USDA Natural Resources Conservation Service

Ecological site AX002X02X007
Portland Basin Wet 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): 002X–Willamette and Puget Sound Valleys

The Willamette and Puget Sound Valleys Major Land Resource Area (MLRA 2) is in western parts of Washington and Oregon. It occupies a forearc basin between the Coast Ranges and the Cascade Mountain volcanic arc. The northern part contains Pleistocene drift, outwash, and lacustrine and glaciomarine deposits associated with continental glaciers. The southern part contains Late Pleistocene deposits from glacial outburst floods (Missoula Floods).

Climate is mild and moist, and the growing season is long. Mean annual precipitation ranges from 20 to 60 inches, received mostly in fall, winter, and spring. Summers are dry. The soil temperature regime is mesic, and the soil moisture regimes are xeric and aquic.

Most sites in this MLRA can support forested vegetation, but some were maintained as prairie, savanna, or woodland through cultural burning prior to Euro-American settlement. Puget Sound has a moderating effect on temperatures, and humidity can be higher in the northern part of the MLRA. Douglas-fir (*Pseudotsuga menziesii*) is widespread throughout. Oregon white oak (Quercus garryana) is common on uplands in the south and on warm, exposed or droughty sites in the north. Pacific madrone grows in areas close to saltwater. Western hemlock (*Tsuga heterophylla*) is codominant with Douglas-fir in the north. Flood plains typically contain Brayshaw black cottonwood (Populus balsamifera ssp. trichocarpa) and red alder (*Alnus rubra*). Oregon ash (Fraxinus latifolia) is typical of forested wetlands in the south.

Forestry, urban development, and cultivated agriculture are currently the most extensive land uses (USDA, Agriculture Handbook 296, 2022).

LRU notes

The Portland Basin and Hills Land Resource Unit (LRU B) is in southwestern Washington and northwestern Oregon. The LRU extends north to the Cowlitz River and transitions to the Willamette Valley in the south. The Columbia River Gorge limits the eastern extent, and influence of tidewater at Cathlamet identifies the northwestern extent. Elevation ranges from sea level to about 2,000 feet. Major landforms include glaciofluvial terraces along the Columbia River, as well as residual hills and foothills surrounding the basin. Minor areas of Columbia River flood plain are present in Washington and more extensively in Oregon. Residual hills are composed primarily of Quaternary-Pliocene and Tertiary volcanic and sedimentary rocks. The lower-relief basin is composed primarily of sediment from catastrophic Quaternary glacial flooding from Glacial Lake Missoula.

The Columbia River splits this LRU between Oregon and Washington.

In Washington, mean annual precipitation ranges from 35 to 60 inches. Most falls as rain between October and May. The frost-free period ranges from 160 to 220 days. Locations near the Columbia River Gorge experience strong winds and infrequent ice storms with little winter snow. Average daily maximum temperatures in summer at

Vancouver, Washington, are 1 to 3 degrees F warmer compared to Seattle or Olympia, Washington (Agricultural Climate Information System, 2007a, 2007b).

Oregon white oak and Douglas-fir are common north of the Columbia River in Washington. Western redcedar and western hemlock grow in areas of higher moisture, at higher elevations, or on protected aspects.

Classification relationships

Relationship to Other Established Classifications:

Washington Department of Natural Resources, Ecological Systems of Washington State: North Pacific Hardwood-Conifer Swamp

Ecological site concept

This ecological site consists of forested wetlands in depressions and drainageways. The site is affected by a seasonal high water table. The site is strongly influenced by physiography and hydrology, which provide rare and unique habitats in Puget Sound. The climate has warm, moist summers and cool, wet winters. Precipitation falls mostly as rain. Snow is rare. Soils that support this ecological site are in the mesic soil temperature regime and aquic soil moisture regime. Most areas of this site can be subject to residual ponding in addition to extended periods of water at the surface. These anaerobic conditions can lead to a slowed rate of organic decomposition. 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. This horizon helps to protect the soils from wind and water erosion.

This site can be compared to the Puget Lowlands Wet Forest site in LRU A, which is similar but has lower summer temperatures and higher amounts of summer precipitation. The climate may be moister during the growing season in LRU A, leading to a shorter recovery between disturbances than in LRU B.

Associated sites

AX002X02X008	**Portland Basin Riparian Forest**
AX002X02X003	**Portland Basin Bogs and Fens**

Similar sites

F002XN904WA	**Sitka spruce - red alder/salmonberry/field horsetail**
AX002X01X007	**Puget Lowlands Wet Hemlock Forest**

Table 1. Dominant plant species

Tree	(1) *Tsuga heterophylla* (2) *Alnus rubra*
Shrub	(1) *Rubus spectabilis*
Herbaceous	(1) *Lysichiton americanus*

Legacy ID

F002XB007WA

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Depression (2) Drainageway

Flooding frequency	None to rare
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	0–152 m
Slope	0–5%
Ponding depth	0–25 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	0–305 m
Slope	0–15%
Ponding depth	Not specified

Climatic features

Mean annual air temperature: 48 to 54 degrees Fahrenheit

Table 4. Representative climatic features

Frost-free period (characteristic range)	160-220 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	508-1,778 mm

Influencing water features

Wetland description

National vegetation classification: G853 *Tsuga heterophylla–Alnus rubra*/Lysichiton Americanus Swamp Forest Group

Soil features

Surface textures: Silt loams, loams, and silty clay loams
Soil family textures: Coarse-loamy, fine-loamy, and sandy
Parent material: alluvium; Mudflow deposits
Soil depth: Greater than 60 inches
Soil drainage: Poorly and somewhat poorly
Available water capacity in the top 40 inches: 3 to 12 in/in.
pH in water: 5.1 to 7.3

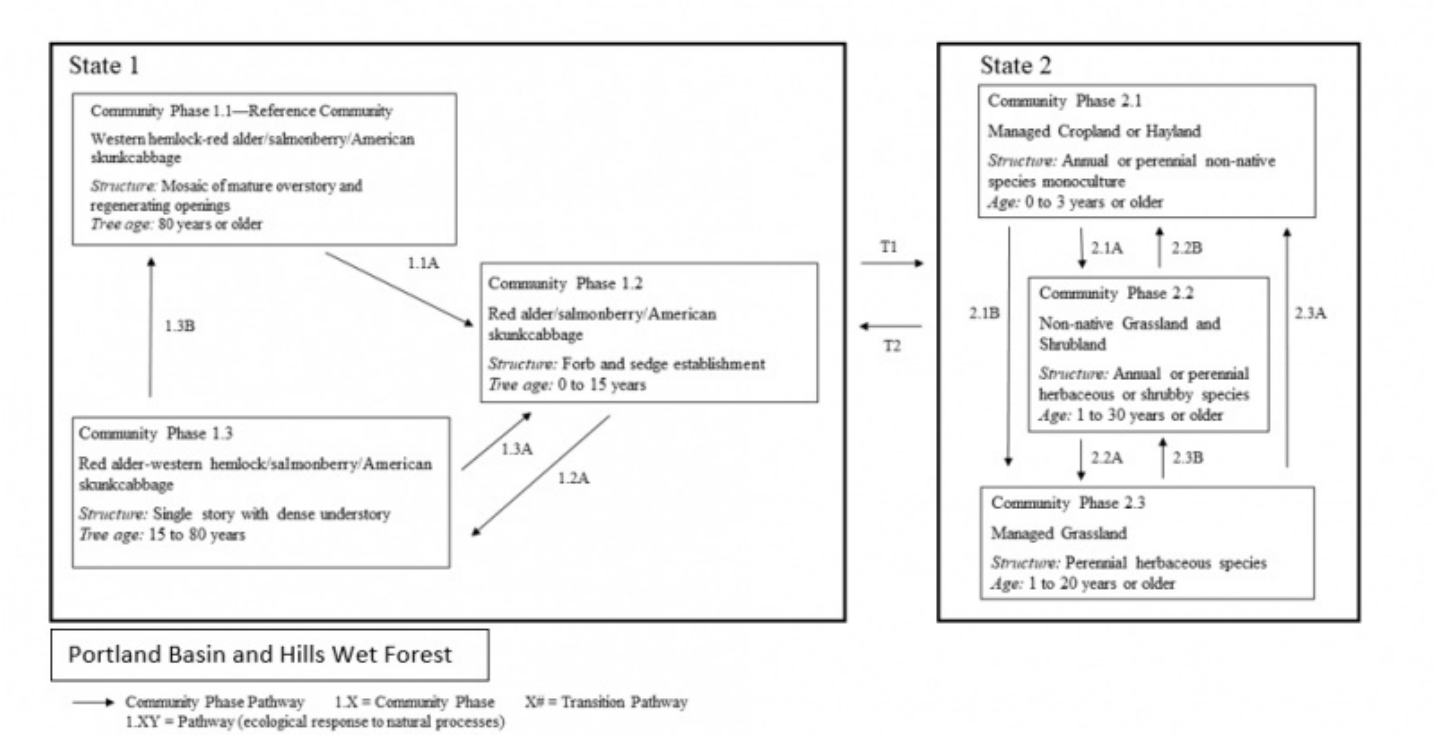
Ecological dynamics

The most common overstory species are western hemlock (*Tsuga heterophylla*), western redcedar (*Thuja plicata*), Douglas-fir (*Pseudotsuga menziesii*), Cascara buckthorn (*Frangula purshiana*), bigleaf maple (*Acer macrophyllum*), and red alder (*Alnus rubra*). 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 and Crawford, 2015).

Shrubs may be sparse or entirely absent in some areas. Shrubs include salmonberry (*Rubus spectabilis*), devilsclub (*Oplopanax horridus*), vine maple (*Acer circinatum*), red huckleberry (*Vaccinium parvifolium*) and salal (*Gaultheria shallon*). The herb layer commonly is dominantly American skunkcabbage (Lysichiton Americanus), threeleaf foamflower (*Tiarella trifoliata*), small enchanter's nightshade (*Circaea alpina*), ladyfern (*Athyrium filix-femina*), deer fern (*Blechnum spicant*), and slough sedge (*Carex obnupta*).

The most common natural disturbance is ponding. The volume and longevity of the ponding determines 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 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. The fallen trees result in more canopy openings. The openings allow more sunlight to reach the forest floor, which leads to a shrubby understory. Disturbances in adjacent areas may alter the hydrology and increase the susceptibility to infestation by invasive species.

State and transition model



State 1
Reference

Community 1.1
Western Hemlock, Red Alder, Salmonberry, and American Skunkcabbage

Structure: Mosaic of mature overstory and regenerating openings Community 1.1 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 red alder are the dominant overstory species. Western redcedar and Douglas-fir may be present, but they are limited to drier microsites such as nurse logs and mounds. Shrubs commonly are restricted to nurse logs, stumps, and higher microsites. Understory species include salmonberry, devilsclub, salal, American skunkcabbage, red huckleberry, swordfern (*Polystichum munitum*), deer fern, and sedges (Carex spp.). Common disturbances include small gap dynamics (1/2-acre openings or smaller) following windstorms and excessive ponding.

Dominant plant species

- red alder (*Alnus rubra*), tree

- western redcedar (*Thuja plicata*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- salal (*Gaultheria shallon*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous
- sedge (*Carex*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- small enchanter's nightshade (*Circaea alpina*), other herbaceous
- threeleaf foamflower (*Tiarella trifoliata*), other herbaceous

Community 1.2
Red alder, Salmonberry, and American Skunkcabbage

Structure: Tree, shrub, forb, and sedge establishment This phase represents a forest that is undergoing regeneration or stand initiation immediately following excessive ponding or windthrow. Scattered remnant mature trees and shrubs are in some areas, and woody debris is abundant. Loss of the overstory and the fallen trees can 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. Rapid recolonization is limited to plants that are well adapted to saturated soil conditions much of the year. Red alder is the primary tree and establishes quickly with an open canopy. Salmonberry, American skunkcabbage, and sedges begin to reestablish during this phase.

Dominant plant species

- red alder (*Alnus rubra*), tree
- salmonberry (*Rubus spectabilis*), shrub
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- sedge (*Carex*), other herbaceous

Community 1.3
Red Alder, Western Hemlock, Salmonberry, and American Skunkcabbage

Structure: Single story with dense understory This community consists of early seral forest in regeneration. Scattered remnant mature trees may be present. Western hemlock regenerates on hummocks and mounds and begins to establish a canopy. Shrubs are sparse, but species such as salmonberry, devilsclub, and red huckleberry become established on fallen trees and in higher microsites. Understory species can include deer fern, American skunkcabbage, and sedges.

Dominant plant species

- red alder (*Alnus rubra*), tree
- western hemlock (*Tsuga heterophylla*), tree
- western redcedar (*Thuja plicata*), tree
- salmonberry (*Rubus spectabilis*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- American skunkcabbage (*Lysichiton americanus*), other herbaceous
- sedge (*Carex*), other herbaceous

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, which may create pockets of fallen trees. The pockets can be larger than 1 acre. 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 growth over time with active management to maximize timber development. Precommercial thinning, commercial thinning, or both, combined with understory control, lower the stand density and decrease competition for water and nutrients.

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, which may create pockets of fallen trees. The pockets can be larger than 1 acre. Catastrophic windstorms may be stand-replacing.

State 2
Converted

Community 2.1
Managed Cropland or Hayland

Structure: Annual or perennial non-native species monoculture Community phase 2.1 can 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 the addition of 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 consists of areas that receive regular agronomic inputs. Examples include adding soil nutrients and other soil amendments, such as lime; implementing grazing management plans; mowing regularly; 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. This phase includes minor amounts of introduced species that commonly are in non-native grassland and shrubland communities (community phase 2.2).

Pathway 2.1A
Community 2.1 to 2.2

In the absence of agronomic and livestock management activities, seeds from surrounding weedy plant communities are transported to the site by wind, animals, or vehicle traffic, and the adapted species become

established. Management activities include tilling; adding soil nutrients and other soil amendments, such as lime; mowing; burning; harvesting or chemically controlling vegetation; planting 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. Examples include tilling; adding soil nutrients and other soil amendments, such as lime; mowing; burning; harvesting or chemically controlling vegetation; planting desirable herbaceous species; and implementing grazing management plans.

Pathway 2.2B
Community 2.2 to 2.1

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

Pathway 2.2A
Community 2.2 to 2.3

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

Pathway 2.3A
Community 2.3 to 2.1

This pathway represents agronomic activities. Examples include tilling; adding soil nutrients and other soil amendments, such as lime; mowing; burning; harvesting or chemically controlling vegetation; and planting 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 are transported to the area by wind, floodwater, animals, or vehicle traffic, and the adapted species become established. Management activities include tilling; adding soil nutrients and other soil amendments, such as lime; mowing; burning; harvesting or chemically controlling vegetation; planting desirable herbaceous species; and implementing grazing management plans.

Transition T1A
State 1 to 2

This transition 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 (1.1).

Transition T2A
State 2 to 1

This transition 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

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.

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

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Contributors

Erik Dahlke
Erin Kreutz
Marty Chaney
Stephanie Shoemaker

Approval

Kirt Walstad, 12/09/2024

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	12/09/2024
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:**

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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):**

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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:**
