USDA Natural Resources
Conservation Service

Ecological site F004AC410OR
Coastal Upland Warm Forest

Last updated: 5/07/2024
Accessed: 05/21/2024

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/salal-evergreen huckleberry

Ecological site concept

This ecological site is on the western coastline of the Pacific Northwest, from central to southern Oregon. It is on mountains, marine terraces, and ridgetops. Elevation typically is 50 to 400 feet, and slopes are 0 to 65 percent. This site is similar to the Coastal Upland Cool Forest ecological site in LRU C; but it is at the transition between MLRA 4A and MLRA 1. This transition zone receives less coastal fog, which results in a mixed conifer forest that includes shrubs and forbs adapted to the warmer temperatures in summer.
The maritime climate is characterized by cool, moist summers and cool, wet winters. The mean annual precipitation is 80 to 160 inches. Coastal fog provides supplemental moisture in summer. Snowfall is rare, and it is not persistent when it occurs. The mean annual air temperature is 50 to 55 degrees F. The mild temperatures and long growing season are major climatic influences on this 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.
The most common overstory species is Sitka spruce (Picea sitchensis), but white fir (Abies concolor), shore pine (*Pinus contorta* var. contorta), and Douglas-fir (Pseudotsuga menziesii) may be present. Red alder (Alnus rubra) may be common in forest openings. 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 evergreen huckleberry (Vaccinium ovatum), salal (Gaultheria shallon), and western swordfern (Polystichum munitum). The vegetation of this site is similar to that of the Coastal Upland Warm Forest (F04AB404WA) site in LRU B; however, the productivity of this site is higher because of the warmer, longer growing season in LRU C.
The most common natural disturbance is windthrow following large storms, which creates pockets of forest openings. Although wildfires are uncommon, catastrophic crown fires that are stand replacing may occur (Taylor, 1990). The natural fire regime for Sitka spruce is 150 to 400 years (Griffith, 1992).

Table 1. Dominant plant species

Tree	(1) *Picea sitchensis*
Shrub	(1) *Gaultheria shallon* (2) *Vaccinium ovatum*
Herbaceous	(1) *Polystichum munitum*

Physiographic features

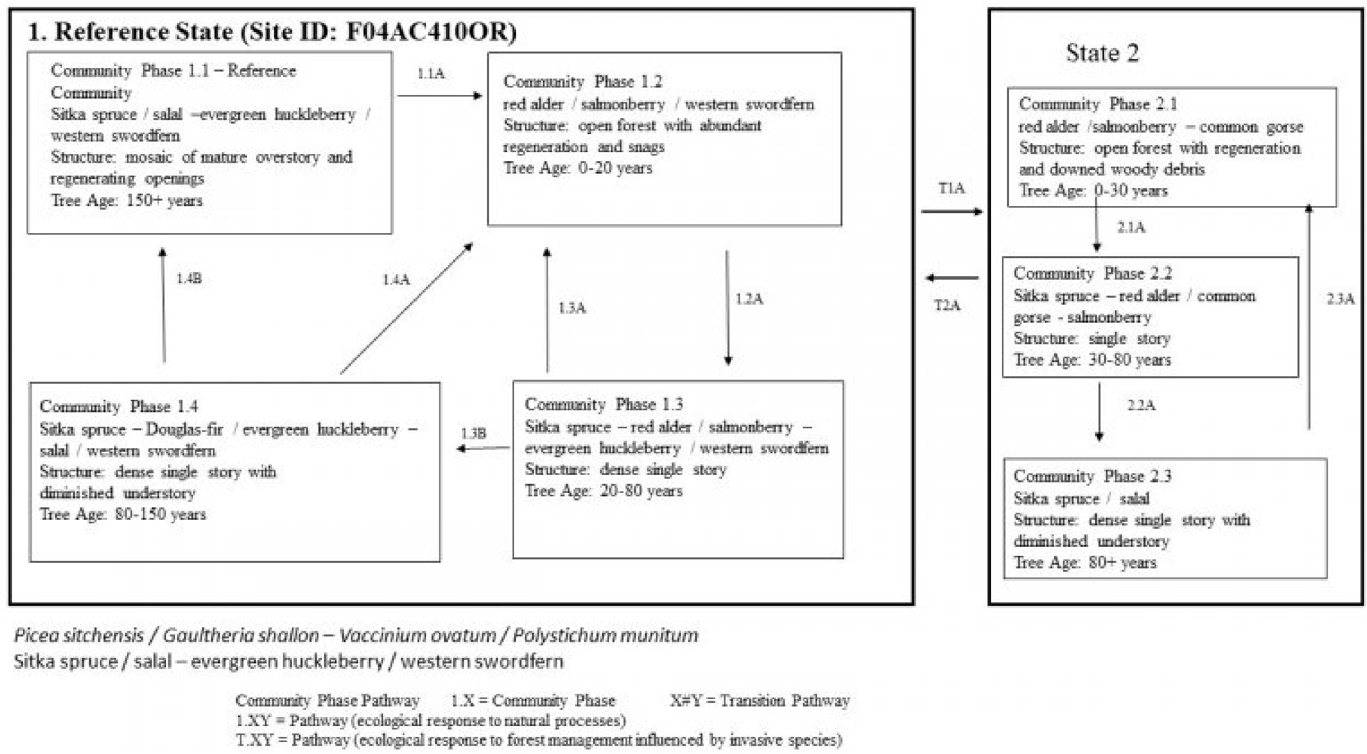
Climatic features

Influencing water features

Soil features

Ecological dynamics

State and transition model



State 1
Reference State

Community 1.1
Sitka spruce/salal-evergreen huckleberry/western swordfern

Structure: Mosaic of mature overstory and regenerating openings Sitka spruce is the most common overstory species in the reference community. Douglas-fir, white fir, shore pine (*Pinus contorta* var. contorta), and tanoak (*Notholithocarpus densiflorus*) commonly are present. 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 present throughout this community. The understory tends to be more continuous in areas where there is no mid canopy. Common understory shrub species include evergreen huckleberry, salal, red huckleberry (*Vaccinium parvifolium*), and salmonberry (*Rubus spectabilis*). The herbaceous cover commonly is diverse. It includes western swordfern, western brackenfern (*Pteridium aquilinum*), and fragrant bedstraw (*Galium triflorum*).

Community 1.2
Red alder/salmonberry/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 a major infestation of insects or disease. Nearly all trees are absent, but some fire-resistant trees may survive in the overstory. Standing, decaying snags are prevalent. Large stems may be on the surface and serve as nurse sites. The understory is dominantly early seral species of trees, shrubs, and forbs, such as red alder, thimbleberry (*Rubus parviflorus*), red elderberry (*Sambucus racemosa*), and salmonberry. Red alder has several competitive advantages, and it 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, seedlings and saplings of red alder typically establish within 3 to10 years. Some grasses will establish, but they will be replaced by shrubs over time.

Community 1.3
Sitka spruce-red alder/salmonberry-evergreen huckleberry/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 to severe fire, shrubs likely will outcompete tree seedlings. Red alder, shore pine, red huckleberry, evergreen huckleberry, western swordfern, fragrant bedstraw, and salmonberry may be abundant in the understory if sunlight is available (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 seedlings and survivors of the disturbance results in a mixed stand that can include Sitka spruce, Douglas-fir, and white fir.

Community 1.4
Sitka spruce-Douglas-fir/evergreen huckleberry-salal/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, shore pine, white fir, and Douglas-fir are dominant in the overstory canopy; however, red alder may be in pockets of canopy openings. 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, a large-scale wind event, a major infestation of insects, timber harvesting, 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, a large-scale wind event, a major infestation of insects or disease, timber harvesting, 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 disease, or large mass movement that leads to the stand initiation phase of forest development.

State 2
Disturbed State

Community 2.1
Red alder/salmonberry-common gorse

Structure: Open forest with regeneration and downed woody debris Community phase 2.1 represents a recently disturbed forest that is naturally regenerating. Large woody debris commonly is prolific after large-scale disturbances. This inhibits the establishment of vegetation under natural conditions. Areas that are not replanted immediately (1 to 3 years) following timber harvesting or another large-scale disturbance may become vulnerable to infestation by invasive species. Typically, commercially managed forests will be replanted following a 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. Plant community typically is homogenous and even aged. Common gorse (*Ulex europaeus*) and Scotch broom (*Cytisus scoparius*) are common after a disturbance, and they tend to outcompete the establishment of native species. Management of invasive species is critical during this phase.

Community 2.2
Sitka spruce-red alder/common gorse-salmonberry

Structure: Single story Community phase 2.2 represents an even-aged, regenerating forest. Sitka spruce, western hemlock, shore pine, and Douglas-fir can regenerate quickly on nurse logs or in recently disturbed areas. 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/salal

Structure: Dense single story with diminished understory Community phase 2.3 represents a maturing conifer forest that has increased species diversity. A shrubby understory of shade-tolerant species will develop; however, common gorse likely will remain in canopy openings. 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 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 timber harvesting that leads to the stand initiation phase of forest development.

Transition T1A
State 1 to 2

This pathway represents a major disturbance that removes 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, 5/07/2024

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:**