

Ecological site AX003X00D004

Western Middle Cascades Frigid Udic Forest Group

Last updated: 1/24/2025

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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

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 isotonic mineralogy. Andisols are usually amorphous 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 (*Chrysopsis 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 shrubfields on sites subject to heavy snowpack or avalanches. Wetlands typically support shrubby or herbaceous vegetation.

Classification relationships

This ecological site group description covers a variety of cool western hemlock plant associations including the following (McCain and Diaz 2002): • Western hemlock / twinflower • Western hemlock / devilsclub / Oregon oxalis • Western hemlock / devilsclub / starry false lily of the valley • Western hemlock / Pacific rhododendron / salal • Western hemlock / Pacific rhododendron / twinflower • Western hemlock / Pacific rhododendron / Cascade barberry • Western hemlock / Pacific rhododendron / Oregon oxalis • Western hemlock / Pacific rhododendron / common beargrass • Western hemlock / Alaska blueberry / bunchberry dogwood , • Western hemlock / Alaska blueberry / Oregon oxalis • Western hemlock / Alaska blueberry - devilsclub

Ecological site concept

This forested site occurs in the cooler portion of the western hemlock zone. Soil temperature regime is frigid, and soil moisture regime is udic. Forest litter turnover and associated nutrient cycling can be slow compared with warmer sites, but rapid compared with colder sites. Elevation is typically 2000 to 4000 feet.

Associated sites

AX003X00B003	Western Middle Cascades Mesic Udic Forest Group Lower elevations, drier and warmer sites.
AX003X03F007	Glaciated Middle Cascades Cryic Udic Forest Group Higher elevations, cooler and wetter sites.

Similar sites

AX003X03C004	Glaciated Middle Cascades Frigid Udic Forest Group Similar position, but on the Glaciated portion of the Western Cascades.
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Table 1. Dominant plant species

Tree	(1) <i>Pseudotsuga menziesii</i> (2) <i>Tsuga heterophylla</i>
Shrub	(1) <i>Rhododendron macrophyllum</i> (2) <i>Vaccinium alaskaense</i>
Herbaceous	Not specified

Legacy ID

F003XE004OR

Physiographic features

Landform: mountain slopes, landslides

Elevation: 2000 to 4000 feet

Slope: 0 to 90 percent

Aspect: all aspects

Flooding: none

Ponding: none

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Landslide
Flooding frequency	None

Ponding frequency	None
Elevation	610 – 1,220 m
Slope	0 – 90 %
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Mean annual air temperature: 42 to 45 degrees F

Mean annual precipitation: 60 to 100 inches

Frost free period: 80 to 120 days

Precipitation occurs mainly during fall, winter, and spring. Summers are dry. Snowpack accumulates during winter but melts in early spring.

Influencing water features

None

Wetland description

None

Soil features

Drainage class: well drained or moderately well drained

Parent material: colluvium, residuum, till; mixed with volcanic ash

Restrictive feature(s): shallow to very deep to bedrock

Soil temperature regime: frigid

Soil moisture regime: udic

Soil reaction: strongly or very strongly acid

Soil mineralogy: amorphous or isotropic

Soils are usually very deep and well drained, but those with a brief seasonal water table still capable of supporting Douglas-fir (*Pseudotsuga menziesii*) are included in this concept. The rooting zone is usually moist but may be dry up to 45 consecutive days in late summer. Litter layers under mature forest are usually thicker and exhibit a more advanced state of decomposition compared with warmer sites. O horizons associated with this site on the Willamette National Forest were usually 3 to 7 cm thick (inner quartiles, n=63). Organic materials at the surface were slightly decomposed, but 37 percent of pedons contained moderately or highly decomposed plant materials at the boundary with mineral soil (Rand, 2020). Earthworms are absent. Millipedes (especially *Harpaghe haydeniana*) may be responsible for fragmenting and mixing litter into the A horizon (Moldenke, et al. 2000). Soils usually have umbric epipedons. Andic soil properties derived from the weathering of volcanic ash are usually present. Andisols and Inceptisols are common soil orders. Apparent fine-earth textures are usually loams or silt loams. Apparent clay content usually ranges from 18 to 27 percent.

Table 3. Representative soil features

Parent material	(1) Colluvium (2) Residuum (3) Till
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Drainage class	Moderately well drained to well drained
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Ecological dynamics

Central Concept: This forested site occurs in the cooler portion of the western hemlock zone. Soil temperature regime is frigid, and soil moisture regime is udic. Forest litter turnover and associated nutrient cycling can be slow compared with warmer sites, but rapid compared with colder sites. Elevation is typically 2000 to 4000 feet.

Range in Variability: Duration of dryness linked to local landscape position, aspect, and soil depth may define subtypes with distinctive reference communities. Southern exposures and convex slopes may support drought-tolerant communities. Northern exposures and concave slopes may support moist communities. Soils with a seasonal water table may restrict rooting depth for some species.

Disturbance: Fire is the dominant natural landscape level driver. Mixed severity fires dominate in this vegetation type, with areas of low (30%), moderate (30-70%) and high (> 70%) overstory mortality expressed within fires. Historical fire frequency has varied from 50 to 200 years mean fire return intervals (MFRI) (Morrison and Swanson 1990, Tepley et al. 2013, Spies et al. 2018). Wind, insects and pathogens, and infrequent landslides may also shape forest composition and pattern at finer scales. Human management is prevalent in this type, with activities such as regeneration harvest and thinning occurring within its range and dominating phase trajectories over fire (Spies et al. 2013).

Vegetation composition: Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco), western hemlock, western redcedar (*Thuja plicata* Donn ex D. Don), and Pacific yew (*Taxus brevifolia* Nutt.) are common tree associates that span most of these types. Giant chinquapin (*Chrysolepis chrysophylla* (Douglas ex Hook.) Hjelmqvist) is found more commonly in the drier portions of this type. Pacific silver fir (*Abies amabilis* (Douglas ex Loudon) Douglas ex Forbes) is found in the cooler portions of this type, often in the transition to higher elevation vegetation types (McCain and Diaz 2002).

Understory shrub species are varied. Tall shrubs such as Pacific rhododendron (*Rhododendron macrophyllum* D. Don ex G. Don) and Alaska blueberry (*Vaccinium alaskaense* Howell) are common and serve as key indicators for this type. Vine maple (*Acer circinatum* Pursh) is a common associate. Red huckleberry (*Vaccinium parvifolium* Sm) is scattered throughout. Low shrubs, such as Cascade barberry (*Mahonia nervosa* (Pursh) Nutt.), and to a lesser extent salal (*Gaultheria shallon* Pursh) occur. Devilsclub (*Oplopanax horridus* (Sm.) Miq) dominated types are found in wetter areas within this zone (McCain and Diaz 2002).

A diverse array of herbs occupies these sites. Sweet after death (*Achlys triphylla* (Sm.) DC), Columbian windflower (*Anemone deltoidea* Hook.), bride's bonnet (*Clintonia uniflora* (Menzies ex Schult. & Schult. f.) Kunth), bunchberry dogwood (*Cornus canadensis* L.), western rattlesnake plantain (*Goodyera oblongifolia* Raf.), twinflower (*Linnaea borealis* L.), starry false lily of the valley (*Maianthemum stellatum* (L.) Link), western swordfern (*Polystichum munitum* (Kaulf.) C. Presl) and threeleaf foamflower (*Tiarella trifoliata* L.) occur most commonly in this type. Liverleaf wintergreen (*Pyrola asarifolia* Michx), whiteveined wintergreen (*Pyrola picta* Sm) and common beargrass (*Xerophyllum tenax* (Pursh) Nutt.) are found in cooler, drier portions of this type (McCain and Diaz 2002).

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 (%) 60

State and transition model

Additional community tables

Table 4. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 5. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 6. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.5 plant community composition

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

Kirt Walstad, 1/24/2025

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)	
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Contact for lead author	
Date	10/05/2023
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:

17. Perennial plant reproductive capability:
