USDA Natural Resources Conservation Service

Ecological site R004AA005WA
Bog or Fen

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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.

LRU notes

The Northern Sitka Spruce Belt land resource unit (LRU A) of MLRA 4A is along the northwest coast of the Olympic Peninsula to the Chehalis River in Washington State. The parent material is dominantly glacial deposits derived from continental or alpine sources. This LRU extends from the northwesternmost corner of the Olympic Peninsula south to the northern edge of Grays Harbor. It is bounded on the west by the Pacific Ocean and on the east by the Olympic Mountains. Several major rivers carved valleys through the glacially derived landscape and deposited more recent alluvium. These include the Sol Duc, Bogachiel, Hoh, Queets, Quinault, and Humptulips Rivers.

Ecological site concept

This ecological site is at low elevations (less than 1,500 feet) on the western coastline of the Olympic Peninsula. The site receives abundant precipitation and has persistent fog in summer. It is strongly influenced by physiography and hydrology. It includes both bogs and fens, which are unique ecosystems that impact carbon and hydrologic cycles and host rare and unique plant and animal species. Bogs commonly are in depressions and within closed hydrologic basins that primarily are influenced by snowpack and rainfall. They do not have an outlet for water flow; therefore, they are a more acidic environment. Fens are influenced by groundwater and aquifer recharge and discharge (Patterson, 2007).
The duration and frequency of ponding directly influence the plant community. Plant species vary depending on soil

acidity and anaerobic conditions. Typically, the most common plants are bog Labrador tea (Ledum groenlandicum) and western bog laurel (Kalmia microphylla). These species vary in cover depending on soil saturation. They may be restricted to floating mats in wet areas, but they may have continuous cover across the landscape in drier areas. Additional plant species include bog cranberry (Vaccinium oxycoccos), black crowberry (Empetrum nigrum), sweetgale (Myrica gale), brackenfern (Pteridium aquilinum), slough sedge (Carex obnupta), livid sedge (Carex livida), and sphagnum moss (Sphagnum spp.).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ledum groenlandicum* (2) *Kalmia microphylla*
Herbaceous	Not specified

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Valley > Bog > Closed depression (2) Valley > Fen
Elevation	0–1,500 ft
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The maritime climate is characterized by cool, moist summers and cool, wet winters. The mean annual precipitation is 75 to 185 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 47 to 51 degrees F.

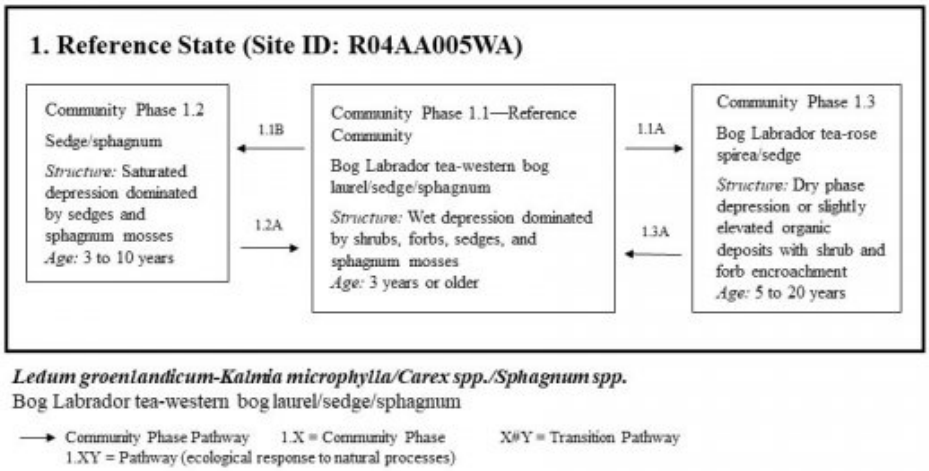
Influencing water features

Soil features

The soils that support this ecological site are in the isomesic soil temperature regime and aquic soil moisture regime. This site typically is subject to residual ponding or a seasonal high water table. The water table commonly is at or near the surface for much of the growing season, and the rate of organic decomposition is slow due to anaerobic conditions. The most common natural disturbance is a change toward wetter or drier conditions. The seasonal high water table and ponding dynamics may be altered by artificial drainage of the site or adjacent areas.

Ecological dynamics

State and transition model



State 1
Reference

Community 1.1
Bog Labrador Tea, Western Bog Laurel, Sedge, and Sphagnum

Structure: Wet depression dominated by shrubs, forbs, sedges, and sphagnum mosses The reference community is a wet meadow. It consists dominantly of shrubs, forbs, sedges, and sphagnum mosses that are influenced by a water table near the soil surface or above it for much of the growing season. The soils are anaerobic and very poorly drained, which restrict plant growth to uniquely adapted species. The most common plants are bog Labrador tea and western bog laurel. Additional plant species include bog cranberry, black crowberry, sweetgale, brackenfern, slough sedge, livid sedge, and sphagnum moss.

Dominant plant species

- black crowberry (*Empetrum nigrum*), shrub
- small cranberry (*Vaccinium oxycoccos*), shrub
- sweetgale (*Myrica gale*), shrub
- alpine laurel (*Kalmia microphylla*), shrub

- bog Labrador tea (*Ledum groenlandicum*), shrub
- western brackenfern (*Pteridium aquilinum*), other herbaceous
- slough sedge (*Carex obnupta*), other herbaceous
- livid sedge (*Carex livida*), other herbaceous

Community 1.2
Sedge and Sphagnum

Structure: Saturated depression dominated by sedges and sphagnum mosses Community phase 1.2 represents a plant community of sedges and sphagnum mosses that is influenced by a water table above the soil surface during the growing season. Extended ponding restricts the plant diversity to water- and peat-adapted species such as sedges.

Dominant plant species

- sedge (*Carex*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous

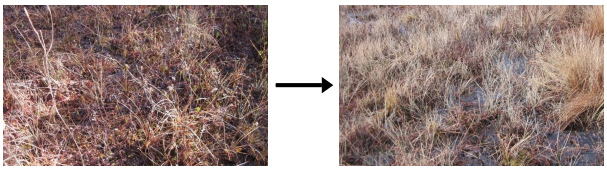
Community 1.3
Bog Labrador Tea, Rose Spirea, and Sedge

Structure: Dry phase depression or slightly elevated organic deposits with shrub and forb encroachment Community phase 1.3 represents a plant community of shrubs, forbs, grasses, and sedges that is influenced by a water table at or below the soil surface during the growing season or by a buildup of organic matter above the surface. This plant community has been subject to below-average ponding and precipitation for several consecutive years. The drier conditions restrict the regeneration of some wetland species. Species along the edges of the reference site and ecotone, such as rose spirea (Spirea douglasii) and salal (*Gaultheria shallon*), will begin to encroach on the open meadow and become more dominant. Over a long period of dry conditions or absence of fire, shore pine (*Pinus contorta* var. contorta) and Sitka spruce (*Picea sitchensis*) may establish and encroach on the site.

Dominant plant species

- bog Labrador tea (*Ledum groenlandicum*), shrub
- rose spirea (*Spiraea douglasii var. douglasii*), shrub
- salal (*Gaultheria shallon*), shrub

Pathway 1.1B
Community 1.1 to 1.2



Bog Labrador Tea, Western Bog Laurel, Sedge, and Sphagnum

Sedge and Sphagnum

This pathway represents a climatic change toward wetter conditions. If the site becomes wetter from increased precipitation, the depth to a water table will decrease and the duration of flooding or ponding will increase. This will restrict drainage and alter the plant community.

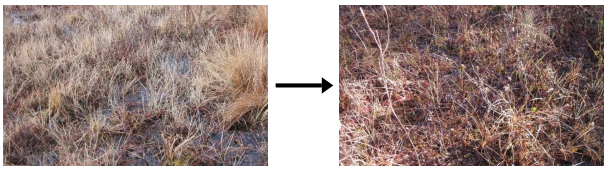
Pathway 1.1A
Community 1.1 to 1.3

Bog Labrador Tea, Western Bog Laurel, Sedge, and Sphagnum

Bog Labrador Tea, Rose Spirea, and Sedge

This pathway represents a climatic change toward drier conditions. If the site becomes drier from reduced precipitation, the depth to a water table will increase and the duration of ponding will decrease.

Pathway 1.2A
Community 1.2 to 1.1



Sedge and Sphagnum

Bog Labrador Tea, Western Bog Laurel, Sedge, and Sphagnum

This pathway represents a climatic change toward drier conditions or an absence of periodic wildfires. If the site becomes drier from reduced precipitation, the depth to a water table will increase and the duration of ponding will decrease. This will lengthen the growing season and alter the plant community.

Pathway 1.3A
Community 1.3 to 1.1

Bog Labrador Tea, Rose Spirea, and Sedge

Bog Labrador Tea, Western Bog Laurel, Sedge, and Sphagnum

This pathway represents a climatic change toward wetter conditions or restoration from periodic wildfire. If the site becomes wetter by excessive ponding or flooding, the duration of soil saturation will increase. This will impact the growing season and alter the plant community.

Additional community tables

Inventory data references

National vegetation classification: G284 North Pacific Bog and Acidic Fen Group; A2514 Bog and Acidic Fen Alliance Group
Ecological Systems of Washington State community type: North Pacific Bog and Fen; Sphagnum Bog

Other references

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Contributors

Erin Kreutz
Erik Dahlke
Jason Martin
Marty Chaney
Carri Gaines

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:**

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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):**

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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):**

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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:

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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):**

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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:**
