

Ecological site F003XC303WA Flood Plain black cottonwood

Last updated: 1/29/2025
Accessed: 05/10/2025

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): 003X—Olympic and Cascade Mountains

This area includes the west slope and parts of the east slope of the Cascades Mountains in Washington and Oregon. The Olympic Mountains in Washington State are also included. These mountains are part of a volcanic arc located at a convergent plate boundary. Volcanic rocks predominate but metamorphic and sedimentary rocks occur in the North Cascades and Olympic Mountains. Topography is generally dissected and steep, but some areas consist of constructional volcanic platforms and isolated stratovolcanoes. Elevation is usually 500 to 6000 feet but reaches to 14,410 ft at the summit of Mount Rainier. Many areas hosted alpine glaciers or ice sheets during the Pleistocene, and a few remain today.

Climate becomes cooler and moister with increasing elevation and latitude. Low elevations experience a long growing season and mild temperatures. High elevations can accumulate snowpack lasting into summer and frost may occur in any month. Average annual precipitation ranges from 60 to 180 inches in most areas. Most precipitation falls during the fall, winter, and spring during low-intensity frontal storms. Summers are relatively dry. Average annual temperature is 27 to 50 degrees F. The frost-free period is 10 to 180 days.

LRU notes

The Glaciated Western Cascades land resource unit is located in southwestern Washington primarily along the western slope of the Cascade Range. It is bounded by the Snoqualmie Pass area to the north and the Columbia River to the south. To the west is the Puget Sound Trough (MLRA 2) and to the east is the drier eastern slope of the Cascade Range (MLRA 6).

The major rivers originating in the LRU are the Puyallup and Nisqually Rivers which drain to Puget Sound and the Cowlitz and Lewis Rivers which drain west to the Columbia.

Some of the lithology in the LRU is the result of numerous accretions from tectonic subduction of the Pacific plate along the margin of the North American plate creating combinations of metamorphized sedimentary or oceanic rock and intrusive volcanic plutons. The Cascades in this area have a long history of volcanic activity starting about 55 million years ago. Eruptions have created a complex sequence of low-silica and silica-rich depositions that have been eroded and buried repeatedly (Washington Geological Survey). Mount Rainier, Mount Adams, and Mount Saint Helens are volcanoes and the most notable peaks; Mount Saint Helens continues to vent after the 1980 eruption. Alpine glaciers still remain active at the highest elevations. The area was not influenced by continental glaciation, however Pleistocene alpine glaciation modified much of the dissected terrain and contributed glacial sediment to the complex combination of lithologies and volcanism.

Soils are mainly Spodosols and Andisols.

Vegetation is primarily dense forest with some parkland in subalpine and alpine areas. Douglas-fir (*Pseudotsuga menziesii*) and western hemlock (*Tsuga heterophylla*) are the dominate tree species found at lower elevations;

western redcedar (*Thuja plicata*) is quite common. Pacific silver fir (*Abies amabilis*) and mountain hemlock (*Tsuga mertensiana*) are the primary tree species in the higher elevations; subalpine fir (*Abies lasiocarpa*) and Alaska cedar (*Callitropsis nootkatensis*) can be widespread as well.

Ecological site concept

This ecological site resides on floodplains in valleys at elevations of 2,200 to 7,200 feet on slopes of 0 to 4 percent, with frost free days ranging from 35 to 75 days, mean annual precipitation of 40 to 100 inches and mean annual air temperature of 35 to 45 degrees Fahrenheit. Soils are Entisols or Andisols with highly variable soil textures. Parent material is alluvium mixed with volcanic ash. There is a seasonal water table within 20 inches of the soil surface sometime during the growing season; seasonal flooding affects the site. Soils are in the cryic soil temperature regime and aquic soil moisture. This ecological site has a reference community of black cottonwood (*Populus balsamifera* ssp. *trichocarpa*), western redcedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), red alder (*Alnus rubra*) and understory of vine maple (*Acer circinatum*), salal (*Gaultheria shallon*), Cascade barberry (*Mahonia repens*), western brackenfern (*Polystichum minutum*), California blackberry (*Rubus ursinites*)

Associated sites

F003XC305WA	Low Mountain Slopes Moist Forest western hemlock
-------------	---

Similar sites

F003XA303WA	Flood Plain black cottonwood
-------------	-------------------------------------

Table 1. Dominant plant species

Tree	(1) <i>Populus balsamifera</i> ssp. <i>trichocarpa</i> (2) <i>Tsuga heterophylla</i>
Shrub	(1) <i>Alnus rubra</i> (2) <i>Rubus ursinus</i>
Herbaceous	(1) <i>Acer circinatum</i> (2) <i>Gaultheria shallon</i>

Physiographic features

This ecological site resides on floodplains in valleys at elevations of 700-1250 feet on slopes of 0-4%.

Table 2. Representative physiographic features

Landforms	(1) Valley > Flood plain
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to occasional
Elevation	700–1,250 ft
Slope	0–4%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

The mean annual air temperature is 35 to 45 degrees Fahrenheit.

Table 3. Representative climatic features

Frost-free period (characteristic range)	35-75 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	40-100 in

Influencing water features

This ecological site is found in floodplains, directly impacted by flooding.

Soil features

Soils are Entisols or Andisols with highly variable soil textures. Parent material is alluvium mixed with volcanic ash. There is a seasonal water table within 20 inches of the soil surface sometime during the growing season; seasonal flooding affects the site. Soils are in the cryic soil temperature regime and aquic soil moisture.

Table 4. Representative soil features

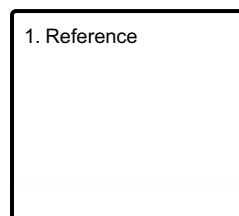
Parent material	(1) Alluvium (2) Volcanic ash
Surface texture	(1) Silty clay loam (2) Ashy fine sandy loam (3) Ashy, ashy loam
Family particle size	(1) Coarse-loamy (2) Fine
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow to rapid
Depth to restrictive layer	60 in
Soil depth	60 in
Surface fragment cover ≤3"	0–17%
Surface fragment cover >3"	0–6%
Available water capacity (2-7.5in)	Not specified
Calcium carbonate equivalent (0in)	Not specified
Soil reaction (1:1 water) (5.1-7.3in)	Not specified

Ecological dynamics

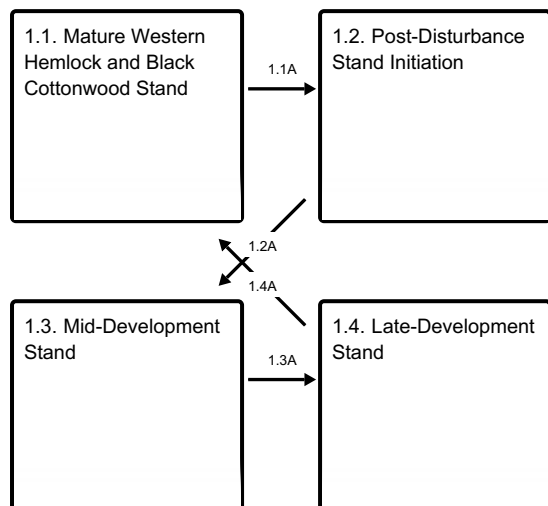
This ecological site has a reference community of black cottonwood, western redcedar, western hemlock, red alder and understory of vine maple, salal, Cascade barberry, western brackenfern, California blackberry, that resides on active floodplains that are subject to periodic flooding that is high energy, removes trees, and shrubs, and deposits fresh mineral alluvial material. This mineral bed allows pioneering herbaceous species to establish, stabilize the soil, and allow further development to longer living perennial species. Shrubs such as willows are particularly adapted to this community phase, while other species are more adapted to forest understories but with time, also establish. The force of the flooding may cut deeply into establish forested areas, cutting banks steeply.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1 Reference

Community 1.1 Mature Western Hemlock and Black Cottonwood Stand

This phase has an overstory black cottonwood, western hemlock, western redcedar, and pockets of red alder and understory of vine maple, salal, Cascade barberry, western brackenfern, California blackberry. Western hemlock and western redcedar are the longest living tree in the overstory with black cottonwood typically living only till 200 years and red alder for the initial 40 to 70 years. The deciduous trees will typically reside closer to the floodplain active surface and the western hemlock and western redcedar on the associated terraces.

Community 1.2 Post-Disturbance Stand Initiation

The post disturbance, stand initiation community phase has two distinct communities. Pioneering herbaceous community: Immediately post-flooding, on-site and windblown tree seeds establish, shrub and herbaceous plants resprout and pioneering herbaceous plants establish on mineral soil interspaces. This is a short duration community phase. Shrub Community: This plant community contains a high diversity of shrubs including Salix species, vine maple, salal, Cascade barberry, western bracken fern, California blackberry. Seedlings mature to saplings including overstory black cottonwood, western hemlock and western redcedar, red alder.

Community 1.3 Mid-Development Stand

This is a mid-development stand community. This phase is dominated by a mix of overstory black cottonwood, western hemlock and western redcedar, red alder. that are pole sized trees.

Community 1.4 Late-Development Stand

This is a late-development community of larger than pole-sized trees. This phase is dominated by a mix of overstory black cottonwood, western hemlock and western redcedar, red alder.

Pathway 1.1A

Community 1.1 to 1.2

High energy flooding event that kills significant number of mature trees and top-kills shrubs and herbaceous plants. The flooding event deposits fresh mineral soil. This disturbance causes a return to the pioneering, herbaceous community with resprouting shrubs.

Pathway 1.2A

Community 1.2 to 1.3

With time, the tree seedlings and small saplings go to the mid development community.

Pathway 1.3A

Community 1.3 to 1.4

With time, the pole sized trees develop to large mature trees in the late development phase.

Pathway 1.4A

Community 1.4 to 1.1

With time, the large mature trees develop into the closed configuration of the reference phase.

Additional community tables

Other references

Scientific Literature:

WENATCHEE N.F.

Lillybridge, Terry R., et al. "Field guide for forested plant associations of the Wenatchee National Forest." Gen. Tech. Rep. PNW-GTR-359. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 335 p. In cooperation with: Pacific Northwest Region, Wenatchee National Forest 359 (1995).

OLYMPIC N.F.

Henderson, Jan A., et al. "Forested plant associations of the Olympic National Forest." (1989).

GIFFORD PINCHOT N.F.

Brockway, Dale G. Plant association and management guide for the Pacific silver fir zone: Gifford Pinchot National Forest. US Department of Agriculture, Forest Service, Pacific Northwest Region, 1983.

Topik, Christopher, Nancy M. Halverson, and Dale G. Brockway. Plant association and management guide for the western hemlock zone: Gifford Pinchot National Forest. US Department of Agriculture, Forest Service, Pacific Northwest Region, 1986.

Topik, Christopher. Plant association and management guide for the grand fir zone: Gifford Pinchot National Forest. Vol. 6. No. 88. US Department of Agriculture, Forest Service, Pacific Northwest Region, 1989.

Diaz, Nancy M. "Plant association and management guide for the mountain hemlock zone: Gifford Pinchot and Mt. Hood National Forests." (1997).

MT. BAKER-SNOQUALMIE N.F.

Henderson, Jan A. Field guide to the forested plant associations of the Mt. Baker-Snoqualmie National Forest. Vol. 28. No. 91. USDA, Forest Service, Pacific Northwest Region, 1992.

FIRE

LANDFIRE, 2007, Biophysical Settings Model Descriptions, LANDFIRE 1.1.0, U.S. Department of the Interior, USDA Forest service, Accessed 20 April 2020 at <https://www.landfire.gov/bps-models.php>

Kovalchik, Bernard L., and Rodrick R. Clausnitzer. "Classification and management of aquatic, riparian, and wetland sites on the national forests of eastern Washington: series description." Gen. Tech. Rep. PNW-GTR-593. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 354 p. In cooperation with: Pacific Northwest Region, Colville, Okanogan, and Wenatchee National Forests 593 (2004).

Rocchio, F. Joseph, and Rex C. Crawford. "Conservation Status Ranks for Washington's Ecological Systems."

(2015).

Rocchio, F. J., and R. C. Crawford. "Draft field guide to Washington's ecological systems." Washington Natural Heritage Program, Washington Department of Natural Resources. Olympia, WA (2008).

Franklin, J., & Dyrness, C. Natural vegetation of Oregon and Washington. : Portland, Or., Pacific Northwest Forest and Range Experiment Station, Forest Service, U.S. Dept. of Agriculture.

Contributors

Stephanie Shoemaker
Erik Dahlke
Erin Kreutz
Steve Campbell

Approval

Kirt Walstad, 1/29/2025

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	05/09/2024
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:**

-
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:**
