Ecological site F006XA008WA
Cryic Xeric Mountain Slopes (Subalpine fir Cold Moderately Dry Shrub/Herb)

Last updated: 9/11/2023
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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): 006X–Cascade Mountains, Eastern Slope

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Stretching from northern Washington to southern Oregon, MLRA 6 encompasses the mountain slopes, foothills, elevated plateaus and valleys on the eastern slopes of the Cascade mountains. This MLRA is a transitional area between the Cascade Mountains to the west and the lower lying Columbia Basalt Plateau to the east. Situated in the rain shadow of the Cascade Crest, this MLRA receives less precipitation than portions of the cascades further west and greater precipitation than the basalt plateaus to the east. Geologically, the majority of the MLRA is dominated by Miocene volcanic rocks, while the northern portion is dominated by Pre-Cretaceous metamorphic rocks and the southern portion is blanketed with a thick mantle of ash and pumice from Mount Mazama. The soils in the MLRA dominantly have a mesic, frigid, or cryic soil temperature regime, a xeric soil moisture regime, and mixed or glassy mineralogy. They generally are moderately deep to very deep, well drained, and loamy or ashy. Biologically, the MLRA is dominated by coniferous forest, large expanses of which are dominated by ponderosa pine, Douglas-fir or lodgepole pine. Areas experiencing cooler and moister conditions include grand fir, white fir, and western larch while the highest elevations include pacific silver fir, subalpine fir and whitebark pine. Economically, timber harvest and recreation are important land uses in these forests. Historically, many of these forests would have experienced relatively frequent, low and mixed severity fire favoring the development of mature forests dominated by ponderosa pine or Douglas-fir. In the southern pumice plateau forests, less frequent, higher severity fire was common and promoted the growth of large expanses of lodgepole pine forests.

LRU notes

This ecological site typically resides on northerly-facing mountain slopes, at elevations of 4400 to 7200 feet with slope gradients of 25 to 60 percent. The climate is cold and moderately dry with 55 to 90 frost-free days, mean annual precipitation of 30 to 50 inches, and mean annual air temperatures of 36 to 40 degrees Fahrenheit. This covers the subalpine fir zone of cold, high elevation areas with persistent slow-melting snow that causes a short growing season.

Classification relationships

The ecological site relates to the Wenatchee National Forest plant associations:
CES211 - Subalpine fir/Cascade azalea (ABLA2/RHAL)
CES213 - Subalpine fir/Cascade azalea/smooth woodrush (ABLA2/RHAL-LUHI)

Ecological site concept

The soils are dominantly Inceptisols, specifically Andic Dystrocryepts, with a loamy-skeletal particle-size class,

surface textures of ashy silt loam or ashy fine sandy loam, and andic soil properties. The parent material is volcanic ash over glacial till, colluvium, and residuum. The soils are well drained, have no flooding, ponding or water table and are typically 20 to 40 inches deep to a root-restricting feature. These soils are typically in the cryic soil temperature and udic soil moisture regimes, with less extensive areas in a xeric moisture regime.

The reference community is dominated by an overstory of ABLA and PIEN with a diverse assemblage of cold adapted shrub and herbaceous species. Seral tree species include PICO (until 100 yrs.), warmer sites will have PSME, PIMO3, LAOC and higher elevations will have PIAL, LALY. The understory includes: ARLA8, CACO11, CARU, GOOB2, LULA4, ORSE, OSMOR, PAMY, RHAL2, VAME, VAMY2, VASC, LUHI4.

Associated sites

F006XA004WA	**Cold Cryic Xeric Mountain Slopes (Subalpine fir Cold Dry Shrub)**

Similar sites

F006XA003WA	**Cryic Xeric Mountain Slopes (Subalpine fir Cool Moderately Dry Shrub/Herb)** Warmer, lower elevation.

Table 1. Dominant plant species

Tree	(1) *Abies lasiocarpa* (2) *Picea engelmannii*
Shrub	(1) *Vaccinium scoparium*
Herbaceous	(1) *Luzula glabrata*

Physiographic features

This ecological site typically resides on northerly-facing mountain slopes, at elevations of 4400 to 7200 feet with slope gradients of 25 to 60 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	4,400–7,200 ft
Slope	30–60%
Aspect	NW, N, NE

Climatic features

The climate is cold and moderately dry with 55 to 90 frost-free days, mean annual precipitation of 30 to 50 inches, and mean annual air temperatures of 36 to 40 degrees Fahrenheit.

Table 3. Representative climatic features

Frost-free period (actual range)	55-90 days
Freeze-free period (actual range)	
Precipitation total (actual range)	30-50 in

Influencing water features

This site is not influenced by water from a wetland or stream.

Wetland description

N/A

Soil features

The soils are dominantly Inceptisols, specifically Andic Dystrocryepts, with a loamy-skeletal particle-size class, surface textures of ashy silt loam or ashy fine sandy loam, and andic soil properties. The parent material is volcanic ash over glacial till, colluvium, and residuum. The soils are well drained, have no flooding, ponding or water table and are typically 20 to 40 inches deep to a root-restricting feature. These soils are typically in the cryic soil temperature and udic soil moisture regimes, with less extensive areas in a xeric moisture regime.

Parent Material
volcanic ash over glacial till, colluvium, and residuum

Table 4. Representative soil features

Surface texture	(1) Ashy silt loam (2) Ashy fine sandy loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	35 in
Soil depth	20–40 in
Surface fragment cover <=3"	0–26%
Surface fragment cover >3"	0–25%
Soil reaction (1:1 water) (Depth not specified)	5.1–7.3

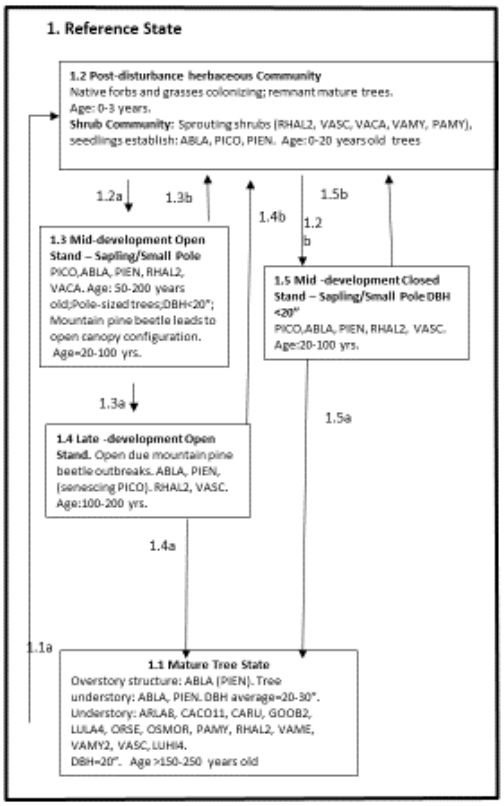
Ecological dynamics

This covers the subalpine fir zone of cold, high elevation areas with persistent slow-melting snow that causes a short growing season. Fire may be more numerous in this MLRA east of the Cascade crest due to the more continental climate, then on the more maritime climate of the west side of the crest in MLRA 3. There are numerous lightning strikes in the area and the fire return interval ranges 100 to 300 years generally, with half of the fires occuring as stand replacing events and half mixed severity fires.

USFS FEIS for *Abies lasiocarpa* for the North Cascades states a fire return interval of 154 years and seral stands with *Pinus contorta* have a fire return interval of 109 years. In the Wenatchee National Forest, fire return intervals were viewed as less than 300 years, as evidenced by stand ages. LANDFIRE BPS 0810550 Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland, has fire return interval ranging from 99 to 125 years, though for subalpine mixed conifer forests as 250 years of stand replacing and mixed severity fires.

Insects and disease can cause small endemic patch disturbances or larger epidemic events. Insects such as mountain pine beetles and bark beetles effect PICO seral stands, causing small or large patches of dead trees. Diseases the effect the site include Armillaria and Annosum root disease, Laminated and Tomentosus root rot, Indian paint fungus, brown cubical rot, dwarf mistletoe.

State and transition model



1 Reference State

1.1 This phase has an overstory dominated by Subalpine fir and Engelmann spruce, with a lower tree canopy of both species, a higher elevations PIAL, LALY; an understory of tall shrubs, and cool, moist adapted herbaceous species. Thick tall and medium statured shrubs and herbaceous species include: ARLA8, CACO11, CARU, GOOB2, LULA4, ORSE, OSMOR, PAMY, RHAL2, VAME, VAMY2, VASC, LUHI4.

1.2 Pioneering herbaceous community. Immediately post-fire, on-site and windblown tree seeds establish, shrub and herbaceous plants resprout and pioneering herbaceous plants establish on mineral soil interspaces. This is a short duration community phase. **Shrub Community**. This plant community contains a high diversity of shrubs including RHAL2, VASC, VACA, VAMY, PAMY. Seedlings mature to saplings including ABLA, PIEN, PICO, at warmer sites PSME, PIMO3, LAOC and at higher elevations LALY, PIAL.

1.3 Mid-development OPEN CANOPY community. This phase is dominated by a mix of ABLA, PIEN and seral tree species (PICO, PSME, PIMO3, LAOC, PIAL, LALY) that are pole sized and are in an open canopy.

1.4 LATE-development OPEN CANOPY community. This phase is dominated by a mix of ABLA, PIEN and seral tree species other than PICO which is senescing after 100 yrs. (PSME, PIMO3, LAOC, PIAL, LALY) that are pole sized and are in an open canopy.

1.5 MID-development CLOSED CANOPY community. This phase is dominated by a mix of ABLA, PIEN and seral tree species (PICO, PSME, PIMO3, LAOC, PIAL, LALY) that are pole sized and are in a closed canopy.

1.1a; 1.3b; 1.4b; 1.5b: Rare, stand-replacement fire that kills significant number of mature trees and top-kills shrubs and herbaceous plants. This disturbance causes a return to the pioneering, herbaceous community with resprouting shrubs.
1.2a:With time, the tree seedlings and small saplings go to the mid development community and due to the occurrence of mixed severity fire the canopy is in an open configuration.
1.2b:With time, the tree seedlings and small saplings go to the mid development community grow into the closed canopy configuration.

1.3a: With time, the pole sized trees develop to large mature trees in the late development phase.
1.4a: With time, the large mature trees develop into the closed configuration of the reference phase without the occurrence of mixed severity fire.
1.5a: With time, the large mature trees develop into the closed configuration of the reference phase without the occurrence of mixed severity fire.

State 1
Reference State

Community 1.1
Mature Tree State

This phase has an overstory dominated by subalpine fir and Engelmann spruce, with a lower tree canopy of both species, at higher elevations PIAL, LALY; an understory of tall shrubs, and cool, moist adapted herbaceous species. Thick-, tall-, and medium-statured shrubs and herbaceous species include: ARLA8, CACO11, CARU, GOOB2, LULA4, ORSE, OSMOR, PAMY, RHAL2, VAME, VAMY2, VASC, LUHI4.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- Engelmann spruce (*Picea engelmannii*), tree
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- Cascade azalea (*Rhododendron albiflorum*), shrub
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- whortleberry (*Vaccinium myrtillus*), shrub
- grouse whortleberry (*Vaccinium scoparium*), shrub
- pinegrass (*Calamagrostis rubescens*), grass
- northwestern sedge (*Carex concinnoides*), grass
- western rattlesnake plantain (*Goodyera oblongifolia*), other herbaceous
- sidebells wintergreen (*Orthilia secunda*), other herbaceous
- smooth woodrush (*Luzula glabrata*), other herbaceous

Community 1.2
Post-Disturbance Herbaceous Community

Pioneering herbaceous community. Immediately post-fire, on-site and windblown tree seeds establish, shrub and herbaceous plants re-sprout and pioneering herbaceous plants establish on mineral soil interspaces. This is a short-duration community phase. Shrub Community. This plant community contains a high diversity of shrubs including RHAL2, VASC, VACA, VAMY, PAMY. Seedlings mature to saplings, including ABLA, PIEN, PICO, at warmer sites

PSME, PIMO3, LAOC and at higher elevations LALY, PIAL.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- Engelmann spruce (*Picea engelmannii*), tree
- lodgepole pine (*Pinus contorta*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- western white pine (*Pinus monticola*), tree
- subalpine larch (*Larix lyallii*), tree
- whitebark pine (*Pinus albicaulis*), tree
- Cascade azalea (*Rhododendron albiflorum*), shrub
- grouse whortleberry (*Vaccinium scoparium*), shrub
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub

Community 1.3
Mid-development Open Stand-Sapling/Small Pole

This phase is dominated by a mix of ABLA, PIEN and seral tree species (PICO, PSME, PIMO3, LAOC, PIAL, LALY) that are pole sized and are in an open canopy.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- Engelmann spruce (*Picea engelmannii*), tree
- lodgepole pine (*Pinus contorta*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- western white pine (*Pinus monticola*), tree
- western larch (*Larix occidentalis*), tree
- whitebark pine (*Pinus albicaulis*), tree
- subalpine larch (*Larix lyallii*), tree

Community 1.4
Late-development Open Stand

This phase is dominated by a mix of ABLA, PIEN and seral tree species other than PICO which is senescing after 100 yrs. (PSME, PIMO3, LAOC, PIAL, LALY) that are pole-sized and are in an open canopy.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- lodgepole pine (*Pinus contorta*), tree
- Engelmann spruce (*Picea engelmannii*), tree
- western larch (*Larix occidentalis*), tree
- whitebark pine (*Pinus albicaulis*), tree
- subalpine larch (*Larix lyallii*), tree

Community 1.5
Mid-development Closed Stand

This phase is dominated by a mix of ABLA, PIEN and seral tree species (PICO, PSME, PIMO3, LAOC, PIAL, LALY) that are pole-sized and are in a closed canopy.

Dominant plant species

- subalpine fir (*Abies lasiocarpa*), tree
- Engelmann spruce (*Picea engelmannii*), tree
- lodgepole pine (*Pinus contorta*), tree

- Douglas-fir (*Pseudotsuga menziesii*), tree
- western white pine (*Pinus monticola*), tree
- western larch (*Larix occidentalis*), tree
- whitebark pine (*Pinus albicaulis*), tree
- subalpine larch (*Larix lyallii*), tree

Pathway 1.1a
Community 1.1 to 1.2

Rare, stand-replacement fire that kills significant number of mature trees and top-kills shrubs and herbaceous plants. This disturbance causes a return to the pioneering, herbaceous community with re-sprouting shrubs.

Pathway 1.2a
Community 1.2 to 1.3

With time, the tree seedlings and small saplings go to the mid-development community and due to the occurrence of mixed severity fire the canopy is in an open configuration.

Pathway 1.2b
Community 1.2 to 1.5

With time, the tree seedlings and small saplings go to the mid development community grow into the closed canopy configuration.

Pathway 1.3b
Community 1.3 to 1.2

Rare, stand-replacement fire that kills significant number of mature trees and top-kills shrubs and herbaceous plants. This disturbance causes a return to the pioneering, herbaceous community with resprouting shrubs.

Pathway 1.3a
Community 1.3 to 1.4

With time, the pole sized trees develop to large mature trees in the late development phase.

Pathway 1.4a
Community 1.4 to 1.1

With time, the large mature trees develop into the closed configuration of the reference phase without the occurrence of mixed severity fire.

Pathway 1.4b
Community 1.4 to 1.2

Rare, stand-replacement fire that kills significant number of mature trees and top-kills shrubs and herbaceous plants. This disturbance causes a return to the pioneering, herbaceous community with resprouting shrubs.

Pathway 1.5a
Community 1.5 to 1.1

With time, the large mature trees develop into the closed configuration of the reference phase without the occurrence of mixed severity fire.

Pathway 1.5b
Community 1.5 to 1.2

Rare, stand-replacement fire that kills significant number of mature trees and top-kills shrubs and herbaceous

plants. This disturbance causes a return to the pioneering, herbaceous community with resprouting shrubs.

Additional community tables

Inventory data references

Information presented here has been derived from NRCS data. Field observations from range trained personnel were also used. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

Other references

Scientific Literature:
Lillybridge, Terry R., et al. "Field guide for forested plant associations of the Wenatchee National Forest." Gen. Tech. Rep. PNW-GTR-359. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 335 p. In cooperation with: Pacific Northwest Region, Wenatchee National Forest 359 (1995).
Henderson, Jan A. Field guide to the forested plant associations of the Mt. Baker-Snoqualmie National Forest. Vol. 28. No. 91. USDA, Forest Service, Pacific Northwest Region, 1992.
Landfire, USFS FEIS.
LANDFIRE, 2007, Biophysical Settings Model Descriptions, LANDFIRE 1.1.0, U.S. Department of the Interior, USDA Forest service, Accessed 20 April 2020 at https://www.landfire.gov/bps-models.php

Contributors

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Approval

Kirt Walstad, 9/11/2023

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	10/12/2024
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):**

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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:**