

Ecological site AX001X01X303 Cryic Udic Subalpine Meadow

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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 Udic Subalpine Meadow sites occur on cirques, bench basins, and bedrock knobs at

elevations above 900 meters. These sites are characterized by a community of shrubs, forbs, and graminoids. Tree establishment is generally precluded by high snowpack and low temperatures; however, tree islands may occasionally develop on site. These sites frequently generate run-off moisture that increases the effective precipitation of associated Cryic Udic Moist Meadow, Cryic Udic Wet Meadow, and Cryic Aquic Meadow sites. These sites are commonly distributed throughout the mid to high elevation zones of the park, except for the Northeast quadrant of the park where the Cryic Udic Dry Meadow site is more common.

Associated sites

AX001X01X304	<p>Cryic Udic Moist Subalpine Meadow</p> <p>Cryic Udic Moist Subalpine Meadow sites may be found on more stable slopes adjacent to Cryic Udic Subalpine Meadow sites. Increased effective precipitation favors productivity Cryic Udic Moist Subalpine Meadows.</p>
AX001X01X305	<p>Cryic Udic Wet Subalpine Meadow</p> <p>Cryic Udic Wet Subalpine Meadow sites may be found on more stable slopes adjacent to Cryic Udic Subalpine Meadow sites. Cryic Udic Wet Subalpine Meadow sites have seasonally high water tables but are not subject to ponding.</p>
AX001X01X306	<p>Cryic Aquic Subalpine Wet Meadow</p> <p>Cryic Aquic Subalpine Wet Meadow sites may be found on more stable slopes adjacent to Cryic Udic Subalpine Meadow sites. Cryic Aquic Subalpine Wet Meadow sites are subject to frequent ponding for long duration.</p>

Similar sites

AX001X01X302	<p>Cryic Udic Dry Subalpine Meadow</p> <p>Cryic Udic Dry Subalpine Meadow sites occur in the rain shadow of the Olympic mountains and on steep or exposed aspects where effective precipitation is reduced. Cryic Udic Dry Subalpine Meadow sites have much lower productivity and commonly support common juniper (<i>Juniperus communis</i>).</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Eucephalus paucicapitatus</i> (2) <i>Lupinus latifolius</i>

Legacy ID

R001XA303WA

Physiographic features

This site primarily occurs on glacial valley walls and colluvial aprons on mountains. Cryic Udic Subalpine Meadow sites are found on relatively unstable slopes and generate run-off that is captured by more stable downslope sites.

Table 2. Representative physiographic features

Landforms	(1) Mountains (2) Glacial-valley wall (3) Colluvial apron
Flooding frequency	None
Ponding frequency	None
Elevation	900–1,900 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)	30-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	1,499-3,988 mm

Influencing water features

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

Soil features

The soils that support this ecological site occur in the cryic soil temperature regime and the udic soil moisture regime. Lollah soils are very deep, formed from colluvium from metasedimentary rock, and occur on cirques and glacial valley walls. Catpeak soils are

moderately deep, formed from residuum, and occur on cirques and structural benches. These soils are all well drained and have high or very high saturated hydraulic conductivity. They have a rock fragment content of greater than 35 percent in the control section, and a relatively high organic carbon content in the surface horizons. 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 (2) Colluvium–metasedimentary rock
Surface texture	(1) Silt loam (2) Gravelly silt loam (3) Very gravelly silt loam
Drainage class	Well drained
Soil depth	51 cm
Surface fragment cover ≤3"	0–5%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	5.59–11.18 cm
Soil reaction (1:1 water) (0-25.4cm)	4.5–5.5
Subsurface fragment volume ≤3" (0-50.8cm)	0–50%
Subsurface fragment volume >3" (0-50.8cm)	0–20%

Ecological dynamics

The Cryic Udic Subalpine Meadow site is found at mid-to-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 toward the windward side of the Olympic mountains but may occasionally occur on sufficiently protected aspects within the rain shadow where solar radiation does not significantly reduce effective precipitation. These sites are typically located on gentle to moderate slopes and produce runoff water that is captured by downslope, stable Moist Subalpine Meadow, Wet Subalpine Meadow, and Aquic Subalpine Meadow sites.

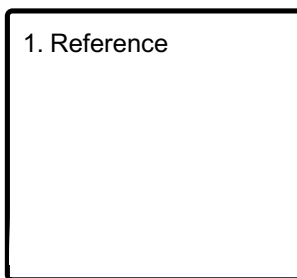
Cryic Udic Subalpine Meadows are subject to severe disturbance from wildfire, avalanches, and mass-movement events. The fire regime of this site likely resembles that of adjacent and lower High Cryic Udic Forest sites that are characterized by high-intensity

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 meadow sites. When fire does occur, burns are often patchy and low-extent due to discontinuous fuels. Cryic Udic Subalpine Meadow 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.

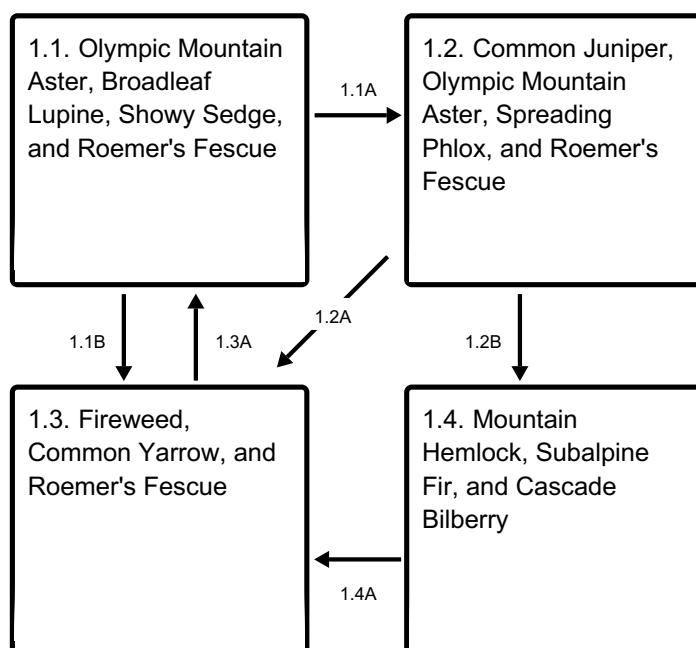
High snowpack generally precludes tree establishment on sites, but trees may occasionally establish at the lower elevations of this ecological site. Once established, trunks and limbs may provide shelter from snowdrifts and allow additional seedlings to recruit in tree island mosaics. Cryic Udic Subalpine Meadow sites are subject to high-intensity winds that are capable of uprooting and throwing trees. Temporal and spatial patterns of tree establishment on this site are unpredictable due to large interannual variations in snowfall.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Time without disturbance

~~1.2A~~ - High-intensity disturbance

1.2B - Time without disturbance

1.3A - Time without disturbance

1.4A - High-intensity disturbance

State 1 Reference

Cryic Udic Subalpine Meadow sites support communities of shrubs, forbs, and graminoids. Three communities exist in the Reference state which encompass varying stages of regeneration from disturbance. There is also a tree island community which may arise given an extensive time without disturbance.

Dominant plant species

- mountain hemlock (*Tsuga mertensiana*), tree
- subalpine fir (*Abies lasiocarpa*), tree
- common juniper (*Juniperus communis*), shrub
- Cascade bilberry (*Vaccinium deliciosum*), shrub
- Roemer's fescue (*Festuca idahoensis* ssp. *roemeri*), grass
- Olympic Mountain aster (*Eucephalus paucicapitatus*), other herbaceous
- broadleaf lupine (*Lupinus latifolius*), other herbaceous
- showy sedge (*Carex spectabilis*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous

Community 1.1

Olympic Mountain Aster, Broadleaf Lupine, Showy Sedge, and Roemer's Fescue

Structure: meadow dominated by forbs, grasses, and graminoids This community is characterized by a diverse composition of forbs, grasses, and sedges. Common reference community plants include Olympic mountain aster, broadleaf lupine, arctic lupine (*Lupinus arcticus*), phacelia (*Phacelia* spp.), Sitka valerian (*Valeriana sitchensis*), cascade desertparsley (*Lomatium martindalei*), and hairy arnica (*Arnica mollis*).

Community 1.2

Common Juniper, Olympic Mountain Aster, Spreading Phlox, and Roemer's Fescue

Structure: meadow / shrubland Given enough time without disturbance, shrubs may become established on site. Common juniper, western moss heather (*Phyllodoce empetriformis*), and pink mountainheath (*Cassiope mertensiana*) may be found in this community.

Community 1.3

Fireweed, Common Yarrow, and Roemer's Fescue

Structure: Grass and forb meadow This community is an early seral stage, occurring after severe disturbance. Fireweed is generally the first species to establish on site. Common yarrow (*Achillea millefolium*) and Roemer's fescue (*Festuca idahoensis* ssp. *roemeri*) are subdominant to minor on site.

Community 1.4

Mountain Hemlock, Subalpine Fir, and Cascade Bilberry

Structure: Tree island Given enough time without significant disturbance, mountain hemlock (*Tsuga mertensiana*) and subalpine fir (*Abies lasiocarpa*) may recruit to the site. Tree establishment tends to be patchy and discontinuous on this site, resulting in a mosaic of tree islands within a non-forested, meadow or shrubland matrix. Tree cover results in diminished understory richness and production.

Pathway 1.1A

Community 1.1 to 1.2

Time without disturbance.

Pathway 1.1B

Community 1.1 to 1.3

Severe disturbance such as avalanche, landslide, or fire that removes most vegetation from the site.

Pathway 1.2A

Community 1.2 to 1.3

Severe disturbance such as avalanche, landslide, or fire that removes most vegetation from the site.

Pathway 1.2B

Community 1.2 to 1.4

Time without disturbance.

Pathway 1.3A

Community 1.3 to 1.1

Time without disturbance.

Pathway 1.4A

Community 1.4 to 1.3

Severe disturbance such as avalanche, landslide, or fire that removes most vegetation from the site.

Additional community tables

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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	04/11/2026
Approved by	Grant Petersen
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):**
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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:**
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17. **Perennial plant reproductive capability:**
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