

Ecological site F004AA004WA

Aquic 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.

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 consists of forested wetlands in depressions and on glacial outwash terraces and till plains that have a seasonal high water table. The site is strongly influenced by physiography and hydrology; thus, it provides rare and unique habitats along the coast of the Pacific Ocean. The most common overstory species are western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), and Sitka spruce (*Picea sitchensis*). Because the soils are saturated much of the year, conifers may grow only on nurse logs or in higher microsites and they commonly are short and stunted (Roccio, 2015). Western redcedar has a shallow, dense network of fine roots that make it well adapted to forested swamps. Common understory species in the higher, drier microsites include salal (*Gaultheria shallon*), rusty menziesia (*Menziesia ferruginea*), and deer fern (*Blechnum spicant*). The wetter depressions dominantly support American skunkcabbage (*Lysichiton americanus*), but a variety of sedges may be present (*Carex* spp.). 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 also subject to windthrow following large coastal storms. The trees on the site are particularly susceptible to windthrow because the rooting depth is restricted by 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. Windthrow results in canopy openings that allow more sunlight to reach the forest floor, which leads to a shrubby understory. Logging and agricultural disturbances in adjacent areas may alter the hydrology and increase the susceptibility of this site to an infestation of invasive species.

Table 1. Dominant plant species

Tree	(1) <i>Thuja plicata</i> (2) <i>Tsuga heterophylla</i>
Shrub	Not specified
Herbaceous	(1) <i>Lysichiton americanus</i> (2) <i>Blechnum spicant</i>

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Outwash plain > Outwash terrace (2) Till plain
Elevation	0 – 460 m
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 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 protects them from wind and water erosion.

Ecological dynamics

State and transition model

Additional community tables

Table 3. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 4. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 5. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Inventory data references

National vegetation classification: G610 North Pacific Maritime Poor Fen & Bog Forest and Woodland Group Forest association: CEGLO01787 Thuja plicata-Tsuga heterophylla/Lysichiton americanus/Sphagnum spp. Ecological Systems of Washington State community type: North Pacific Bog and Fen & Sphagnum Bog

Other references

Dwire, K., and J. Kauffman. 2003. Fire and riparian ecosystems in landscapes in the western United States. Forest Ecology and Management. Volume 178, pages 61-74.

Fonda, R.W. 1974. Forest succession in relation to river terrace development in Olympic National Park, Washington. Ecology. Volume 55, number 5, pages 927-942.

Franklin, J.F., and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Oregon State University Press, Corvallis, OR.

Goheen, E.M. and E.A. Willhite. 2006. Field guide to common diseases and insect pests of Oregon and Washington conifers. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Series R6-NR-FID-PR-01-06.

Griffith, R.S. 1992. Picea sitchensis. In Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory.

Kunze, L.M. 1994. Preliminary classification of native, low elevation, wetland vegetation in western Washington. Washington State Department of Natural Resources, Natural Heritage Program. Olympia, WA.

Minore, D. 1990. Thuja plicata. In Silvics of North America. U.S. Department of Agriculture, Forest Service, Northeastern Area.

Naiman, R., S. Bechtold, T. Beechie, J. Latterell, and R. Van Pelt. 2009. A process-based view of floodplain forest patterns in coastal river valleys of the Pacific Northwest. Ecosystems. Volume 13, pages 1-31.

Packee, E.C. 1990. Tsuga heterophylla. In Silvics of North America. U.S. Department of Agriculture, Forest Service, Northeastern Area.

Peterson, E.B., N.M. Peterson, G.F. Weetman, and P.J. Martin. 1997. Ecology and management of Sitka spruce: Emphasizing its natural range in British Columbia. University of British Columbia Press, Vancouver, British Columbia.

Pojar, J., and A. MacKinnon. 1994. Plants of the Pacific Northwest coast. Lone Pine Publishing, Vancouver, British Columbia.

PRISM Climate Group. Oregon State University. <http://prism.oregonstate.edu>. Accessed February 2015.

Roccio, J., and R. Crawford. 2015. Ecological systems of Washington State. A guide to identification. Washington Department of Natural Resources, Natural Heritage Report 2015-04.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2014. Keys to soil taxonomy. 12th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Stolnack, S., and R. Naiman. 2010. Patterns of conifer establishment and vigor on montane river floodplains in Olympic National Park, Washington, USA. Canadian Journal of Forest Research. Volume 40, number 3, pages 410-422.

Taylor, A. 1990. Disturbance and persistence of Sitka spruce (Picea sitchensis) in coastal forests of the Pacific Northwest, North America. Journal of Biogeography. Volume 17, number 1, pages 47-58.

United States National Vegetation Classification. 2016. United States national vegetation classification database, V2.0. Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. Accessed November 28, 2016.

Contributors

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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	
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:
