

Ecological site F004AC409OR

Coastal Upland Cool Forest

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General information

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.

MLRA notes

Major Land Resource Area (MLRA): 004A–Sitka Spruce Belt

This resource area is along the coast of the Pacific Ocean. It is characterized by a marine climate and coastal fog belt. The parent material is primarily glacial, marine, or alluvial sediment and some scattered areas of Tertiary sedimentary rock and organic deposits. Glacial deposits are dominant in the northern part of the MLRA in Washington; marine and alluvial deposits and eolian sand are dominant along the southern part of the Washington coast and extending into Oregon. The mean annual precipitation ranges from 52 to 60 inches near the beaches to more than 190 inches in the inland areas of the MLRA.

Andisols and Inceptisols are the dominant soil orders in the MLRA, but Spodosols, Entisols, and Histosols are also present. The soils are shallow to very deep and very poorly drained to somewhat excessively drained. They are on hilly marine terraces and drift plains; coastal uplands, hills, and foothills; flood plains; and coastal dunes, marshes, and estuaries.

The soil temperature regimes of MLRA 4A are moderated by the proximity to the Pacific Ocean, which eases the differences between the mean summer and winter temperatures. The seasonal differences in temperature are more pronounced in adjacent MLRAs further inland. Included in MLRA 4A are soils in cooler areas at higher elevations or on northerly aspects that have an isofrigid temperature regime.

The soil moisture regimes of MLRA 4A are typified by soils that do not have an extended dry period during normal years. Many of the soils further inland in MLRA 2 have a dry period in summer. Soils in low-lying areas and depressions of MLRA 4A are saturated in the rooting zone for extended periods due to a high water table or long or very long periods of flooding or ponding.

MLRA 4A Soil Temperature Regimes

Isomesic The mean annual soil temperature (measured at a depth of 20 inches) is 46 to 59 degrees F, and the difference between the mean winter and summer temperatures is less than 11 degrees. The seasonal soil temperatures and difference between the mean winter and summer temperatures are moderated by the proximity to the ocean and the effects of fog in summer.

Isofrigid The mean annual soil temperature (measured at a depth of 20 inches) is 32 degrees F to less than 46 degrees, and the difference between the mean winter and mean summer temperatures is less than 11 degrees. The seasonal soil temperatures and difference between the mean winter and summer temperatures are moderated by the proximity to the ocean and the effects of fog in summer. The temperatures are cooler than in surrounding lowlands because of the higher elevation and differences in slope and aspect.

MLRA 4A Soil Moisture Regimes

Udic The soil rooting zone is not dry in any part for more than 90 cumulative days in normal years. Soil moisture does not limit plant growth because of the fog in summer.

Aquic The soil is virtually free of dissolved oxygen due to saturation of the rooting zone. The soils are saturated for extended periods during the growing season and may be subject to long or very long periods of ponding and flooding.

Refer to Keys to Soil Taxonomy for complete definitions of the soil temperature and moisture regimes.

LRU notes

The Southern Sitka Spruce Belt land resource unit (LRU C) of MLRA 4A is along the west coast of Oregon. This LRU extends from the northern edge of South Slough to the Chetco River, and it is bounded on the west by the Pacific Ocean. The area consists of sand dunes, flood plains, and marine terraces that extend a few miles east and are parallel to the Pacific Ocean, and it transitions to steeper, higher elevation ridges and foothills of the western slopes of the Coast Range. The soils in the coastal lowland areas dominantly formed in eolian (wind-deposited) sand, alluvium, and marine sediment. The soils in the coastal foothills formed in residuum, colluvium, and landslide deposits derived from sedimentary and basaltic rock. Minor additions of recent alluvium are along the river valleys. Several major rivers that have headwaters in the coastal mountains carved steep, narrow valleys through the foothills before entering the broader coastal valleys. Subduction zones along the Pacific Coast may cause significant earthquakes and tsunamis, which would disrupt the ecological processes beyond what is described in this ecological site description.

Classification relationships

National vegetation classification: G751 North Pacific Western Hemlock-Sitka Spruce-Western Redcedar Seasonal Rainforest

Forest Service plant associations of southwestern Oregon: Sitka spruce-white fir/salmonberry

Ecological site concept

This ecological site is on the western coastline of the Pacific Northwest, from central to southern Oregon. It is on coastal hills, mountains, and headlands at an elevation of 30 to 1,800 feet.

The maritime climate is characterized by cool, moist summers and cool, wet winters. The mean annual precipitation is 55 to 130 inches. Coastal fog provides supplemental moisture in summer. Snowfall is rare, and it is not persistent when it occurs. The mean annual air temperatures is 50 to 54 degrees F. The mild temperatures and long growing season result in highly productive forestland.

This forest ecological site is supported by soils that have a wide range in physical properties. The soils are in the udic temperature regime and isomesic moisture regime. This climate is characterized by low potential evapotranspiration during the growing season; therefore, plants are not drought stressed. The soils have a high to low water-holding capacity, and the main soil properties that affect water-holding capacity are depth and texture. As a result of the unique abiotic conditions, this ecological site is considered one of the most productive forests in the world (Franklin, 1973). The most common overstory species are Sitka spruce (*Picea sitchensis*) and white fir (*Abies concolor*). Stands may also include Douglas-fir (*Pseudotsuga menziesii*) and red alder (*Alnus rubra*). Regeneration of red alder is limited by the canopy cover, and it commonly is in gaps where sunlight is most available. Common understory species include salmonberry (*Rubus spectabilis*), evergreen huckleberry (*Vaccinium ovatum*), red huckleberry (*Vaccinium parvifolium*), salal (*Gaultheria shallon*), and western swordfern (*Polystichum munitum*). The vegetation is similar to that of the Coastal Upland Cool Forest (F04AB403WA) site in LRU B, but the productivity of this site in LRU C is higher because of the warmer, longer growing season.

The most natural disturbance on this ecological site is windthrow following major storms, which creates pockets of forest openings. Although wildfires are uncommon, the site is susceptible to catastrophic crown fires that are stand replacing (Taylor, 1990). The natural fire regime for Sitka spruce is 150 to 400 years (Griffith, 1992).

Table 1. Dominant plant species

Tree	(1) <i>Picea sitchensis</i> (2) <i>Abies concolor</i>
Shrub	(1) <i>Vaccinium ovatum</i> (2) <i>Rubus spectabilis</i>
Herbaceous	(1) <i>Polystichum munitum</i>

Physiographic features

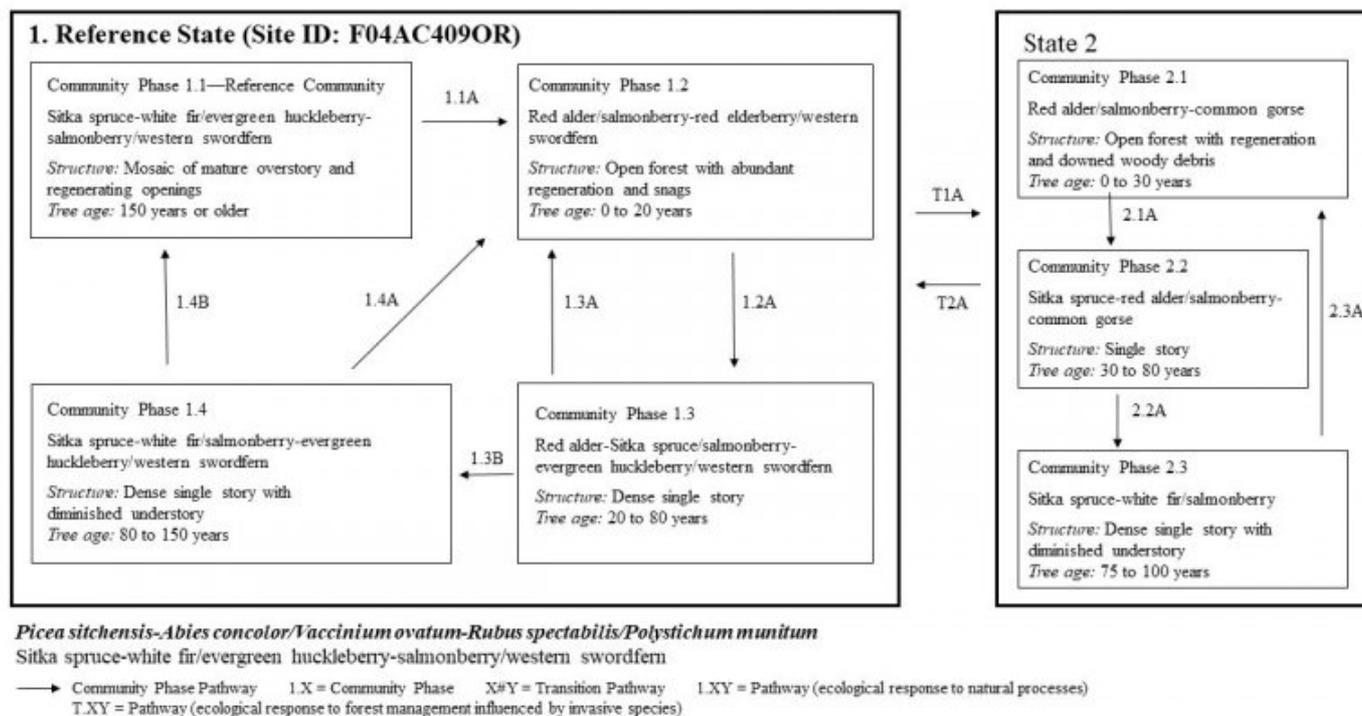
Climatic features

Influencing water features

Soil features

Ecological dynamics

State and transition model



State 1

Reference

Community 1.1

Sitka Spruce, White Fir, Evergreen Huckleberry, Salmonberry, and Western Swordfern

Structure: Mosaic of mature overstory and regenerating openings Sitka spruce and white fir are the most common overstory species in the reference community. Douglas-fir likely is present; however, minimal regeneration occurs in a closed canopy forest. The dense canopy created by the multiple age groups of trees may block most of the sunlight from the forest floor, which leads to sparse understory in some areas. Gaps in the mid canopy and overstory allow sunlight to reach the ground, and a majority of the understory plants establish in these gaps. The gaps also allow red alder to regenerate, and mature stands of red alder may be throughout this community. The understory tends to be more continuous in areas where there is no mid canopy. Common understory species include evergreen huckleberry, red huckleberry, salal, salmonberry, red elderberry (*Sambucus racemosa*), and western swordfern.

Community 1.2

Red Alder, Salmonberry, Red Elderberry, and Western Swordfern

Structure: Open forest with abundant regeneration and snags Community phase 1.2 is an early seral plant community that has been impacted by a stand-replacing disturbance such as a wildfire, a large-scale wind event, mass movement, or major insect or disease infestation. Nearly all trees are absent, but some fire-resistant trees may survive in the overstory. Standing, decaying snags are prevalent. Vegetative regeneration occurs quickly following disturbance. The understory is dominantly early seral species of trees, shrubs, and forbs such as red alder, thimbleberry (*Rubus parviflorus*), red elderberry, salmonberry, and western swordfern. Red alder has several

competitive advantages and can establish quickly as compared to conifers. It can sprout and establish in full sunlight and fixes nitrogen, which provide an early competitive advantage (Villarin, 2009). Seeds of deciduous species are light and can be transported long distances by wind and water, which allows for rapid recolonization. Depending on the severity of the disturbance, tree seedlings and saplings typically establish within 3 to 10 years. Some grasses will establish, but they will be replaced by shrubs over time.

Community 1.3

Red Alder, Sitka Spruce, Salmonberry, Evergreen Huckleberry, and Western Swordfern

Structure: Dense single story Community phase 1.3 is an early seral forest in regeneration. Scattered remnant mature trees may be present. Species composition depends on the natural seed sources present and the intensity of the disturbance. After a moderate or severe fire, shrubs likely will outcompete tree seedlings. Red alder, red huckleberry, evergreen huckleberry, salmonberry, and western swordfern may be abundant in the understory if sunlight is sufficient (Bailey, 1968). Red alder will begin to die 40 to 70 years following disturbance and more light will penetrate the newly nitrogen-rich soil (Naiman, 2009). As a result, conifer regeneration becomes more prevalent in this community phase. Seed sources for tree species are the surrounding areas of undisturbed forest. The combination of new growth and survivors of the disturbance result in a mixed stand that could include Sitka spruce, Douglas-fir, and white fir. Sitka spruce is vulnerable to outbreaks of white pine weevil during this community phase.

Community 1.4

Sitka Spruce, White Fir, Salmonberry, Evergreen Huckleberry, and Western Swordfern

Structure: Dense single story with diminished understory Community phase 1.4 is a forest in the competitive exclusion stage. Scattered remnant mature trees may be present. Competition among individual trees for available water and nutrients is increased. Sitka spruce and white fir are dominant in the overstory canopy; however, more shade-intolerant species such as Douglas-fir and red alder may be present. The canopy closure is nearly 100 percent, which leads to diminished shrubs and forbs. Some understory species better adapted to at least partial shade will begin to increase. Over time, the forest will begin to self-thin due to the elevated competition.

Pathway 1.1A

Community 1.1 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, timber harvesting, a large-scale wind event, a major insect infestation, or large mass movement that leads to the stand initiation phase of forest development.

Pathway 1.2A

Community 1.2 to 1.3

This pathway represents growth over time with no further significant disturbance.

Pathway 1.3A

Community 1.3 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, timber harvesting, a large-scale wind event, a major infestation of insects, or large mass movement that leads to the stand initiation phase of forest development.

Pathway 1.3B

Community 1.3 to 1.4

This pathway represents growth over time with no further major disturbance.

Pathway 1.4B

Community 1.4 to 1.1

This pathway represents growth over time with no further major disturbance.

Pathway 1.4A

Community 1.4 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, timber harvesting, a large-scale wind event, a major infestation of insects, or large mass movement that leads to the stand initiation phase of forest development.

State 2

Disturbed

Community 2.1

Red Alder, Salmonberry, and Common Gorse

Structure: Open forest with regeneration and downed woody debris Community phase 2.1 represents a recently disturbed forest that is naturally regenerating. Following large-scale disturbances, large woody debris commonly is prolific. This inhibits establishment of vegetation under natural conditions. Areas that are not replanted immediately (1 to 3 years) following timber harvesting or a large-scale disturbance may become vulnerable to infestation by invasive species. Typically, commercially managed forests will be replanted following disturbance. Species preference depends on site conditions and long-term economic decisions. Overall, species biodiversity is diminished in forests managed for short-rotation timber. Natural reforestation depends on available seed sources following disturbance. Early seral species such as red alder and salmonberry tend to regenerate quickly under abundant sunlight. The plant community typically is homogenous and even-aged. Common gorse (*Ulex europaeus*) and Scotch broom (*Cytisus scoparius*) commonly are dominant after a disturbance. They tend to outcompete establishment of native species. Invasive species management is critical during this phase.

Community 2.2

Sitka Spruce, Red Alder, Salmonberry, and Common Gorse

Structure: Single story Community phase 2.2 represents an even-aged regenerating forest. Sitka spruce, white fir, western hemlock, shore pine, and Douglas-fir can regenerate quickly on nurse logs or in recently disturbed soils. A higher soil temperature favors seed germination of Sitka spruce, which commonly is the first coniferous tree species to re-establish following logging (Peterson, 1997). Shade-intolerant red alder remains a large component in the overstory until it reaches maturity (Fonda, 1974). The vegetation in areas that have been replanted commonly is dense and even aged, and the understory species are sparse in areas that have a high percentage of canopy cover. Salmonberry, common gorse, and Scotch broom increase in prominence in areas that receive abundant sunlight. Management techniques such as pre-commercial or commercial thinning and mitigation of invasive species will accelerate the maturation and improve the health of the forest.

Community 2.3

Sitka Spruce, White Fir, and Salmonberry

Structure: Dense single story with diminished understory Community phase 2.3 represents a maturing forest that has increased plant diversity. White fir can regenerate under a dense, shrubby canopy. It will begin to establish in the overstory canopy along with Sitka spruce. The dense, shrubby understory is prone to wildfires. Commercial logging operations commonly take place during this phase as trees reach economical maturity in size and volume. It is presumed that without timber management during this phase, an old-growth stand of Sitka spruce and western hemlock will develop.

Pathway 2.1A

Community 2.1 to 2.2

This pathway represents growth over time with no further major disturbance or active forest management.

Pathway 2.2A

Community 2.2 to 2.3

This pathway represents growth over time with no further major disturbance or active forest management.

Pathway 2.3A

Community 2.3 to 2.1

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, a large-scale wind event, a major infestation of insects or disease, large mass movement, or logging activities that lead to the stand initiation phase of forest development.

Transition T1A

State 1 to 2

This pathway represents a major disturbance that has removed most of the overstory. Large-scale disturbances may increase the vulnerability to infestation by invasive species if a seed source is nearby or introduced into the site. This type of disturbance will impact the natural feedbacks that maintained the reference state.

Transition T2A

State 2 to 1

This pathway represents intensive management to restore the historic plant community.

Additional community tables

Other references

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Approval

Kirt Walstad, 1/23/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/07/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant:

Sub-dominant:

Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**
