Ecological site F004AB006OR
Udic Flood Plain Forest

Last updated: 1/23/2025
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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 Central Sitka Spruce Belt land resource unit (LRU B) of MLRA 4A is along the west coast of Washington and Oregon. The LRU extends from the Chehalis River in Washington to South Slough in Oregon, and it is bounded on the west by the Pacific Ocean. This 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 and higher elevation ridges and mountainsides of the western slopes of the Coast Range in Oregon. Near the shore in coastal lowland areas, the parent material is dominantly eolian (wind-deposited) sand, alluvium, and marine sediment. Residuum, colluvium, and landslide deposits derived from sedimentary and basaltic sources are on the coastal foothills and mountains, and minor additions of recent alluvium are along the river valleys. Several major rivers carved steep, narrow valleys through the coastal mountains and foothills before entering 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: G254 North Pacific Lowland Riparian Forest and Woodland Group; A3747 Sitka Spruce Riparian Forest Alliance
Plant associations of the Siuslaw National Forest: Sitka spruce/Oregon oxalis

Ecological site concept

This ecological site is on the western coastline of the Pacific Northwest, from southern Washington through central Oregon. It is at low elevations (less than 1,500 feet) that receive abundant precipitation and persistent fog in summer. It is in riparian corridors of stream terraces and flood-plain steps. The soils are alluvial and subject to stream overflow. Riparian ecological sites typically differ in topography, vegetation, geomorphology, and microclimate from the surrounding uplands of the forest ecosystem (Dwire, 2003).
The maritime climate is characterized by cool, moist summers and cool, wet winters. The mean annual precipitation is 70 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 temperature is 48 to 52 degrees F. The mild temperatures and long growing season result in highly productive forestland.
The soils that support this ecological site are in the isomesic soil temperature regime and udic soil moisture regime. They formed in alluvium and are on flood-plain steps and stream terraces. Soil moisture is not a limiting factor to forest growth due to the abundance of precipitation and the fog in summer. The soils typically are subject to flooding in November through April. The smaller, more frequent floods typically cause minor scouring as compared to the 100- to 500-year floods. The soils are weakly developed Inceptisols due to their young age and association with active flood plains.
The most common overstory species are Sitka spruce (Picea sitchensis), Douglas-fir (Pseudotsuga menziesii), western redcedar (Thuja plicata), western hemlock (Tsuga heterophylla), and red alder (Alnus rubra). Red alder may be dominant, especially in forest openings or pockets of disturbance. Regeneration is restricted by the canopy cover, and it commonly is limited to gaps where sunlight is most available. Common understory species include salmonberry (Rubus spectabilis), red elderberry (Sambucus racemosa), rusty menziesia (Menziesia ferruginea), western swordfern (Polystichum munitum), common ladyfern (Athyrium filix-femina), and Oregon oxalis (Oxalis oregana).
The most common natural disturbance is flooding. The volume and longevity of the flooding determine the effect on the dynamics of the forest. Although wildfire is uncommon in this ecological site (more than 450-year return interval), it may be stand replacing (Balian, 2005). Trees are particularly susceptible to windthrow following large coastal storms due to the shallow rooting depth in response to the seasonal high water table and long periods of ponding that extend into the growing season. Fallen trees that have exposed root systems and large woody debris are common. As the interval between disturbances extends, the overstory becomes more diverse due to conifer establishment. In the absence of disturbance, it is expected that maturation and succession will result in an old-growth conifer forest (Van Pelt, 2006). This site commonly is cleared for pasture, which may affect the hydrology and flooding regime.

Table 1. Dominant plant species

Tree	(1) *Picea sitchensis* (2) *Alnus rubra*

Shrub	(1) *Rubus spectabilis* (2) *Menziesia ferruginea*
Herbaceous	(1) *Oxalis oregana* (2) *Athyrium filix-femina*

Physiographic features

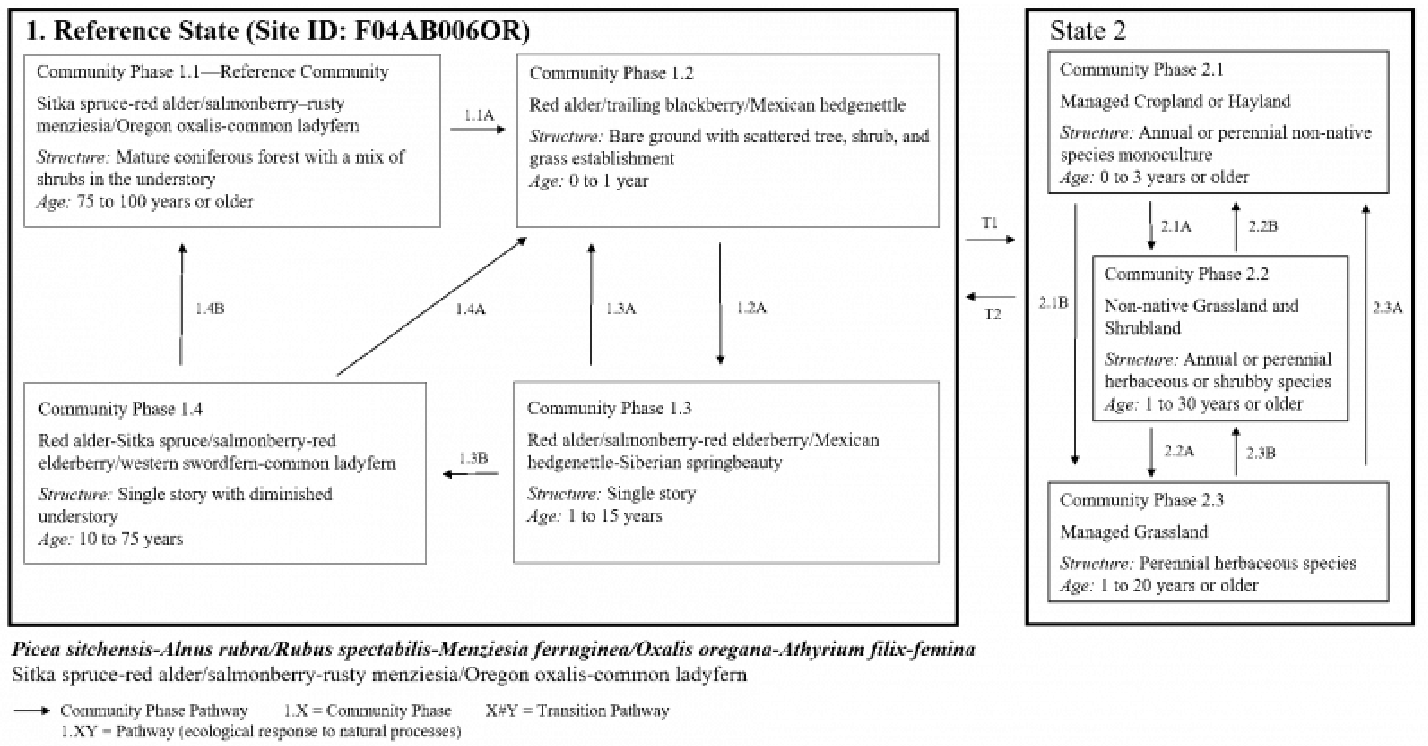
Climatic features

Influencing water features

Soil features

Ecological dynamics

State and transition model



State 1
Reference

Community 1.1
Sitka Spruce, Red Alder, Salmonberry, Rusty Menziesia, Oregon Oxalis, and Common Ladyfern

Figure 1. Mature reference community.

Figure 2. Small gap dynamics in reference community.

Structure: Mature coniferous forest with a mix of shrubs in the understory Sitka spruce commonly is the dominant overstory species in the reference community. Red alder may be dominant, especially in areas where there are forest openings or pockets of disturbance. Regeneration is restricted by the canopy cover, and it commonly is limited to gaps where sunlight is most available. Conifers such as western hemlock (typically in stands older than 100 years), Douglas-fir, and western redcedar may be present in the stand. Herbivory on western hemlock and western redcedar by elk (Cervus elaphus) and black-tailed deer (Odocoeleus hemionus columbianus) may greatly impact the prominence of these species (Stolnack, 2010). The reference community represents a lack of major flooding for at least 75 years, which allows the pioneering species to form a mature canopy. The lack of flooding also allows for growth of a robust understory of shrubs, including salmonberry, red elderberry, rusty menziesia, thimbleberry (*Rubus parviflorus*), twinberry (*Lonicera involucrata*), red huckleberry (*Vaccinium parvifolium*), salal (*Gaultheria shallon*), and evergreen huckleberry (*Vaccinium ovatum*). Forbs such as western swordfern, common ladyfern, false lily of the valley (*Maianthemum dilatatum*), deer fern (*Blechnum spicant*), and Oregon oxalis commonly are prolific. Common disturbances include small gap dynamics (1/2-acre openings or smaller) following the decline of the red alder canopy and minor scouring from flooding. Soil deposition from minor scouring caused by smaller scale, periodic flooding temporarily affects the understory community, but it does not alter the composition of the overstory. Beaver (Castor canadensis) activity can by a significant driver in small-scale disturbances and hydrologic morphology, and it can contribute large woody debris to riparian edges and corridors.

Community 1.2
Red Alder, Trailing Blackberry, and Mexican Hedgenettle

Structure: Bare ground with scattered tree, shrub, and grass establishment Community phase 1.2 represents a riparian forest that is undergoing regeneration or stand initiation immediately following flooding. The surface of the soils is gravelly and highly variable depending on the intensity, frequency, and aggradation of the flooding (Fonda, 1974). Scattered remnant mature trees may be in some areas, and woody debris is abundant. Successful regeneration is dependent on the local seed source, an adequate seedbed, and sufficient light and water (Nierenberg, 2000). Red alder has several competitive advantages, and it can establish quickly as compared to conifers. Red alder can sprout and establish in full sunlight and fixes nitrogen in poorly developed alluvial soils, 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. Trailing blackberry (*Rubus ursinus*) and Mexican hedgenettle (*Stachys mexicana*) commonly are established in this community phase. Plant cover is relatively sparse; it ranges from 5 to 20 percent (Fonda, 1974). Invasive species include Japanese knotweed (*Polygonum cuspidatum*) and giant knotweed (*Polygonum sachalinense*).

Community 1.3
Red Alder, Salmonberry, Red Elderberry, Mexican Hedgenettle, and Siberian Springbeauty

Structure: Single story Community phase 1.3 is an early seral forest in regeneration. Scattered remnant mature trees may be present. Competition among individual trees for available water, light, and nutrients is increased. Red alder is dominant in the overstory. Trailing blackberry is a large component of the understory, but salmonberry and red elderberry begin to become dominant in the shrub layer. Forbs such as Mexican hedgenettle and Siberian springbeauty (*Claytonia sibirica*) may be common in openings, but they begin to diminish under a closed canopy.

Community 1.4
Red Alder, Sitka Spruce, Salmonberry, Red Elderberry, Western Swordfern, and Common Ladyfern

Structure: Single story with diminished understory Community phase 1.4 is a forest in the competitive exclusion stage. Scattered remnant mature trees may be present. Red alder generally is dominant in the overstory; however, it 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 will become more prevalent in this community phase. Seedlings of Sitka spruce will begin to establish sporadically, especially in areas that have more shade. They may establish within 4 years of hardwood establishment (Stolnack, 2010). Downed logs, which are more prevalent in established stands, are an important component for conifer establishment (Villarin, 2009). About 60 to 90 years following disturbance, Sitka spruce begins to flourish and replace red alder (Van Pelt, 2006). Sitka spruce seedlings can survive small floods and inundation by producing adventitious roots from recently buried stems (Van Pelt, 2006). During this phase, the canopy closure will mature to 100 percent and the understory will diminish. If red alder regeneration is in this community phase, it may be inferred that frequent minor flooding has been influencing site dynamics (Nierenberg, 2000). Over time, the forest begins to self-thin as a result of competition and a decrease in species that are intolerant of shade.

Pathway 1.1A
Community 1.1 to 1.2

This pathway represents a stand-replacing wildfire, catastrophic windstorm, or major 100- or 500-year flood that scours the stream channel, removes understory and overstory vegetation, and may alter the streamflow. This type of disturbance may completely reconfigure sediment loads and dramatically reduce or eliminate the forest overstory.

Pathway 1.2A

Community 1.2 to 1.3

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

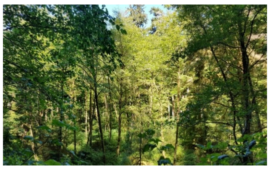
Pathway 1.3A
Community 1.3 to 1.2

This pathway represents a stand-replacing wildfire, catastrophic windstorm, or major 100- or 500-year flood that scours the stream channel, removes understory and overstory vegetation, and may alter the streamflow. This type of disturbance may completely reconfigure sediment loads and dramatically reduce or eliminate the forest overstory.

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



Red Alder, Sitka Spruce, Salmonberry, Red Elderberry, Western Swordfern, and Common Ladyfern

Sitka Spruce, Red Alder, Salmonberry, Rusty Menziesia, Oregon Oxalis, and Common Ladyfern

This pathway represents no further major disturbance. Continued growth over time and ongoing mortality lead to increased vertical diversification. The community begins to resemble the structure of the reference community, including small pockets of regeneration (both deciduous and coniferous) and a more diversified understory.

Pathway 1.4A
Community 1.4 to 1.2

This pathway represents a stand-replacing wildfire, catastrophic windstorm, or major 100- or 500-year flood that scours the stream channel, removes understory and overstory vegetation, and may alter the streamflow. This type of disturbance may completely reconfigure sediment loads and dramatically reduce or eliminate the forest overstory.

State 2
Converted

Community 2.1
Managed Cropland or Hayland

Structure: Annual or perennial non-native species monoculture Community phase 2.1 may consist of a range of crops, including annually planted species, short-lived perennial species, and more permanent shrubby species. Hay and grasses and legumes for silage are included in this community phase.

Community 2.2
Non-Native Grassland and Shrubland

Structure: Annual or perennial herbaceous or shrubby species Community phase 2.2 is characterized by low-level agronomic or management activity such as adding fertility, intensive grazing management, regular mowing, or weed control. This plant community commonly consists dominantly of introduced weedy species. Areas that have extremely low fertility or are subject to heavy grazing pressure have a higher proportion of annual, stoloniferous, or rhizomatous species. Wetland areas commonly support dominantly non-native rhizomatous grasses. The plant community may include remnants of introduced pasture species that commonly are seeded.

Community 2.3
Managed Grassland

Structure: Perennial herbaceous species Community phase 2.3 receives regular agronomic inputs, including adding soil nutrients and other soil amendments such as lime, implementing grazing management plans or regular mowing, controlling weeds, and reseeding as needed. This plant community typically includes introduced perennial pasture and hay species that commonly are seeded. In areas of historic native grassland, mixtures of perennial and annual native species may be seeded and managed by appropriate agronomic and livestock management activities. Minor amounts of introduced species that commonly are in non-native grassland and shrub communities (community phase 2.2) are in this phase.

Pathway 2.1A
Community 2.1 to 2.2

In the absence of agronomic and livestock management activities, seeds from surrounding weedy plant communities will be transported to the site by wind, flood water, animals, or vehicle traffic. Adapted species will become established. Management activities include tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.1B
Community 2.1 to 2.3

This pathway represents agronomic and livestock management activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.2B
Community 2.2 to 2.1

This pathway represents agronomic activities such as tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, and planting to desirable crop species.

Pathway 2.2A
Community 2.2 to 2.3

This pathway represents agronomic and livestock management activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Pathway 2.3A
Community 2.3 to 2.1

This pathway represents agronomic activities, including tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, and planting to desirable crop species.

Pathway 2.3B
Community 2.3 to 2.2

In the absence of agronomic and livestock management activities, seeds from surrounding weedy plant communities will be transported to the area by wind, floodwater, animals, or vehicle traffic. Adapted species will become established. Management activities include tilling, adding soil nutrients and other soil amendments such as lime, mowing, burning, harvesting or chemically controlling vegetation, planting to desirable herbaceous species, and implementing grazing management plans.

Transition T1A

State 1 to 2

This pathway represents a change in land use. Land management includes modifications to the hydrologic function to develop pasture and agriculture. Non-native seed disbursement is introduced (intentionally or unintentionally), which alters the reference community.

Transition T2A
State 2 to 1

This pathway represents restoration of the natural hydrologic function and native plant habitat. Native seed sources and extensive management and mitigation of brush and invasive species are needed to restore the 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:**