USDA Natural Resources
Conservation Service

Ecological site AX002X02X008
Portland Basin Riparian 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:

National Vegetation Classification Group: G851 North-Central Pacific Lowland Riparian Forest Group and A3743 Oregon Ash–Black cottonwood–Alder Riparian Forest Alliance

Washington Department of Natural Resources, Ecological Systems of Washington State: North Pacific Lowland Riparian Forest and Shrubland

Ecological site concept

This ecological site is in riparian corridors on stream terraces and flood plain steps on alluvial soils. It is at lower elevations that have abundant precipitation. Summers are warm and moist. Winters are cool, wet, and have intermittent winter ice storms or rare snowfall that does not persist.

Parent material is alluvium. The soils are typically subject to flooding from November to

April. The smaller, more frequent flood events typically only cause minor scouring in comparison to greater-magnitude 100- to 500-year floods.

Associated sites

AX002X02X003	**Portland Basin Bogs and Fens**
AX002X02X007	**Portland Basin Wet Forest**
AX002X02X004	**Portland Basin Forest**

Similar sites

AX002X01X008	**Puget Lowlands Riparian Forest**

Table 1. Dominant plant species

Tree	(1) *Populus balsamifera ssp. trichocarpa* (2) *Fraxinus latifolia*
Shrub	(1) *Salix*
Herbaceous	(1) *Polystichum munitum*

Legacy ID

F002XB008WA

Physiographic features

Table 2. Representative physiographic features

Landforms	(1) Terrace (2) Flood plain
Flooding duration	Brief (2 to 7 days) to very long (more than 30 days)
Flooding frequency	Occasional to frequent
Ponding duration	Brief (2 to 7 days)
Ponding frequency	None to frequent
Elevation	0–152 m
Slope	0–5%
Ponding depth	0–13 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	0–457 m
Slope	0–15%
Ponding depth	Not specified

Climatic features

Mean annual air temperature: 48 to 52 degrees Fahrenheit

Table 4. Representative climatic features

Frost-free period (characteristic range)	160-240 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	762-2,032 mm

Influencing water features

Soil features

Surface textures: Silt loams, loams, and silty clay loams
Soil family textures: Sandy, coarse-loamy, loamy-skeletal, and sandy-skeletal
Parent material: Alluvium
Soil depth: Greater than 60 inches
Soil drainage: Somewhat poorly drained to somewhat excessively drained
Available water capacity in the top 40 inches: 3 to 15 in/in
pH in water: 5.1 to 6.5

Ecological dynamics

Black cottonwood (*Populus balsamifera* spp. trichocarpa), Oregon ash (*Fraxinus latifolia*), and red alder (*Alnus rubra*) are the most common trees in the overstory. Other trees include bigleaf maple (*Acer macrophyllum*) and cascara (*Frangula purshiana*). Conifers, such as Douglas-fir (*Pseudotsuga menziesii*) and grand fir (*Abies grandis*), grow in some late seral sites and on some terraces.

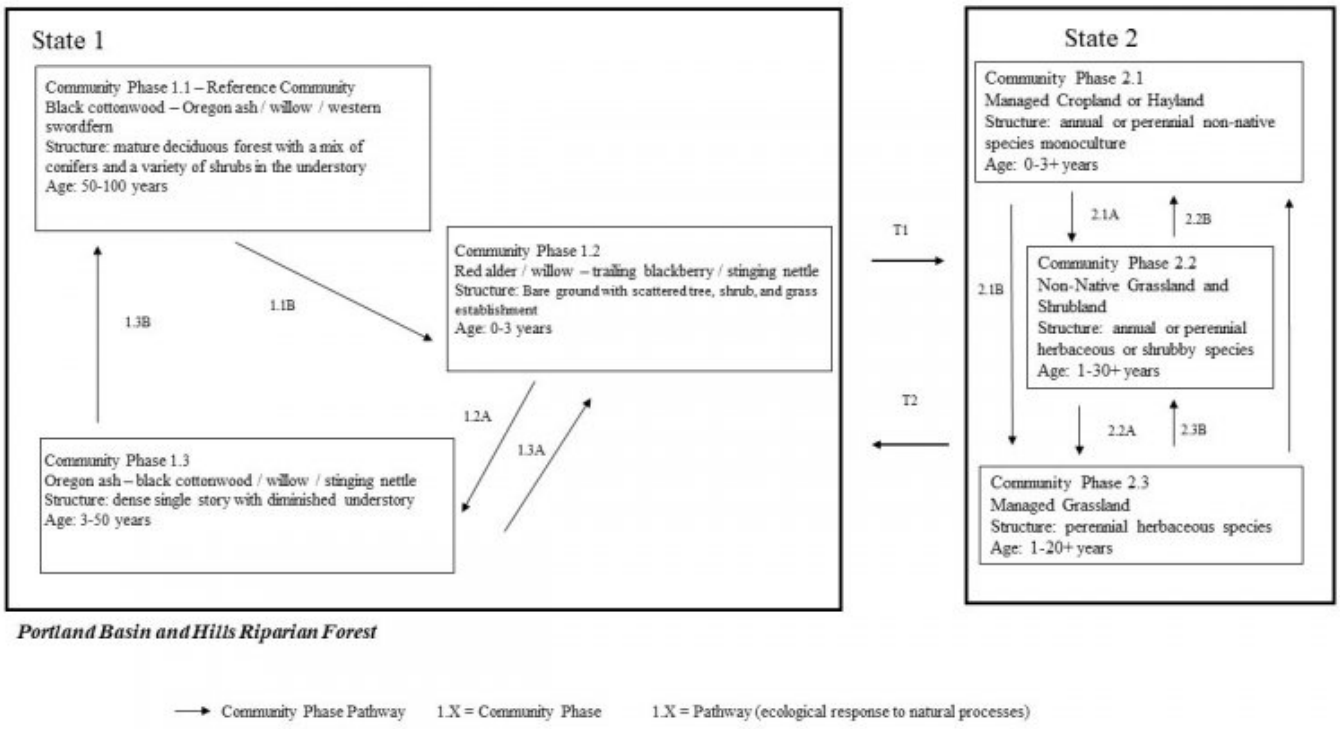
Understory species diversity is greatest near the streams because erosion and deposition create small openings for pioneering species. Understory species include Sitka willow

(*Salix sitchensis*), shining willow (*Salix lucida*), salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), elderberry (*Sambucus racemosa*), redosier dogwood (*Cornus sericea*), vine maple (*Acer circinatum*), and western swordfern (*Polystichum munitum*).

The most common natural disturbance is flooding. The volume and longevity of the flooding determine the effect on the dynamics of the forest. Although wildfire is uncommon in this ecological site, stand-replacing fires may occur at intervals of greater than 450 years.
Fallen trees that have exposed root systems are common. The presence of large woody debris is also common.

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

State and transition model



State 1
Reference

Community 1.1
Black Cottonwood, Oregon Ash, Willow, and Western Swordfern

Structure: Mature deciduous forest with a mix of shrubs in the understory Black cottonwood, Oregon ash, and red alder are the most dominant overstory species in the reference community (1.1). Douglas-fir and grand fir may also be present, but flooding restricts conifer regeneration. Conifers are more common further from the active alluvial areas. Regeneration of trees generally is restricted by canopy cover and commonly limited to gaps where sunlight and exposed mineral soil are most available. The reference community (1.1) represents a lack of major flooding for at least 75 years, allowing pioneering species to form a mature canopy. The lack of flooding also permits growth of understory shrubs, including salmonberry, vine maple, stink currant, thimbleberry, and snowberry (*Symphoricarpos albus*). Common forbs are western swordfern, false lily of the valley (*Maianthemum dilatatum*), and ladyfern (*Athyrium filix-femina*). Disturbances include small gap dynamics (1/2 acre openings or smaller) following the decline of the red alder canopy, minor scouring from flooding, and mass movement. Soil deposition following minor scouring from smaller scale and periodic flooding temporarily affects the understory community, but it does not alter the composition of the overstory. Animal activity, such as dam-building by North American beaver (Castor canadensis), can change the hydrology.

Dominant plant species

- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree
- Oregon ash (*Fraxinus latifolia*), tree
- red alder (*Alnus rubra*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- grand fir (*Abies grandis*), tree
- willow (*Salix*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- thimbleberry (*Rubus parviflorus*), shrub
- red elderberry (*Sambucus racemosa*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- vine maple (*Acer circinatum*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- false lily of the valley (*Maianthemum dilatatum*), other herbaceous

Community 1.2
Red Alder, Willow, Trailing Blackberry, and Stinging Nettle

Structure: Bare ground with scattered tree, shrub, and grass establishment This site is a riparian forest undergoing regeneration or stand initiation immediately following flooding disturbance. The soil surface quite often has been scoured or covered by alluvial sediment. Some mature trees maybe present. Some places have increased amounts of downed woody debris. Bare ground permits rapid spread of pioneering species. Relative to conifers, red alder can establish quickly. Salmonberry, willow, trailing blackberry (*Rubus ursinus*), and stinging nettle (*Urtica dioica*) establish during this phase.

Dominant plant species

- red alder (*Alnus rubra*), tree
- willow (*Salix*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- California blackberry (*Rubus ursinus*), shrub
- stinging nettle (*Urtica dioica*), other herbaceous

Community 1.3
Oregon Ash, Black Cottonwood, Willow, and Stinging Nettle

Structure: Dense single story with diminished understory This community consists of early seral forest in regeneration that has scattered remnant mature trees in some places. Competition is increased among individual trees for available water, light, and nutrients. Red alder, which has a limited lifespan of 40 to 70 years, initially dominates the overstory. The community shifts to the longer-lived Oregon ash as red alder declines. Shade-tolerant forbs, such as western swordfern, establish during this phase.

Dominant plant species

- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree
- Oregon ash (*Fraxinus latifolia*), tree
- red alder (*Alnus rubra*), tree
- willow (*Salix*), shrub
- salmonberry (*Rubus spectabilis*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- thimbleberry (*Rubus parviflorus*), shrub
- red elderberry (*Sambucus racemosa*), shrub
- vine maple (*Acer circinatum*), shrub
- California blackberry (*Rubus ursinus*), shrub
- western swordfern (*Polystichum munitum*), other herbaceous

Pathway 1.1B
Community 1.1 to 1.2

This pathway represents a stand-replacing wildfire, catastrophic windstorm, major 100- or 500-year flood event, or mass movement that scours the stream channel, removes understory and overstory vegetation, and may alter the stream flow. This type of disturbance may completely reconfigure sediment loads and dramatically reduce or eliminate the forest overstory.

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 a stand-replacing wildfire, catastrophic windstorm, major 100- or 500-year flood event, or mass movement that scours the stream channel, removes understory and overstory vegetation, and may alter the stream flow. This type of disturbance may completely reconfigure sediment loads and dramatically reduce or eliminate the forest overstory.

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 additions 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 receives 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

United States National Vegetation Classification. 2016. United States National Vegetation Classification Database, V2.0. Federal Geographic Data Committee, Vegetation Subcommittee, Washington, D.C. (accessed 11 October 2020).

Washington Department of Natural Resources, Natural Heritage Program. 2015. Ecological systems of Washington State. A guide to identification.

Contributors

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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:**

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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:

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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:**
