USDA Natural Resources Conservation Service

Ecological site AX003X00Z001
Western Middle Cascades Flood Plain Group

Last updated: 5/09/2024
Accessed: 05/20/2024

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

The Cascade and Olympic Mountains (MLRA 3) include 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 Western Cascades land resource unit (LRU E) is located in western Oregon. It is bounded by the Santiam River on the north, the High Cascade volcanic platform on the east, the Rogue-Umpqua Divide on the south, and the Willamette and Umpqua Valleys on the west. This area is equivalent to the area generally known as the “Old Cascades.”
Bedrock consists of basalt and andesite of the Sardine Formation overlying the Little Butte Volcanic Series which contains soft tuff (Orr, et al. 1992). The Sardine Formation “cap” is absent at many locations. Topography is dissected and steep in most areas. Areas of low relief contain ancient and contemporary landslides. Alpine glaciation occurred in headwater basins during the Pleistocene but subsequent mass movement has partially obscured glacial features (Noller, et al. 2016).
Soil moisture regime is udic or aquic. Soil temperature regime ranges from mesic to cryic. Soils in this LRU generally have higher apparent clay content compared with those to the north and Spodosols do not occur. Most soils contain an appreciable amount of volcanic glass. Inceptisols usually have isotic mineralogy. Andisols are usually amorphic and meet the second criteria for andic soil properties (Soil Survey Staff, 2014). Ultisols can occur at the lowest elevations.
Conifer forest is the dominant vegetation. Natural fire is dominantly moderately frequent, mixed-severity (Spies, et al. 2018). Franklin and Spies (1991) noted an increase in tree bole fire scars south of 44.5 degrees latitude in the Oregon Cascades. This LRU hosts small amounts of fire-tolerant species common in the Siskiyou-Trinity Area (MLRA 5) but absent in areas to the north. These species include Pacific madrone (Arbutus menziesii), incense cedar (Calocedrus decurrens), giant chinkapin (Chrysolepis chrysophylla), and sugar pine (Pinus lambertiana).
At low to mid elevations, Douglas-fir (*Pseudotsuga menziesii*) is a long-lived, early-seral tree; western hemlock (*Tsuga heterophylla*) is an associated shade-tolerant tree. Red alder (*Alnus rubra*) is a short-lived, early-seral tree. It occurs ephemerally on uplands but persists on wet or repeatedly-disturbed sites.
At high elevations, Noble fir (Abies procera) is an early-seral tree; Pacific silver fir (Abies amabilis) is an associated

shade-tolerant tree. Sitka alder (Alnus viridis ssp. sinuata) and vine maple (*Acer circinatum*) form persistent shrub fields on sites subject to heavy snowpack or avalanches. Wetlands typically support shrubby or herbaceous vegetation.

Classification relationships

This ecological site group description is similar to several plant communities described by Diaz and Mellen (1996):

• Red alder / blue wildrye
• red alder / coltsfoot
• red alder / thimbleberry
• red alder / devilsclub
• red alder / vine maple
• red alder / salmonberry / oxalis
• red alder/ oxalis
• red alder / youth on age - Siberian springbeauty
• red alder / coastal hedgenettle

Ecological site concept

Central Concept: This forested site occurs on floodplains bounded by mountains that support Douglas-fir - western hemlock forest. Red alder and other broadleaf trees establish readily on fresh sediment deposits. Proximity to perennial surface and ground water, diurnal atmospheric inversions, high humidity recovery, and protected topographic position ameliorate summer moisture deficit compared with adjacent upland sites.Soil temperature regime can be mesic or frigid, and soil moisture regime can be udic or aquic. Elevation is typically 500 to 2500 feet.

Associated sites

AX003X00Z014	**Western Middle Cascades Swamp Group** Relationship to water table and lower points in the floodplain.

Similar sites

AX003X00Z014	**Western Middle Cascades Swamp Group** Relationship to water table and lower points in the floodplain.

Table 1. Dominant plant species

Tree	(1) *Alnus rubra*
Shrub	Not specified
Herbaceous	Not specified

Legacy ID

F003XE001OR

Physiographic features

Landform: floodplains
Elevation: 500 to 2500 feet
Slope: 0 to 8 percent
Flooding: occasional, brief (high-velocity)
Ponding: none

This ecological site group encompasses floodplains in mountain valleys. Valley gradients are usually 0.5 to 4 percent. Valley bottoms are underlain by unconsolidated fill. Floodplains are sufficiently wide for channels to move laterally during occasional high-energy flood events. Floods occur in winter. They are usually produced by rain-on-

snow events.
At the river reach scale, the largest expressions of this site usually occur along aggrading segments where sediment supply exceeds stream power. This can occur where gradient relaxes immediately upstream of a bedrock knickpoint or immediately downstream of a landslide that impinges on the stream.
Stream terraces may exist between this site and adjacent mountain slopes. Stream terraces represent relict floodplain surfaces now located too far above the current channel to experience flooding. These surfaces typically support conifer forest. Many stream terraces are Pleistocene in age, but modern anthropgenic activities can also initiate stream incision.

Table 2. Representative physiographic features

Landforms	(1) Flood plain
Flooding duration	Brief (2 to 7 days)
Flooding frequency	Occasional
Ponding frequency	None
Elevation	500–2,500 ft
Slope	0–8%
Aspect	Aspect is not a significant factor

Climatic features

Mean annual air temperature: 45 to 54 degrees F
Mean annual precipitation: 60 to 90 inches
Frost free period: 120 to 180 days

Precipitation occurs mainly during fall, winter, and spring. Summers are dry. Rain and snow occur in winter but snowpack rarely develops. This site may experience diurnal atmospheric inversions and high humidity recovery.

Influencing water features

High energy flooding occurs occasionally on this site. Channel microfeatures may contain a persistent or seasonal water table that reaches high into the soil profile. Other parts of the floodplain, including bar microfeatures, usually have a water table below five feet.

Wetland description

Associated streams exhibit Rosgen B and C channel types with gravel and cobble beds.

Soil features

Drainage class: excessively drained to poorly drained
Parent material: alluvium
Restrictive feature(s): none
Soil temperature regime: mesic or frigid
Soil moisture regime: udic or aquic
Soil reaction: slightly acid or moderately acid
Soil mineralogy: mixed

Soils are variable across space and time due to ongoing fluvial erosion and deposition. Entisols are the predominate soil order. Strongly-contrasting soil textures typically occur within the same profile: the upper part is loamy and the lower part is sandy or sandy-skeletal. Generally speaking, loamy layers thicken with increasing distance from flood channels and with increasing time since major flood events. Soils on elevated bars are well drained to excessively drained. While not technically root-restrictive sandy-skeletal material, which has low available water capacity, will cause plant communities to be droughty where the loamy mantle is thin or absent. Soils in low-

lying channels can have a persistent water table. Water-saturated organic layers may build in poorly drained soils. Thin layers of slightly decomposed plant material are usually present on well drained soils.

Table 3. Representative soil features

Parent material	(1) Alluvium
Drainage class	Excessively drained to poorly drained

Ecological dynamics

Central Concept:
This forested site occurs on floodplains bounded by mountains that support Douglas-fir - western hemlock forest. Red alder and other broadleaf trees establish readily on fresh sediment deposits. Proximity to perennial surface and ground water, diurnal atmospheric inversions, high humidity recovery, and protected topographic position ameliorate summer moisture deficit compared with adjacent upland sites. Litter turnover and associated nutrient cycling may be rapid on warm sites, but somewhat slower on cooler sites. Soil temperature regime can be mesic or frigid, and soil moisture regime can be udic or aquic. Elevation is typically 500 to 2500 feet.

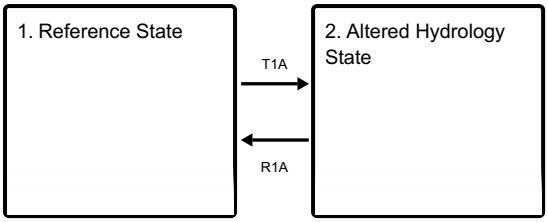
Disturbance:
Flood is the dominant natural landscape level driver. Historical flood frequency has varied from 30 to 100-year intervals (Swanson et al. 1998). Flood disturbance impacts are mostly focused on unconstrained valleys and are highly heterogeneous in nature. Flood impacts range from mild vegetation mortality in lower energy zones to complete removal of vegetation and re-organization of stream-bed substrates (Acker et al. 2003, Johnson et al. 2000, Swanson et al. 1998). Large wood recruitment by flood waters can enhance the spatial heterogeneity and magnitude of impacts at discrete locations (Johnson et al. 2000). Human management is prevalent in this type, with activities such as regeneration harvest, thinning, damming and road construction occurring within its range, sometimes dominating phase trajectories over flood and fire (Swanson et al. 1998).

Vegetation composition:
Red alder (*Alnus rubra* Bong.) is usually dominant on this site. Bigleaf maple (*Acer macrophyllum* Pursh) and black cottonwood (*Populus balsamifera* L. ssp. trichocarpa (Torr. & A. Gray ex Hook.) Brayshaw) are commonly-associated hardwood trees. Small amounts of western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), western redcedar (*Thuja plicata* Donn ex D. Don), and Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) can be found on these sites, especially on floodplains experiencing low-energy inundation (Acker et al. 2003, Swanson et al. 1998), but only dominate when flooding is deferred for decades or hydrology is altered.
On sites with poorly drained soils or with a high water table, the shrub layer may be dominated by devilsclub (*Oplopanax horridus* (Sm.) Miq.), stink currant (*Ribes bracteosum* Douglas ex Hook.), and salmonberry (*Rubus spectabilis* Pursh). Sites that are between infrequent flood events may be dominated by vine maple (*Acer circinatum* Pursh) with low to moderate amounts of salmonberry and California blackberry (*Rubus ursinus* Cham. & Schltdl.). A variety of moisture-loving herbaceous species occur in this type including wall-lettuce (*Mycelis muralis* (L.) Dumort.), western swordfern (*Polystichum munitum* (Kaulf.) C. Presl), Siberian springbeauty, coastal hedgenettle (*Stachys chamissonis* Benth. var. cooleyae (A. Heller) G. Mulligan & D. Munro), youth on age (*Tolmiea menziesii* (Pursh) Torr. & A. Gray), Oregon oxalis (*Oxalis oregana* Nutt. or *O. trilliifolia* Hook.), and ladyfern (*Athyrium filix-femina* (L.) Roth). Blue wildrye (*Elymus glaucus* Buckley) dominates on drier sites while poorly drained sites can support skunk cabbage (*Lysichiton americanus* Hultén & H. St. John) (Diaz and Mellen 1996, Harrington et al. 1994).

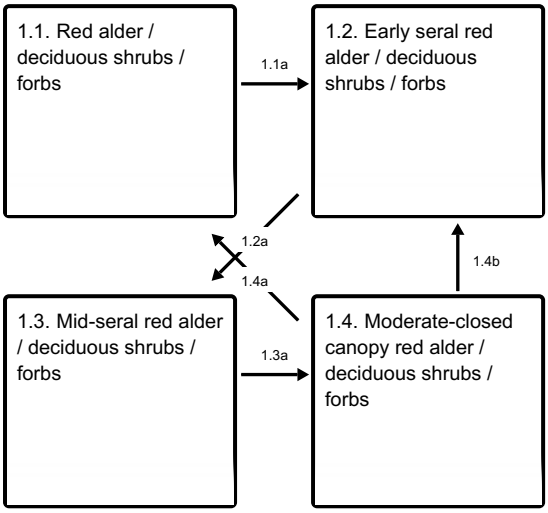
Structural Descriptions Used in State and Transition Model:
Phases are described by size class, cover class and layering. Size class description refers to either the average diameter of the dominant and co-dominant trees (quadratic mean diameter or qmd) in the state and transition model or the general sizes by species in the following narrative.
Size Class
Grass Forb/Seedling Sapling Pole Small Medium Large/Giant
DBH (inches) NA 0.1-4.9 5-9.9 10-19.9 20-29.9 =30
Canopy Cover Class
Open Moderate Closed
Canopy cover (%) <10 10-60 >60

State and transition model

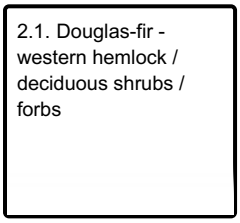
Ecosystem states



State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference State

Community 1.1
Red alder / deciduous shrubs / forbs

Growth from community phase 1. 4 is the dominant pathway producing this condition. Dominant and co-dominant small to medium red alder (age 40 to 80 years; 40-68% cover) with big leaf maple (1-22% cover) in a single-layer moderate to closed canopy are indicators of the climax condition (Diaz and Mellen 1996). Small gaps are scattered throughout phase. Small amounts of shade-tolerant western hemlock (5% cover) and western redcedar (1-2% cover) may be throughout (Diaz and Mellen 1996). Individual red alder trees may begin to die by age 40 and pure stands begin to “break up” after 50 years, with stands senescing after 80 years (Deal 2006). CP 1.1 red alder / deciduous shrubs / forbs Small/Medium, single layered, moderate-closed canopy, scattered small gaps, persisting shade tolerant tree species (bigleaf maple) Age class: 40-80 years

Community 1.2
Early seral red alder / deciduous shrubs / forbs

This community phase is a post-disturbance, early seral condition resulting primarily from high energy flooding. Although uncommon, windthrow may occur on poorly drained sites resulting in this condition (Harrington 2006). Single-layered, open canopy conditions with sprouting (age 1 to 5 years) shade-tolerant trees characterize this phase. Douglas-fir, a shade-intolerant species, may be found in small amounts during these open-canopy conditions. Grasses and forbs are in seedling stage. Disturbance-loving invasive species such as Japanese

knotweed (*Polygonum cuspidatum* Siebold & Zucc.), giant knotweed (*Polygonum sachalinense* F. Schmidt ex Maxim.), and evergreen clematis (*Clematis vitalba* L.) may find a foothold during this phase (Harrington 2006). Reed canary grass (*Phalaris arundinacea* L.) and Himalyan blackberry (*Rubus armeniacus* Focke) may also establish if a seed source is present (David Rand, personal observation). Community phase pathway 1.2a. CP 1.2 red alder / deciduous shrubs / forbs Grass, forbs, seedlings, single layered, open canopy, sprouting shade tolerant tree species (bigleaf maple) Age class: 1-5

Community 1.3
Mid-seral red alder / deciduous shrubs / forbs

This mid-seral phase is the result of growth from CP 1.2. Saplings and poles (age 5 to 15 years) dominate the canopy in this phase. Canopy cover is closed and may include persisting shade-tolerant species such as big maple and small amounts of western hemlock and western redcedar. CP 1.3 red alder / deciduous shrubs / forbs Sap/pole, single layered, moderate-closed canopy, persisting shade tolerant tree species (bigleaf maple) Age class: 5-15

Community 1.4
Moderate-closed canopy red alder / deciduous shrubs / forbs

Growth from CP1.3 produces this community phase. Forest structure is still simple and largely single layered. Canopy cover is moderate to closed and dominated by small to medium sized (age 15 to 40 years) red alder and may include big leaf maple and small amounts of western hemlock and western redcedar. Understory shrub cover may increase after initial dominance by alder in earlier phases (Deal 2006). CP 1.4 red alder / deciduous shrubs / forbs Pole/Small, single layered, moderate-closed canopy, persisting shade tolerant tree species (bigleaf maple) Age class: 15-40

Pathway 1.1a
Community 1.1 to 1.2

This pathway represents high energy flooding.

Pathway 1.2a
Community 1.2 to 1.3

Growth is the major process transitioning out of this early seral condition.

Pathway 1.3a
Community 1.3 to 1.4

Growth is the major process transitioning out of this phase.

Pathway 1.4a
Community 1.4 to 1.1

Growth will serve to transition this phase into the reference community.

Pathway 1.4b
Community 1.4 to 1.2

This pathway represents high energy flooding.

State 2
Altered Hydrology State

Community 2.1
Douglas-fir - western hemlock / deciduous shrubs / forbs

This state is the result of altered groundwater hydrology or flooding regime due to human behavior such as dams, roads and timber harvest activities. Small to medium sized Douglas-fir dominate the overstory canopy layer. A range of shade tolerant (western hemlock, western redcedar, bigleaf maple) and shade intolerant (Douglas-fir) trees may be present, depending on the severity and size of the disturbance (Tepley et al. 2013) and which conifers were able to establish when competition from red alder was minimal (Harrington 2006). A variety of shrubs and herbaceous species occur in these communities including devilsclub, Alaska blueberry (*Vaccinium alaskaense* Howell), bunchberry dogwood (*Cornus canadensis* L.), Oregon oxalis, western swordfern, skunkcabbage, ladyfern, coastal hedgenettle, and youth on age (Diaz and Mellen 1996).

Transition T1A
State 1 to 2

This pathway represents damming, road-building, or activities associated with timber harvest that may alter groundwater hydrology or prolong the interval between high-energy floods.

Restoration pathway R1A
State 2 to 1

Groundwater hydrology is restored. High-energy flooding re-occurs.

Additional community tables

Other references

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Approval

Kirt Walstad, 5/09/2024

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	10/05/2023
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):

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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:**
