

## **Ecological site F004AB010OR Aquic 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 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: G610 North Pacific Maritime Wooded Bog & Poor Fen Group; A3763 Western Hemlock-Western Redcedar/Western Labrador-Tea Treed Bog Alliance; CEG000477 Western Hemlock/Western Labrador-Tea/Slough Sedge-American Skunkcabbage Treed Bog Association  
Oregon Natural Heritage Information Center native freshwater wetland plant association: Western hemlock/Labrador tea/slough sedge-skunk cabbage

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 consists of forested wetlands in depressions, on marine terraces and relatively flat earthflows, and in seeps of mountain slopes that have a seasonal high water table. The site is strongly influenced by physiography and hydrology, which provide rare and unique habitats along the coast of the Pacific Ocean. The maritime climate is characterized by cool, moist summers and cool, wet winters. The mean annual precipitation is 70 to 190 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 46 to 52 degrees F. The soils that support this ecological site are in the isomesic soil temperature regime and aquic soil moisture regimes. This site typically is subject to residual ponding or a seasonal high water table. The water table commonly is at or near the surface much of the growing season, and the rate of organic decomposition is slow due to anaerobic conditions. The seasonal high water table and ponding dynamics may be altered by artificial drainage of the site or adjacent areas. A thin organic horizon consisting of decomposing twigs, needles, and litter is on the surface of the soils, which helps to protect the soils from wind and water erosion. The most common overstory species are western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), shore pine (*Pinus contorta* var. *contorta*), and Sitka spruce (*Picea sitchensis*). As a result of soil saturation during much of the year, conifers may be restricted to nurse logs or higher microsites and they commonly are short and stunted (Roccio, 2015). The root systems of western redcedar are shallow, and they develop a dense network of fine roots that make the trees well adapted to forested swamps. Common understory species include American skunkcabbage (*Lysichiton americanus*), western Labrador tea (*Ledum glandulosum*), and slough sedge (*Carex obnupta*). Bog Labrador tea (*Ledum groenlandicum*) is restricted to ecological sites north of the Columbia River. The most common natural disturbance is ponding. The volume and longevity of the ponding determine the effect on the dynamics of the forest. The site is vulnerable to windthrow following large coastal storms. Trees in this site are particularly susceptible to windthrow because of 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. The fallen trees result in more canopy openings. This allows more sunlight to reach the forest floor and leads to a shrubby understory. Logging and agricultural disturbances in adjacent areas may alter the hydrology and increase the susceptibility to infestation by invasive species.

Table 1. Dominant plant species

Tree	(1) <i>Tsuga heterophylla</i> (2) <i>Thuja plicata</i>
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Shrub	(1) <i>Ledum glandulosum</i>
Herbaceous	(1) <i>Lysichiton americanus</i> (2) <i>Carex obnupta</i>

Physiographic features

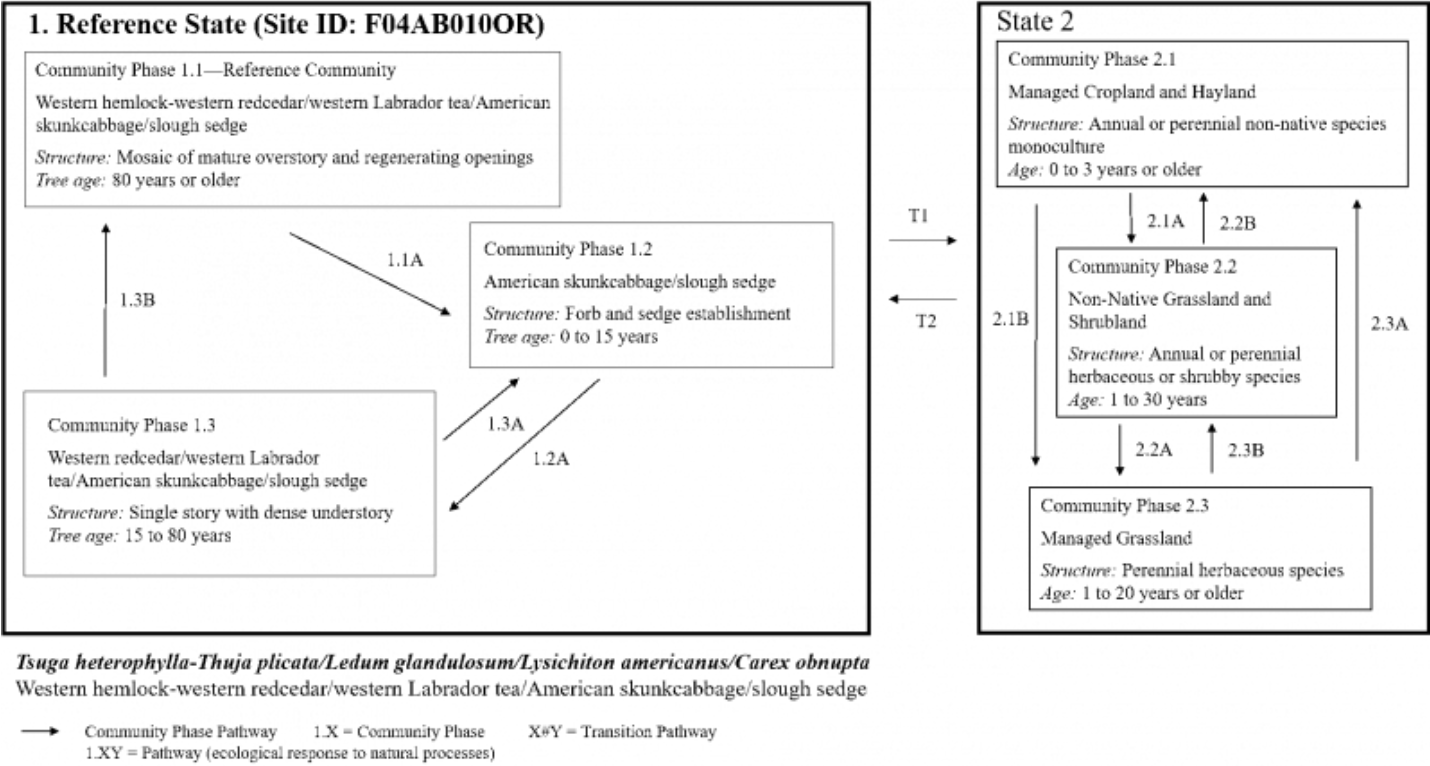
Climatic features

Influencing water features

Soil features

Ecological dynamics

State and transition model



State 1  
Reference

Community 1.1  
Western Hemlock, Western Redcedar, Western Labrador Tea, American Skunkcabbage, and Slough Sedge

Structure: Mosaic of mature overstory and regenerating openings The reference community represents a lack of major disturbance from windthrow or ponding for at least 80 years, which allows the pioneering species to form a mature canopy. Western hemlock and western redcedar are the dominant overstory species. Sitka spruce and shore pine are present, but they are limited to drier microsites such as nurse logs and mounds. Red alder (*Alnus rubra*) may be in some areas, but the site commonly consists dominantly of conifers. The overstory canopy closure is 50 to 70 percent, and the understory is patchy (Christy, 2005). Shrubs commonly are restricted to nurse logs, stumps, and higher microsites. Understory species include salal, American skunkcabbage, evergreen huckleberry (*Vaccinium ovatum*), red huckleberry (*Vaccinium parvifolium*), California wax myrtle (*Morella californica*), water

parsley (*Oenanthe sarmentosa*), deer fern (*Blechnum spicant*), cascara (*Frangula purshiana*), salmonberry (*Rubus spectabilis*), and slough sedge. Common disturbances include small gap dynamics (1/2-acre openings or smaller) following windstorms and excessive ponding.

## **Community 1.2**

### **American Skunkcabbage and Slough Sedge**

Structure: Forb and sedge establishment Community phase 1.2 represents a forest that is undergoing regeneration or stand initiation immediately following excessive ponding or windthrow. Scattered remnant mature trees and shrubs may be in some areas, and woody debris is abundant. Loss of the overstory and the fallen trees may impact the hydrology by resulting in more frequent, longer periods of ponding. Successful regeneration is dependent on the local seed source, an adequate seedbed, and sufficient light and water (Nierenberg, 2000). Rapid recolonization is limited to plants that are well adapted to saturated soil conditions much of the year. American skunkcabbage, water parsley, and slough sedge will begin to re-establish during this phase.

## **Community 1.3**

### **Western Redcedar, Western Labrador Tea, Salal, American Skunkcabbage, and Slough Sedge**

Structure: Single story with dense understory Community phase 1.3 is an early seral forest in regeneration. Scattered remnant mature trees may be present. Western redcedar is successful at regenerating in disturbed areas because it reproduces on fallen branches and trees (Minore, 1990). Shrubs such as western Labrador tea, salal, evergreen huckleberry, and red huckleberry also establish on fallen trees and in higher microsites. Understory species may include deer fern, salmonberry, American skunkcabbage, and slough sedge.

## **Pathway 1.1A**

### **Community 1.1 to 1.2**

This pathway represents excessive ponding that results in a shallow rooting zone. The trees are susceptible to windthrow that may create pockets of fallen trees larger than 1 acre in size. Catastrophic windstorms may be stand replacing

## **Pathway 1.2A**

### **Community 1.2 to 1.3**

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

## **Pathway 1.3B**

### **Community 1.3 to 1.1**

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 1.3A**

### **Community 1.3 to 1.2**

This pathway represents excessive ponding that results in a shallow rooting zone. The trees are susceptible to windthrow that may create pockets of fallen trees larger than 1 acre in size. Catastrophic windstorms may be stand replacing.

## **State 2**

### **Converted**

## **Community 2.1**

### **Managed Cropland and 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 plants. 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 soil nutrients, 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, 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 shrubland 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, 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.

## **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**

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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:

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### 2. Presence of water flow patterns:

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

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

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):**
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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
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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:**
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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):**
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14. **Average percent litter cover (%) and depth ( in):**
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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:**



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17. **Perennial plant reproductive capability:**

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