

Ecological site AX001X02X420

Isofrigid Udic Forest

Last updated: 5/07/2024
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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): 001X–Northern Pacific Coast Range, Foothills, and Valleys

This long and narrow resource area stretches along the Pacific Border Province of the Pacific Mountain System in Oregon and Washington. The area is bounded by the Olympic Mountains on the north and the Klamath Mountains on the south. Most of the area consists of hills and low mountains with gentle to steep slopes. The parent materials are composed primarily of young Tertiary sedimentary rocks with some minor volcanic rocks. Glacial till and outwash deposits are found in the northern half of the area within Washington. In the far southern portion of the area, near the Klamath Mountains, the sedimentary rocks are older and some have been metamorphosed. The average annual precipitation ranges from 60 to 200 inches, increasing with elevation.

The dominant soil orders in this MLRA are Andisols, Inceptisols, and Ultisols. Soil depth ranges from shallow to very deep. While most soils in the area are well drained and occur on foothills, mountain slopes and ridges, floodplain and depressional soils can range from well drained to very poorly drained. Soil textures are typically medial, loamy, or clayey. The dominant soils in the area have a mesic or frigid soil temperature regime and a udic soil moisture regime; however, soils with an aquic soil moisture regime or cryic soil temperature regime do occur.

LRU notes

The North Pacific Coast Range land resource unit (LRU 2) of MLRA 1 is located in the northwestern corner on the Olympic Peninsula and within the Olympic National Forest in Washington State. LRU 2 is bounded on the west by MLRA 4a Sitka Spruce Belt and MLRA 2 Willamette and Puget Sound Valleys to the east. LRU 2 encircles the Olympic National Park (LRU 1). Several major rivers have headwaters in this LRU or carved valleys through the landscape depositing more recent alluvium. These include the Duckabush, Elwha, Queets, Quinault, Skokomish, Sol Duc, and Wynoochee Rivers.

Ecological site concept

This ecological site is found on the western Coast Range on the Olympic Peninsula in Washington state. A temperate climate supports a variety of flora and fauna. Elevations are typically between 800 and 2,500 feet. The most common overstory species are Pacific silver fir (*Abies amabilis*), western hemlock (*Tsuga heterophylla*), and Douglas-fir (*Pseudotsuga menziesii*). Western redcedar (*Thuja plicata*), Pacific yew (*Taxus brevifolia*), and Sitka spruce (*Picea sitchensis*) may be present as minor components. The understory may be sparse depending on canopy cover. Common understory species may include Alaska huckleberry (*Vaccinium alaskaense*), red huckleberry (*Vaccinium parvifolium*), twinflower (*Linnaea borealis*), queencup beadlily (*Clintonia uniflora*), western swordfern (*Polystichum munitum*), salal (*Gaultheria shallon*), deer fern (*Blechnum spicant*), and threeleaf foamflower (*Tiarella trifoliata*).

The most common disturbance on this site is from windthrow of overstory trees, which results in patchy, small pockets of open areas. These areas commonly occur in conjunction with either root-, butt- or stem-rot. Western hemlock and Pacific silver fir are highly susceptible to rot diseases from fungi such as; *Armillaria ostoyae*, *Heterobasidion annosum*, *Phellinus weirii*, and *Echinodontium tinctorium* which may exacerbate the extent and area of disturbance. Following root disease, Pacific silver fir is highly susceptible to fir engravers. The resulting openings

in the canopy allow sunlight to reach the forest floor, benefiting the understory. Disturbance by fire is infrequent as a result of the high humidity, high elevation, and precipitation within the Pacific silver fir and western hemlock zones. The site has a fire interval of 500 years and may experience stand replacing catastrophic wildfires (US Department of Agriculture, 2012).

Table 1. Dominant plant species

Tree	(1) <i>Abies amabilis</i> (2) <i>Tsuga heterophylla</i>
Shrub	(1) <i>Vaccinium alaskaense</i> (2) <i>Vaccinium parvifolium</i>
Herbaceous	(1) <i>Clintonia uniflora</i> (2) <i>Polystichum munitum</i>

Legacy ID

F001XB420WA

Physiographic features

This ecological site is found on the western Coast Range on the Olympic Peninsula in Washington state. Elevations are typically between 800 and 2,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Terrace (2) Till plain > Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	800–2,500 ft
Slope	1–30%
Aspect	N, NE, E, SE, S, SW

Climatic features

The climate has cool, moist summers and cool, wet winters. Mean annual precipitation ranges from 95 to 180 inches. Precipitation falls primarily as rain; snowfall is common during winter months at the higher elevation range. Average annual temperatures range from 41 to 43 degrees F.

Table 3. Representative climatic features

Frost-free period (characteristic range)	151 days
Freeze-free period (characteristic range)	212 days
Precipitation total (characteristic range)	95-180 in

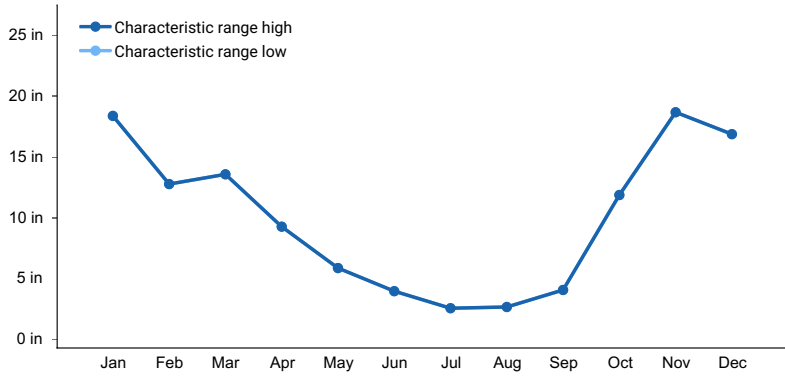


Figure 1. Monthly precipitation range

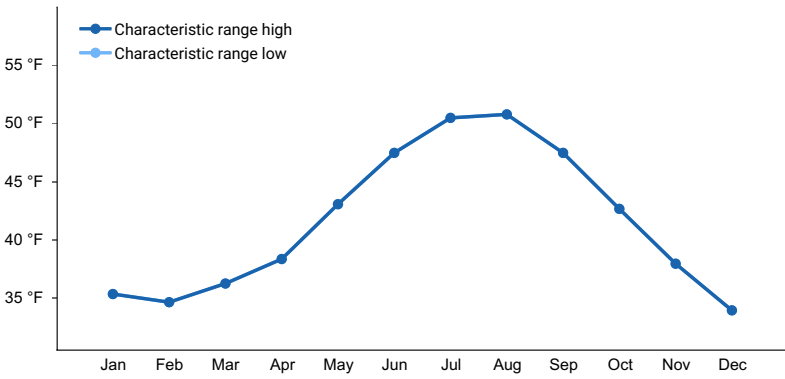


Figure 2. Monthly minimum temperature range

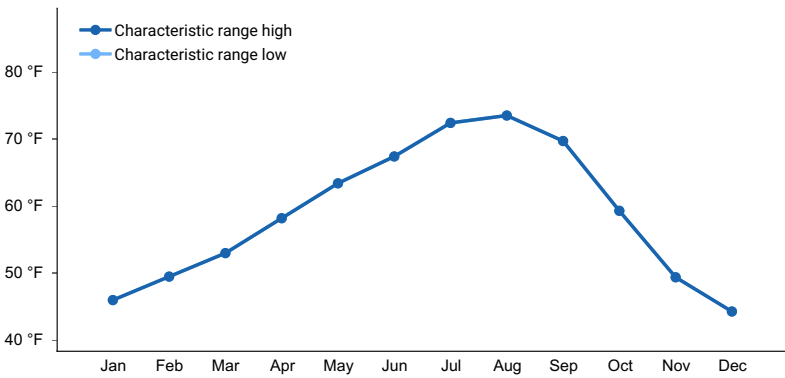


Figure 3. Monthly maximum temperature range

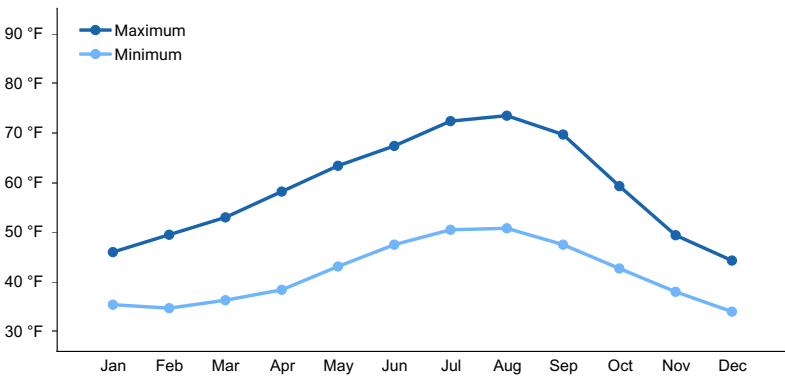


Figure 4. Monthly average minimum and maximum temperature

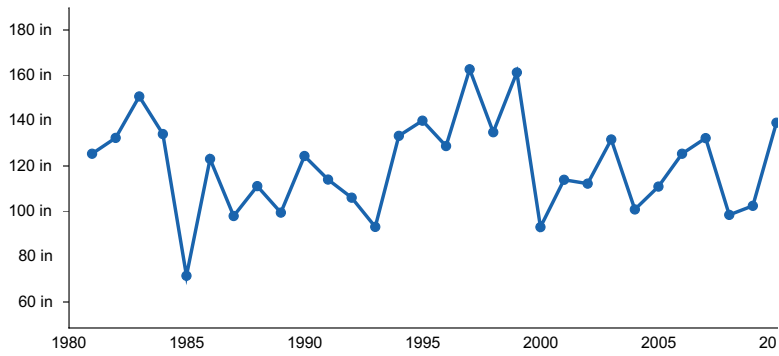


Figure 5. Annual precipitation pattern

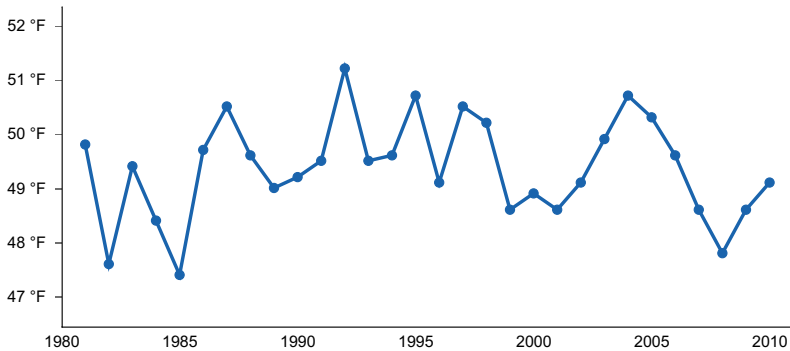


Figure 6. Annual average temperature pattern

Climate stations used

- (1) FORKS 1 E [USC00452914], Forks, WA

Influencing water features

In general, this ecological site is not influenced by wetland or riparian water features but may be found on stream terraces or adjacent to wetland and riparian areas. This site does not experience flooding or ponding.

Soil features

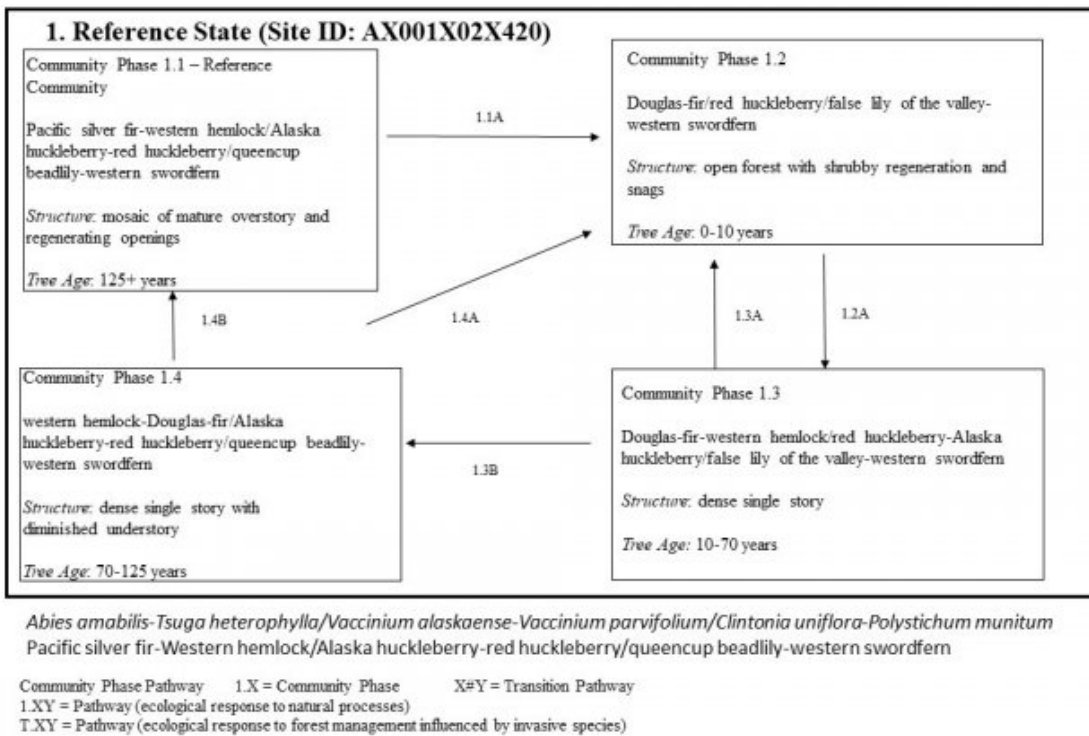
Soils that support this ecological site occur in the isofrigid soil temperature regime and the udic soil moisture regime.

Table 4. Representative soil features

Parent material	(1) Glaciofluvial deposits
Surface texture	(1) Medial silt loam
Drainage class	Well drained
Soil depth	60 in
Surface fragment cover <=3"	0-4%
Surface fragment cover >3"	0%
Clay content (2-6in)	15%
Subsurface fragment volume <=3" (2-60in)	4%
Subsurface fragment volume >3" (2-60in)	0%

Ecological dynamics

State and transition model



State 1

Reference State

Community 1.1

Pacific silver fir - western hemlock / Alaska huckleberry – red huckleberry / queencup beadlily-western swordfern

Pacific silver fir - western hemlock / Alaska huckleberry – red huckleberry / queencup beadlily-western swordfern
Structure: mosaic of mature overstory and regenerating openings
Western hemlock and Pacific silver fir are the most common overstory species in the Reference Community which lacks major disturbance for at least 100 years. Both Pacific silver fir and western hemlock are considered to be very shade tolerant, and perhaps the most shade tolerant of any tree species in North America (Crawford, 1990). Douglas-fir, western redcedar, Sitka spruce, and Pacific yew may be present but there will be minimal Douglas-fir regeneration under closed canopy forests, at times, entirely absent. The dense canopy created by multiple age groups of hemlocks may block most of the sunlight from the forest floor, leading to sparse understory in some areas. Gaps in the mid-canopy and overstory allow sunlight to reach the ground where the majority of the understory plants establish. When there is no mid-canopy, the understory tends to be more continuous. The most common natural disturbance on this site is the small gap dynamics following the death of one or two trees or windthrow. Common understory species include red huckleberry, Alaska huckleberry, twinflower, deer fern, queencup beadlily, threeleaf foamflower, and western swordfern.

Dominant plant species

- Pacific silver fir (*Abies amabilis*), tree
- western hemlock (*Tsuga heterophylla*), tree
- western redcedar (*Thuja plicata*), tree
- Sitka spruce (*Picea sitchensis*), tree
- Pacific yew (*Taxus brevifolia*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- Alaska blueberry (*Vaccinium alaskaense*), shrub

- red huckleberry (*Vaccinium parvifolium*), shrub
- salal (*Gaultheria shallon*), shrub
- bride's bonnet (*Clintonia uniflora*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous
- twinflower (*Linnaea borealis*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous
- threeleaf foamflower (*Tiarella trifoliata*), other herbaceous

Community 1.2

Douglas-fir/red huckleberry/false lily of the valley-western swordfern

Douglas-fir/red huckleberry/false lily of the valley-western swordfern Structure: open forest with abundant regeneration and snags Community phase 1.2 is an early seral plant community that has been impacted by a stand-replacing disturbance such as a wildfire, large scale wind event, timber management, mass movement, or major insect pest or disease. Nearly all trees are absent, but some fire-resistant trees may survive in the overstory. Snags are prevalent and remain standing and decaying. Large stems may be present on the surface and serve as nurse sites. The understory is predominately early seral tree, shrub, and forb species such as fireweed (*Chamerion angustifolium*), western swordfern, red huckleberry, and trailing blackberry (*Rubus ursinus*). Douglas-fir is relatively fire resistant and can survive moderately intense fires, due to its thick corky bark. Depending on fire severity and cambium damage, a mature Douglas-fir component may remain as a dominant overstory species, while western redcedar, Pacific silver fir, Sitka spruce, and western hemlock may be at full stand replacement post fire.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- red huckleberry (*Vaccinium parvifolium*), shrub
- California blackberry (*Rubus ursinus*), shrub
- false lily of the valley (*Maianthemum dilatatum*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.3

Douglas-fir – western hemlock / Alaska huckleberry – red huckleberry / false lily of the valley-western swordfern

Douglas-fir – western hemlock / Alaska huckleberry – red huckleberry / false lily of the valley-western swordfern Structure: dense single story Community phase 1.3 is an early seral forest in regeneration, possibly with scattered remnant mature trees. Species composition depends on the natural seed sources present and the intensity of disturbance. Douglas-fir, western hemlock, and Sitka spruce are the primary conifer species. Red huckleberry and Alaska huckleberry may be abundant in the understory depending on sunlight availability.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- western hemlock (*Tsuga heterophylla*), tree
- Sitka spruce (*Picea sitchensis*), tree
- Alaska blueberry (*Vaccinium alaskaense*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- false lily of the valley (*Maianthemum dilatatum*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous

Community 1.4

western hemlock – Douglas-fir / Alaska huckleberry – red huckleberry / queencup beadlily-western swordfern

western hemlock – Douglas-fir / Alaska huckleberry – red huckleberry / queencup beadlily-western swordfern Structure: dense single story with diminished understory Community phase 1.4 is a forest in the competitive exclusion stage, possibly with scattered remnant mature trees. There is increasing competition among individual

trees for available water and nutrients. Douglas-fir and western hemlock will dominate the overstory canopy, however species composition begins to phase out less shade tolerant species in favor of very shade tolerant species such as western hemlock and Pacific silver fir. Canopy closure is almost 100 percent leading to diminished shrub and forb layers. Some understory species better adapted to at least partial shade will begin to increase. Over time, the forest will begin to self-thin due to the elevated competition.

Dominant plant species

- western hemlock (*Tsuga heterophylla*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- Sitka spruce (*Picea sitchensis*), tree
- Pacific silver fir (*Abies amabilis*), tree
- western redcedar (*Thuja plicata*), tree
- Alaska blueberry (*Vaccinium alaskaense*), shrub
- red huckleberry (*Vaccinium parvifolium*), shrub
- bride's bonnet (*Clintonia uniflora*), other herbaceous
- western swordfern (*Polystichum munitum*), other herbaceous
- false lily of the valley (*Maianthemum dilatatum*), other herbaceous
- threeleaf foamflower (*Tiarella trifoliata*), other herbaceous
- deer fern (*Blechnum spicant*), other herbaceous

Pathway 1.1A

Community 1.1 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event, major insect pest infestation, timber management, or large mass movement event leading to the stand initiation phase of forest development.

Pathway 1.2A

Community 1.2 to 1.3

This pathway represents growth over time with no further major disturbance.

Pathway 1.3A

Community 1.3 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event, major insect pest infestation, timber management, or large mass movement event leading to the stand initiation phase of forest development.

Pathway 1.3B

Community 1.3 to 1.4

This pathway represents growth over time with no further major disturbance.

Pathway 1.4B

Community 1.4 to 1.1

This pathway represents growth over time with no further major disturbance.

Pathway 1.4A

Community 1.4 to 1.2

This pathway represents a major stand-replacing disturbance such as a high-intensity fire, large scale wind event, major insect pest infestation, timber management, or large mass movement event leading to the stand initiation phase of forest development.

Additional community tables

Inventory data references

Other Established Classifications for Ecological Site

National Vegetation Classification: G241 North Central Pacific Maritime Silver fir-Western Hemlock Rainforest

USDA Forest Service Plant Association of the Olympic National Forest: Pacific silver fir/Alaska huckleberry, Pacific silver fir/Alaska huckleberry/Queen's cup, Pacific silver fir/salal, and western hemlock/Alaska huckleberry associations

Washington Department of Natural Resources Ecological Systems of Washington State- North Pacific Mesic Western Hemlock-Silver fir Forest

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Contributors

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Approval

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	12/08/2021
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:**
