Ecological site group R004BN201CA
Windy coastal perennial grassland terraces and bluffs

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Key Characteristics

- Santa Cruz Mountains – LRU N
- Soils supporting rangelands

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 open ridgetops, flatter, south-facing exposures.

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.

Climate varies from the west to the east in LRU N, the Santa Cruz Mountains, as the high mountain ridges reduce the penetration of maritime air. Winters are cool and wet with the occasional snowstorms at the highest elevations and in narrow, north-facing drainages, leading to some white and red fir in limited locations. Heavy rains are also known to cause mudslides throughout this LRU, and on the west side, summers are cooler, and fog or low overcast skies are only around for the mornings and carry through the low slopes and stream terraces.

Soil features

Although the soils of this provisional site concept are highly varied, they are generally shallow to a restrictive horizon or skeletal, creating difficult growing conditions for trees and shrubs. This LRU receives far less summer fog and therefore these types of soils that are shallow or skeletal become dry during crucial summer growing days and provide conditions primarily suitable to grasses, forbs and some competitive scrub species.

Vegetation dynamics

This provisional ecological site concept attempts to describe the coastal prairies and coastal scrub shrublands of this LRU. They exist in a patchwork of herbaceous to dense woody shrub cover wherever the cooling influence of the Pacific Ocean moderates the summer drought (high evapotranspiration rates). This concept lumps many of the unique scrub and 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. This provisional ecological site concept covers a wide variety of coastal scrub and prairie dynamics and expressions that will need to be further refined to better

represent dynamics on a smaller, more ecologically specific scale.

Abiotic Factors

The primary factor that maintains these sites in either coastal scrub or coastal prairie are the shallow to restrictive layer soils that dry out easily and do not hold much soil moisture into the summers, steeper more unstable slopes, and exposed locations on the landforms that create harsher growing conditions for trees and many shrubs. Coastal scrub and herbaceous species are more readily able to colonize and stabilize and adapt to these conditions, which explains why they dominate these open areas and trees do not.

Primary Disturbances

The primary disturbances to this ecological site concept are the harsh soils that create difficult growing conditions, grazing, and fire. Historically, lightning-ignited fires are thought to have occurred in the surrounding forested habitats and would have burned significant acres across many soil types and landforms. Between soil and landform differences and frequencies and intensities of burning that would be interacting with yearly weather patterns that shifted between wet years to drier years, this would have created a patchwork of areas that returned over time to forest while others remained in coastal scrub and grassland. It is also believed that native grazers were common in these lower gradient coastal plains and may have contributed to the open nature and complex patchwork of coastal scrub and prairies. In combination with the fires and periodic droughts, grazers may have assisted in maintaining areas with good soils in more herbaceous vegetation and the less ideal soils in a more coastal scrub and grass patchwork expression. Native American use along these coastlines would also have included burning to maintain as much of the coastal prairies as possible, often times quite frequently to improve hunting and grass and forb production for plant harvesting.

Historically, this ecological site would likely have been much more extensively covered by the coastal prairies due to the repeated burnings by many of the coastal tribes and the scrub species would have likely been more confined to the more inaccessible areas of the site. As the fires became less and less frequent, the coastal scrub species was able to encroach back into the grasslands. Areas where grazing still occurs either by livestock or native grazers, tend to maintain a more open grassland, however they have become a mix of native perennials and forbs and annual grasses and forbs since the introduction of the non-native seed sources and heavy pressures from grazing. Fire to this ecological site is less likely now, due to the urban development and cultivation of much of these areas along the coast however if it does occur, the severity of the fire may be much higher due to the amount of fuels that have built up since the last fire.

Major Land Resource Area

MLRA 004B
Coastal Redwood Belt

Stage

Provisional

Contributors

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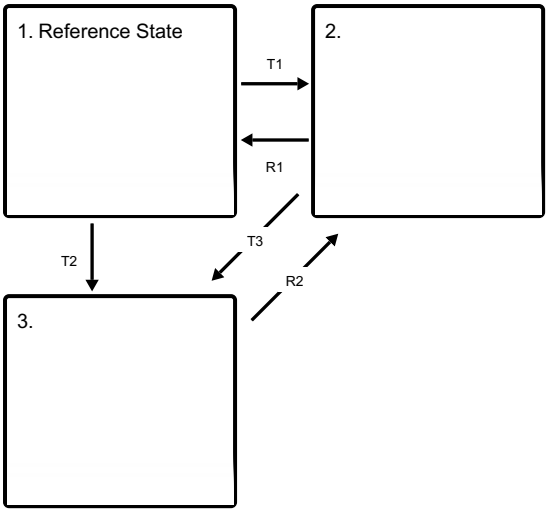
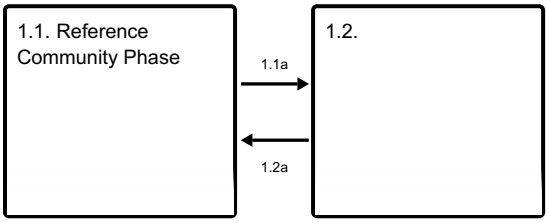
State and transition model

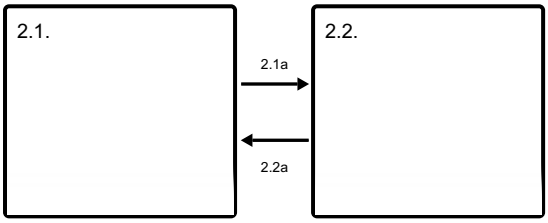
Ecosystem states



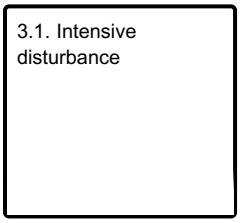
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 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. Reference State (State 1) – This reference state includes a patchwork of coastal prairie dominated and coastal scrub dominated shrublands. These communities are all varied in size and extent, depending on the width of coastline available, elevation and slope, the geologic and soil substrates, and dynamics of disturbance. This variability requires further site investigation and field data collection to refine these communities to the appropriate ecological site scale for more specific site characteristics for each of these finer-scaled differences that have impacts on the land management decision-making process. Where the coastal prairie is more dominant may be primarily due to the soil texture and fertility of the upper rooting zone of the soil. In soils that have finer soil textures and are deeper to a restrictive horizon or

skeletal materials they will provide better growing conditions and water-holding capacity for the fibrous roots of the herbaceous species to compete and dominate over the more tap-rooted scrub species that can take advantage of deeper water that goes farther down in the soil profile than most herbaceous roots can grow. Infrequent fires and a general reduction in grazing activities likely would have assisted in allowing the coastal scrub species to encroach into the prairies and dominate the overstory structure.

Community 1.1
Reference Community Phase

This community phase represents the reference community phase dominated by perennial grasses and forbs. These grasslands can be found on varying slopes with soils that provide greater growing conditions within the rooting zone for the perennial grasses and forbs. This community phase is generally dominated by *Danthonia californica* (California oatgrass), Bromus californica (California brome), and Nasella pulchra (purple needlegrass).

Community 1.2

This community phase represents the coastal scrub dominated vegetation. These coastal scrub species are highly competitive and capable of capitalizing on the available resources of the cool, maritime climate in this LRU. Where the site characteristics create less ideal growing conditions, the coastal scrub species are likely to be more dominant. The most common species is *Baccharis pilularis* (coyotebrush), however there will be areas dominated by *Ceanothus thyrsiflorus* (blueblossom ceanothus), and *Lupinus albifrons* (silver bush lupine). Other species that are commonly found throughout this community phase include *Toxicodendron diversilobum* (poison oak), *Eriophyllum stoechadifolium* (seaside woolly-sunflower), *Scrophularia californica* (California figwort), *Polystichum munitum* (swordfern), *Artemisia californica* (Califonia sagebrush), *Polystichum munitum* (swordfern), and a variety of perennial and annual forbs.

Pathway 1.1a
Community 1.1 to 1.2

This pathway occurs slowly over time as shrubs continue to slowly creep from the edges into the more central parts during seasons where moisture stress makes the herbaceous species less competitive, and may include periods of extended drought or extended periods without summer fog that is common to this LRU. Coastal scrub species, primarily coyotebrush, may capitalize on this drought-caused mortality.

Pathway 1.2a
Community 1.2 to 1.1

This pathway occurs after a fire or grazing that is sufficient enough to remove most of the woody species and open the canopy and soil resources to the herbaceous species.

State 2

This state represents the community phases that have been invaded by non-native species. This ESG is highly susceptible to non-natives and invasives, especially given the proximity and pressures from human use in this LRU. Non-natives and invasives are able to capitalize quickly on available resources much better than the native species can, especially during years that are hotter and drier than average. This state is currently only one community phase, representing all the different types of communities from the reference state and in the future more information and research should be done to determine more specific dynamics in this state that are more heavily related to the different community expressions within this state and the dynamics amongst them all.

Community 2.1

This community phase represents all the different community expressions of a non-native and/or invaded state. The primary annual grass species include *Bromus diandrus* (ripgut brome), *Poa pratensis* (Kentucky bluegrass), Danthonia pilosa (hairy oatgrass), Holcus lanata (velvet grass) and in some areas, *Anthoxanthum odoratum* (sweet vernal grass), Festuca arundinacea (tall fescue) and *Phalaris aquatica* (Harding grass).

Community 2.2

This community phase represents the coastal scrub dominated vegetation. These coastal scrub species are well-adapted to the high, frequent summer winds and salty air and are highly competitive and capable of capitalizing on the available resources of the cool, maritime climate in this LRU. Where the site characteristics create less ideal growing conditions, the coastal scrub species are likely to be more dominant and more consistently stable and resilient to disturbance. The most common species is *Baccharis pilularis* (coyotebrush), however there will be areas dominated by *Ceanothus thyrsiflorus* (blueblossom ceanothus), and *Lupinus albifrons* (silver bush lupine). Other species that are commonly found throughout this community phase include *Toxicodendron diversilobum* (poison oak), *Eriophyllum stoechadifolium* (seaside woolly-sunflower), *Scrophularia californica* (California figwort), *Polystichum munitum* (swordfern), *Artemisia californica* (Califonia sagebrush), Pteridium (brackenfern), and many of the non-native annual grasses and perennial and annual forbs.

Pathway 2.1a
Community 2.1 to 2.2

This pathway occurs slowly over time without fire (or grazing) to clear out the residual dry matter (RDM) that remains from the heavy production of annual grass species. As the litter builds, the site becomes less hospitable for annual seeds to germinate and leaves open niche space for the coastal shrubs that are established to take advantage. As shrubs continue to slowly creep from the edges into the more central parts during seasons where moisture stress makes the herbaceous species less competitive, and may include periods of extended drought or extended periods without summer fog that is common to this LRU. Coastal scrub species, primarily coyotebrush, may capitalize on this drought-caused mortality.

Pathway 2.2a
Community 2.2 to 2.1

State 3

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 3.1
Intensive disturbance

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.

Transition T1
State 1 to 2

This transition occurs when the seed source is introduced to the ecological site. This ecological site is not highly resistant to outside pressures like non-native and/or invasive species. The threshold is crossed when feedback mechanisms shift from natural dynamics to feedback mechanisms that cater to the more competitive non-native and/or invasive species.

Transition T2
State 1 to 3

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.

Restoration pathway R1
State 2 to 1

This restoration pathway occurs through the control of non-native and/or invasive species that can potentially restore this ecological site to its reference state. It is more likely that the non-natives and invasives are minimized and controlled, but complete removal may not be possible without significant time and money inputs and repeated treatments.

Transition T3
State 2 to 3

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.

Restoration pathway R2
State 3 to 2

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.

Citations