USDA Natural Resources Conservation Service

Ecological site F003XA303WA
Flood Plain black cottonwood

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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): 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 North Cascades land resource unit is located in northwestern Washington primarily along the western slope of the Cascade Range. It bounded by the international boundary with Canada to the north and the Snoqualmie Pass area 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 Skagit River is the largest river to originate in the LRU and is governed by three hydroelectric dams. Other rivers that drain west include the Nooksack, Snohomish, and Skykomish. The Wenatchee River drains east toward the Columbia.

Lithology is the result of numerous accretions from tectonic subduction of the Pacific plate along the margin of the North American plate. The North Cascades are arranged in a west to east series of terranes which are combinations of metamorphized sedimentary or oceanic rock and intrusive volcanic plutons, punctuated by the minorly active Mount Baker and Glacier Peak volcanoes (Washington Geological Survey). Additionally, Pleistocene continental and alpine glaciation covered almost all of the area except the highest peaks in the range and deposited large amounts of glacial sediment. Alpine glaciers still remain active today in the highest elevations.

Soils are primarily Spodosols, Andisols, and Inceptisols.

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 at elevations of 1,500 to 6,800 feet on slopes of 0 to 6 percent with climatic conditions of 50 to 110 frost free days, mean annual precipitation of 25 to 70 inches and mean annual air temperature of 35 to 45 degrees Fahrenheit. The soils are Entisols (Aeric Fluvaquents) or Inceptisols. Parent material is typically alluvium mixed with some volcanic ash. There is a seasonal water table between 5 and 20 inches below the surface at some point during the growing season and the soils are affected by flooding. These soils are in the cryic soil temperature regime and aquic soil moisture regime. The reference community has an overstory of mature trees. Large black cottonwood (Populus balsamifera ssp. trichocarpa) dominate with a possible mid-story of quaking aspen (Populus tremuloides). Paper birch (Betula papyrifera) are common in the overstory with an understory of ferns, sedges, grasses, shrubs and forbs. Red alder (Alnus rubra), vine maple (Acer circinatum), Salix species, rose spirea (Spirea douglasii) can also be common in the understory. Fire is a rare occurrence that is on the typical fire return interval of the surrounding forests (200 to 400 years).

Associated sites

F003XA305WA	**Low Glacial Trough Valleys Moist Forest western hemlock**

Similar sites

F003XC303WA	**Flood Plain black cottonwood**

Table 1. Dominant plant species

Tree	(1) *Populus balsamifera ssp. trichocarpa* (2) *Alnus rubra*
Shrub	(1) *Spiraea douglasii* (2) *Acer circinatum*
Herbaceous	Not specified

Physiographic features

This ecological site resides on floodplains at elevations of 1,500 to 6,800 feet on slopes of 0 to 6 percent.

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	457–2,073 m
Slope	0–6%
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Mean annual air temperature of 35 to 45 degrees Fahrenheit.

Table 3. Representative climatic features

Frost-free period (characteristic range)	50-100 days

Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	635-1,778 mm

Influencing water features

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

Soil features

The soils are Entisols (Aeric Fluvaquents) or Inceptisols. Parent material is typically alluvium mixed with some volcanic ash. There is a seasonal water table between 5 and 20 inches below the surface at some point during the growing season and the soils are affected by flooding. These soils are in the cryic soil temperature regime and aquic soil moisture regime.

Table 4. Representative soil features

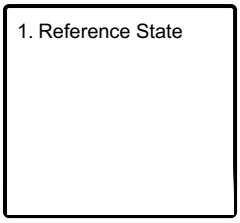
Parent material	(1) Alluvium (2) Volcanic ash
Surface texture	(1) Silty clay loam (2) Ashy sandy loam (3) Ashy loam
Family particle size	(1) Fine-loamy
Drainage class	Somewhat poorly drained to moderately well drained
Permeability class	Moderately slow to rapid
Depth to restrictive layer	152 cm
Soil depth	152 cm
Surface fragment cover <=3"	0–17%
Surface fragment cover >3"	0–6%
Available water capacity (Depth not specified)	3.81–20.07 cm
Calcium carbonate equivalent (Depth not specified)	0%
Soil reaction (1:1 water) (Depth not specified)	5.1–7.3

Ecological dynamics

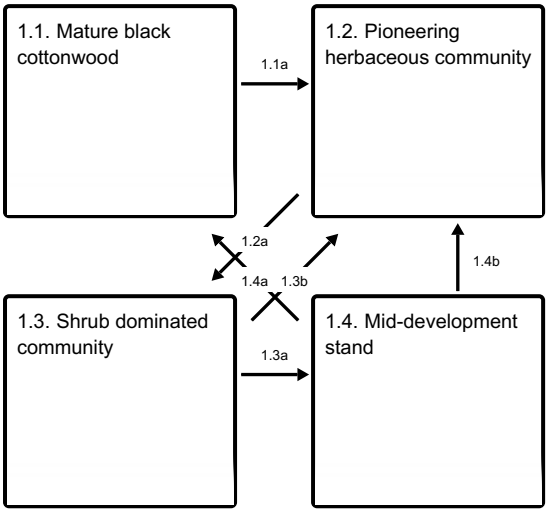
The reference community for this ecological site has an overstory of dominate large black cottonwood, and a possible mid-story of quaking aspen and paper birch trees. Understory is comprised of ferns, sedges, grasses, shrubs and forbs. Also common in the understory are red alder, vine maple, willow species, and rose spirea. The site is found 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 and stabilize the soil which allows for further development of 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. Fire is a rare occurrence that is on the typical fire return interval of the surrounding forests (100 to 200 years).

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

Community 1.1
Mature black cottonwood

Overstory structure has mature, large black cottonwood dominate, possible mid-story of aspen, and paper birch trees with an understory of ferns, sedges, grasses, shrubs and forbs. In particular, the understory can have red alder, vine maple, Salix species, rose spirea. Site is stable with developed soil, and trees over 100-150 years old. Natural disturbances: flooding, ponding, insect, disease, windthrow, very rare fire.

Community 1.2
Pioneering herbaceous community

Immediately post disturbance, windblown tree seeds establish (black cottonwood, quaking aspen, paper birch), and resident shrubs (red alder, vine maple, Salix species, rose spirea) and herbaceous plants resprout and pioneering herbaceous plants establish on mineral soil interspaces. This site is relatively unstable and is in the process of developing soil. This is a short duration community phase of only a few years.

Community 1.3
Shrub dominated community

This plant community is dominated by shrub species and contains a high diversity of willow, red alder, paper birch, vine maple and some willow and sedges, mesic grass species along with a variety of mesic forbs. Trees reach a maximum age of forty years in this community phase. This site is moderately stable, has developed soil with established perennial shrub species, and typically can withstand occasional flooding and ponding.

Community 1.4
Mid-development stand

This plant community contains dense pole sized black cottonwood trees that are in competition for resources and have very high canopy cover which creates low light for the understory community. Quaking aspen and paper birch may also occur on the site. Trees are generally about forty to 100 years old at this phase.

Pathway 1.1a
Community 1.1 to 1.2

Flooding is a high energy event that at its most severe, will kill trees and shrubs, cut the banks of the floodplain and deposit fresh mineral alluvium. The mineral bed allows pioneering herbaceous species to establish, stabilize the soil, and allows longer living perennial shrub species to establish and further develop the soil. Rare, stand-replacement fire kills a significant number of mature trees and top-kills shrubs and herbaceous plants. Fire is rare but will be stand replacing (200 to 400 fire return interval). Other disturbances are occasional to rare ponding, frequent small patch disturbance of windthrow, and some insect or disease disturbance. All disturbances cause a return to the pioneering, herbaceous community with resprouting shrubs, whether in small or large disturbance patch sizes.

Pathway 1.2a
Community 1.2 to 1.3

Over time, short-lived pioneering species are replaced with longer living shrubs such as willow, alder and birch to create a shrubland.

Pathway 1.3b
Community 1.3 to 1.2

Severe flooding can also return the community to the post-disturbance phase. Fire top kills most shrub species and returns site to a community of resprouting shrubs and herbaceous species and pioneering, herbaceous species in mineral soil interspaces.

Pathway 1.3a
Community 1.3 to 1.4

Tree seedlings mature to pole-sized trees, creating competitive exclusion phase of intense tree competition, heavy overstory cover and low light conditions for shrubs and perennial herbaceous plants.

Pathway 1.4a
Community 1.4 to 1.1

Competition reduces overstory with time due to disease, windthrow, insects in which openings allow remaining trees to grow and transition to the mature tree stage.

Pathway 1.4b
Community 1.4 to 1.2

Severe flooding can also return the community to the post-disturbance phase. Fire in the competitive exclusion phase would return forest to the pioneering herbaceous phase.

Additional community tables

Other references

Scientific Literature:
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Approval

Kirt Walstad, 5/10/2024

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	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:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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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:

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:**