be some areas that are just Oregon white oak and grasses and forbs and resemble a woodland. These areas were managed specifically for oak acorns and understory burns helped maintain these areas. They are very small and require more information and soils data to justify their own site concept and did not meet the standards at the larger PES scale to be individually delineated at this time.

Pathway 2.1a
Community 2.1 to 2.2

Regular burning of prairies by Native Americans stimulated the growth of grasses and eliminated invading shrubs and trees. Native perennial grasslands are favored by periodic burning and may temporarily be more dominant in the mix of grasses.

Pathway 2.1b
Community 2.1 to 2.3

In areas where *Baccharis pilularis* (coyotebrush) seed is unavailable, CP 2.1 may go straight to tree dominated, as Douglas-fir and/or redwood slowly infill over many years without fire.

Pathway 2.2a
Community 2.2 to 2.1

Prescribed fire or a natural fire would return the vegetation to CP 2.1.

Pathway 2.2b
Community 2.2 to 2.3

Extended time without fire, allows time for Pseudotsuga menzeisii (Douglas-fir) and/or *Sequoia sempervirens* (redwood) and/or *Quercus garryana* (Oregon white oak) to begin to overtop the shrubs and begin to dominate the site, shading out and killing off the coyotebrush.

Pathway 2.3a
Community 2.3 to 2.1

Either through a stand-replacing fire or through logging clearcuts, Pseudotsuga menzeisii (Douglas-fir) and/or *Sequoia sempervirens* (redwood) and/or *Quercus garryana* (Oregon white oak) will be removed from the site and the grasslands will dominate.

Pathway 2.3b
Community 2.3 to 2.2

State 3
Forested State

This state represents the point when fire has been suppressed for too long and the site has crossed a threshold and become a forest site, dominated by Douglas-fir and/or redwood and resembles many of the other surrounding associated forest sites. This state is not fleshed out beyond recognizing that the prairie may cross a threshold and begin to resemble the surrounding forest sites, depending on where in the LRU that prairie is.

Community 3.1

This community phase represents the point when fire has been suppressed for too long and the site has crossed a threshold and become a forest site, dominated by Douglas-fir and/or redwood and resembles many of the other surrounding associated forest sites. This phase is not fleshed out beyond recognizing that the prairie may cross a threshold and begin to resemble the surrounding forest sites, depending on where in the LRU that prairie is.

State 4
Intensive disturbance

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 4.1

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 the introduction of non-native seed that allowed the conversion from a native perennial prairie to a non-native perennial and annual dominated prairie. Once these species become a part of the system, it is highly unlikely to go back without significant time and labor, and yearly maintenance.

Transition T2
State 1 to 3

Reference State | Forested State

This transition is caused by the long-term suppression of fire or fire emulating practices that allowed the Douglas-fir and/or redwoods to persist and shift the site characteristics and feedback mechanisms to those of a forested site, not a grassland. Time without fire is long enough that even if fire were used there is no longer a seed source or the soil properties necessary to allow grasslands to outcompete the trees and shrubs that now dominate the site. There is no restoration pathway for this site, as it is not known if this type of restoration is possible once it has crossed this threshold.

Transition T3
State 1 to 4

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 that would require constant maintenance and weed management and should be focused on areas that have not been permanently altered by urban developments. This restoration pathway may be less likely than R2, since most of these very altered landscapes will be more hospitable to 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.

Transition T4
State 2 to 3

This transition is caused by the long-term suppression of fire or fire emulating practices that allowed the Douglas-fir and/or redwoods to persist and shift the site characteristics and feedback mechanisms to those of a forested site, not a grassland. Time without fire is long enough that even if fire were used there is no longer a seed source or the soil properties necessary to allow grasslands to outcompete the trees and shrubs that now dominate the site. There is no restoration pathway for this site, as it is not known if this type of restoration is possible once it has crossed this threshold.

Transition T5
State 2 to 4

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 R2
State 3 to 2

This restoration pathway occurs only when significant time and money inputs that would require constant maintenance and weed management and should be 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 invasive species than to the native species that are more particular and require specific growing conditions and simply don’t have the ability to compete with the non-native species in most cases.

Citations