

Ecological site AX002X02X001

Portland Basin Dry Douglas-fir Forest

Last updated: 12/03/2024
Accessed: 08/31/2026

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. This MLRA includes a variety of ecological sites. Many are characterized by forest vegetation but some were maintained as prairie, savanna, or oak woodland through cultural burning prior to Euro-American settlement. In the northern part of this MLRA Puget Sound has a moderating effect on temperature and humidity is generally higher. Douglas-fir (*Pseudotsuga menziesii*) is widespread throughout. Oregon white oak (*Quercus garryana*) is common on valley bottoms and surrounding slopes in the south. In the north its historic extent is more limited, occurring on warm aspects, with exposed and droughty conditions, and areas affected by rain shadowing from local ranges, particularly east of the Olympic Mountains. Big leaf maple (*Acer macrophyllum*) is common as a codominant or sub canopy tree across many sites. Pacific madrone grows in areas close to saltwater, or within drier forest sites with well-drained soils. Western hemlock (*Tsuga heterophylla*) and western red cedar (*Thuja plicata*) are common in wetter portions of the MLRA. 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. 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. Within this LRU most falls as rain between October and May. Occasional snowfall occurs between 1000- and 2000-foot elevation but is usually not persistent; below 1000 feet snow is uncommon. 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).

Classification relationships

Relationship to Other Established Classifications: This site is related to plant associations PSME-ABGR/FEOC, PSME-ABGR/HODI/POMU, PSME-ARME/GASH, PSME-ARME/HODI/LOHI, PSME/GASH-HODI, SPME/HODI-SYAL, SPME/ROGY-HODI, in Chappell (2006). It bears resemblance to A3716 *Pseudotsuga menziesii* - *Abies grandis* - *Arbutus menziesii* Forest & Woodland Alliance within the National Vegetation Classification System (USNVC 2024).

Ecological site concept

This site is on a variety of landforms and aspects in the Portland Basin and Hills LRU. Most of the annual precipitation is received from October through April, primarily as rain. Soils are primarily coarse-textured and well drained or somewhat excessively drained. The soils generally have low plant-available moisture. The site is not impacted by a seasonal high water table. This site is among the warmest and driest of the forest sites in the area. Douglas-fir is typically the dominant tree species. Other tree species may occur alongside Douglas-fir in this site, especially Pacific madrone (*Arbutus menziesii*) in the areas most exposed to prevailing winds and sun. Lesser amounts of western red cedar (*Thuja plicata*) and grand fir (*Abies grandis*) may be present. Oceanspray (*Holodiscus discolor*), Cascade barberry (*Berberis nervosa*, known locally as Oregongrape), and salal (*Gaultheria shallon*) are common shrubs. Pacific poison oak (*Toxicodendron diversilobum*) grows in some places. This site can be compared to the Puget Lowlands Dry Douglas Fir Forest site in LRU A to the north, which is similar but has a lower summer temperature and higher amounts of summer precipitation. Thus plant growth and moisture content often decline more rapidly in late spring and early summer in LRU B as opposed to LRU A, especially for grasses and other herbaceous species.

Associated sites

AX002X02X007	Portland Basin Wet Forest
AX002X02X008	Portland Basin Riparian Forest

Similar sites

F002XN901WA	Douglas-fir - Pacific madrone/oceanspray/rattlesnake plantain
AX002X01X001	Puget Lowlands Dry Forest

Table 1. Dominant plant species

Tree	(1) <i>Pseudotsuga menziesii</i>
Shrub	(1) <i>Holodiscus discolor</i>
Herbaceous	(1) <i>Goodyera oblongifolia</i>

Legacy ID

F002XB001WA

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Bluff (2) Terrace
Flooding frequency	None

Ponding frequency	None
Elevation	0 – 90 m
Slope	10 – 30 %
Aspect	W, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	0 – 460 m
Slope	0 – 60 %

Climatic features

Mean annual air temperature: 48 to 52 degrees Fahrenheit

Table 4 Representative climatic features

Frost-free period (characteristic range)	170-220 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	510-1,780 mm

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

Surface textures: Gravelly sandy loams, gravelly silt loams, gravelly loams, and gravelly loamy sands

Soil family textures: Loamy-skeletal

Parent material: Alluvium, glacial drift, and residuum

Soil depth: 20 to more than 60 inches. Lithic contacts are possible restrictions.

Soil drainage: Well drained, and somewhat excessively drained are most common. Somewhat poorly drained may occur but is uncommon.

Available water capacity in the top 40 inches: 2.5 to 7.5 in/in

pH in water: 5.6 to 7.3

Soil is dry in all parts from 75 to 90 consecutive days.

Ecological dynamics

This ecological site shifts between different stand developmental stages according to occurrence and frequency of disturbances that cause overstory mortality. Natural disturbances include winter storms with strong winds and low to moderate intensity fires. Fires historically occurred with greater frequency than at present due to changes in land management and fire suppression by current local, state and Federal agencies. Cultural fire was used in many parts of this LRU by tribes prior to and at the onset of European settlement and had a strong influence on site dynamics in this and many other sites (Agee 1993). The main contemporary human impacts have been fire suppression, timber harvest and management, grazing with large livestock, conversion to cropland agriculture, or urban development. When trees are removed the site may be maintained in a non-forest state by controlling tree regeneration. In a state managed for timber there are some distinct differences from naturally developed stands or reference stand conditions. With typical even-aged timber management, conditions tend toward a much stronger dominance of Douglas-fir over other tree species, and some structural elements of the site often decline, such as understory vegetation and snags (Cline et al. 1980).

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 2.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 13. Community 3.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 14. Community 3.3 plant community composition

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

Chappell, C.B. 2006. Upland plant associations of the Puget Trough ecoregion, Washington. Natural Heritage Rep. 2006-01. Washington Department of Natural Resources, Natural Heritage Program, Olympia, WA.

Cline, S.P., Berg, A.B. and Wight, H.M., 1980. Snag characteristics and dynamics in Douglas-fir forests, western Oregon. The Journal of Wildlife Management, pp.773-786.

USNVC (United States National Vegetation Classification) Database [2.04]. [2024] Federal Geographic Data Committee, Vegetation Subcommittee. Washington D.C. Accessed June 28th, 2024.

U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. 2019. Fire Effects

Information

System (FEIS). <https://www.feis-crs.org/feis/> (accessed 8 January 2021).

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture, Agriculture Handbook 296.

Agee, J.K. 1993. Fire ecology of Pacific Northwest forests. Island Press. Covelo, CA. ISBN: 978-1559632300.

Perry, D.A. 1994. Forest ecosystems. The Johns Hopkins University Press. Baltimore, MD. ISBN: 0-8018-4760-5.

Contributors

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Approval

Kirt Walstad, 12/03/2024

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	08/31/2026
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:
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17. Perennial plant reproductive capability:
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