Ecological site AX001X01X308
Cryic Alpine Tundra

Last updated: 5/15/2025
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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): 001X–Northern Pacific Coast Range, Foothills, and Valleys

This area consists of a long and narrow range of mountains with associated foothills and valleys that parallels the Pacific Ocean. This area is entirely within the Pacific Border Province of the Pacific Mountain System in Oregon and Washington. MLRA 1 is bounded on the north by the highest elevations of the Olympic Mountains and the strait of Juan de Fuca, and by the Klamath Mountains on the south. The Washington portion of this MLRA is primarily composed of young Tertiary sedimentary rocks (siltstone and sandstone) mixed with some volcanic rocks of the same age. Glacial till and outwash deposits are also found in the northern half of this area in Washington. Much of this area is accreted terrane formed by tectonic processes. The average annual precipitation ranges from 60 to 200 inches (1,525 to 5,580 millimeters), increasing with elevation. Most of the precipitation in this area occurs during low-intensity, Pacific frontal storms and is evenly distributed throughout fall, winter, and spring. The dominant soil orders in this MLRA are Andisols, Inceptisols, and Ultisols. Soil depths broadly range from shallow to very deep. Soils are primarily well drained, however poorly drained soils may be found in depressional areas and on alluvial floodplains. Surface textures are typically medial and loamy or clayey. Soils in this area dominantly have a mesic or frigid temperature regime and a udic moisture regime. Soils with aquic moisture regimes and cryic temperature regimes also occur.

Ecological site concept

Cryic Alpine Tundra sites occur on aretes at elevations above 1,400 meters (4,593 feet). These sites are found above the tree line where conditions generally preclude tree establishment. These sites are found scattered throughout high elevation areas. Sites are dominated by dwarf shrubs including pink mountainheath (Phyllodoce empetriformis) and western moss heather (Cassiope mertensiana), with some forbs and graminoids present. Scattered krummholz tree may be observed on this site depending on site elevation and conditions.

Associated sites

AX001X01X305	**Cryic Udic Wet Subalpine Meadow** Cryic Udic Wet Subalpine Meadow sites may be found on more stable landscape positions downslope from Cryic Alpine Tundra sites. Cryic Udic Wet Subalpine Meadow sites have seasonally high water tables. Increased effective precipitation encourages high productivity on Cryic Udic Wet Subalpine Meadow sites.
AX001X01X306	**Cryic Aquic Subalpine Wet Meadow** Cryic Aquic Subalpine Wet Meadow sites may be found on seeps and depressions on more stable landscape positions downslope from Cryic Alpine Tundra sites. Cryic Aquic Subalpine Wet Meadow sites are subject to frequent ponding for long duration.

Similar sites

AX001X01X302	**Cryic Udic Dry Subalpine Meadow** Cryic Udic Dry Subalpine Meadow sites generally occur at lower elevations and have greater total plant cover.
AX001X01X301	**Cryic Udic Shallow Subalpine Meadow** Cryic Udic Shallow Subalpine Meadow sites generally occur at lower elevations. Cryic Udic Shallow Subalpine Meadow sites support more diverse shrub, forb, and graminoid communities.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Phyllodoce empetriformis* (2) *Cassiope mertensiana*
Herbaceous	(1) *Luetkea pectinata* (2) *Antennaria lanata*

Legacy ID

R001XA308WA

Physiographic features

This site primarily occurs on glacial valley walls on mountains. Cryic Alpine Tundra sites are typically quite steep and unstable, with mass-movement events being common. A significant amount of moisture from precipitation is lost via run-off downslope.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Glacial-valley wall
Flooding frequency	None
Ponding frequency	None
Elevation	1,400 – 2,000 m
Slope	0 – 100 %
Water table depth	150 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

This site occurs in a cryic temperature and udic moisture regime. Precipitation arrives mostly via low-intensity, Pacific frontal storms. Precipitation is unevenly distributed, with the lowest amounts on the leeward side of the Coast Range mountains. Precipitation falls largely as snow in higher elevations. Precipitation is evenly distributed throughout the fall, winter, and spring, while summers are dry. Air temperatures vary significantly along the elevation gradient.

Table 3 Representative climatic features

Frost-free period (characteristic range)	30-60 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	3,000-3,990 mm

Influencing water features

There are no dominant water features influencing plant community dynamics on site.

Soil features

The soils that support this ecological site occur in the cryic soil temperature regime and the udic soil moisture regime. Hangingglacier soils are moderately deep, well-drained, formed from residuum, and occur on mountaintops and cirques. These soils occur at the highest elevations of all the soils in Olympic National Park and are very susceptible to wind, water, and gravitational erosion. Saturated hydraulic conductivity is high or very high throughout, and rock fragment content is greater than 35 percent in the control section. Although representative of this site, these soils may exist across multiple ecological sites because of naturally variable slope, texture, rock fragments, and pH. An on-site soil pit and the most current ecological site key are necessary to classify a site.

Table 4. Representative soil features

Parent material	(1) Residuum
Surface texture	(1) Gravelly silt loam (2) Gravelly loam (3) Gravelly sandy loam
Soil depth	50 – 100 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	50 – 70 %
Available water capacity (0-101.6cm)	3.81 – 6.1 cm

Soil reaction (1:1 water) (0-25.4cm)	4.5 – 5.5
Subsurface fragment volume <=3" (0-50.8cm)	0 – 10 %
Subsurface fragment volume >3" (0-50.8cm)	0 – 10 %

Ecological dynamics

The Cryic Alpine Tundra site is found at high elevations in the park where snowpack persists long into the spring and summer. Long-duration snowpack cover significantly reduces growing degree days on site. These sites are typically located on gentle to moderate upper slopes and produce runoff water that is captured by downslope, stable Moist Subalpine Meadow, Wet Subalpine Meadow, and Aquic Subalpine Meadow sites.

Cryic Alpine Tundra sites are subject to severe disturbance from wildfire, avalanches, and mass-movement events. The fire regime of this site likely resembles that of adjacent and lower High Cryic Udic Forest sites that are characterized by high-intensity burns with a long return interval of greater than 200 years (FEIS). Historical fires would likely begin in lower-elevation forests and move upslope to these shrubland sites. When fire does occur, burns are often patchy and low-extent due to discontinuous fuels. Cryic Alpine Tundra sites are susceptible to avalanches and mass-movement events. Powerful avalanches may remove trees and hard-stemmed shrubs from the site and create early seral conditions favorable for the establishment of graminoids and forbs. Mass movement can occur on unstable slopes and remove all or nearly all vegetation from the site.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

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

Table 6. Community 1.2 plant community composition

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

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Approval

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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	09/24/2026
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):**

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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:**
