Ecological site F006XC001WA
Cryic Xeric Mountain Slopes and Plateaus (Subalpine fir Cool Dry Grass)

Last updated: 9/11/2023
Accessed: 10/12/2024

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

Major Land Resource Area (MLRA): 006X–Cascade Mountains, Eastern Slope.

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

Common Resource Area (CRA) 6.7 - Grand Fir Mixed Forest

This LRU occurs predominantly on mountain slopes and plateaus. The soils are dominantly in the Andisols and Inceptisols taxonomic order. Soil parent materials are dominantly colluvium and residuum from igneous, sedimentary, and metamorphic rock, and glacial till, with a mantle or mixture of volcanic ash in the upper part. Taxonomic soil climate is a cryic temperature regime and xeric moisture regime with average annual precipitation of about 40 inches.

Other LRU'S where the site occurs:
CRA 6.1 - North Cascades Subalpine / Alpine
CRA 6.2 - Pasayten / Sawtooth Highland
CRA 6.3 - Okanogan Pine / Fir Hills
CRA 6.4 - Chelan Tephra Hills

Classification relationships

CEG311 (WEN); CE-G3-11 (OKAN) – Subalpine fir/pinegrass (ABLA2/CARU) (modal)

CES112 (WEN) – Subalpine fir/pachistima/pinegrass (ABLA2/PAMY/CARU)
CES113 (WEN); CE-S1-11 (OKAN) – Subalpine fir/pachistima (ABLA2/PAMY)

Ecological site concept

This is the warmest of the subalpine fir ecological sites. Most landscape locations are upper to middle slopes on warmer south to west landscapes. This site compasses three USFS plant associations: ABLA/CARU, ABLA/PAMY/CARU, and ABLA/PAMY. Its biophysical designation is Subalpine fir Cool Dry Grass. Douglas-fir, lodgepole pine, and ponderosa pine are the major seral species. Subalpine fir is the shade tolerant climax species usually found in the understory.

Associated sites

F006XA004WA	**Cold Cryic Xeric Mountain Slopes (Subalpine fir Cold Dry Shrub)** On colder, higher elevation sites. Has grouse whortleberry in the understory.
F006XA003WA	**Cryic Xeric Mountain Slopes (Subalpine fir Cool Moderately Dry Shrub/Herb)** Lower elevation and warmer

Similar sites

F006XA001WA	**Cool Frigid Xeric Ashy Slopes (Douglas-fir Cool Dry Grass)** On warmer, lower elevation sites.
F006XD002WA	**Cool Frigid Xeric Ashy Slopes (Grand fir Cool Dry Grass)** On warmer, lower elevation sites.

Table 1. Dominant plant species

Tree	(1) *Abies lasiocarpa*
Shrub	Not specified
Herbaceous	(1) *Calamagrostis rubescens*

Physiographic features

This ecological site is on mountain slopes and plateaus. It is found between 3200 and 7000 feet in elevation on all aspects. Slope gradients general range from 10 to 65 percent, but can be found on slopes up to 90 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Plateau > Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	4,600–6,000 ft
Slope	10–65%
Water table depth	80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	3,200–7,000 ft
Slope	0–90%

Water table depth	80 in

Climatic features

Mean Annual Air Temperature
Total Range: 1.7 to 5.5 degrees Celsius (35 to 42 F)
Central tendency: 2.8 to 5.0 degrees Celsius (37 to 41 F)

Table 4. Representative climatic features

Frost-free period (characteristic range)	45-80 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	30-55 in
Frost-free period (actual range)	30-100 days
Freeze-free period (actual range)	
Precipitation total (actual range)	25-70 in

Influencing water features

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

Wetland description

N/A

Soil features

This ecological site is associated with several soil mapunit components. The components are dominantly Xeric Vitricryands in the Andisols taxonomic order and Vitrixerandic Haplocryepts in the Inceptisols order. Soils are dominantly moderately deep to very deep and have average available water capacity of about 4.3 inches (10.9 cm) in the 0 to 40-inches (0 to 100 cm) depth range. Soil parent material is dominantly volcanic ash deposits over glacial till, and colluvium and residuum from granitic, volcanic, metamorphic, and sedimentary rock.
Dominant Soil Series: Almac, Fears, Karu, Patuwatam, Snowplow, Verhart, Volmont, Winsand

Parent Materials:
Kind – volcanic ash, residuum, colluvium, glacial till, ash flows
Origin – granitic rock, volcanic rock, schist, gneiss, sedimentary rock, mixed sources

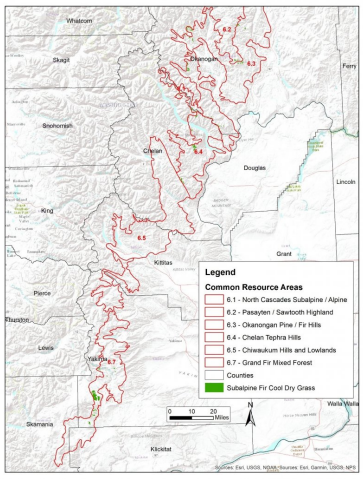


Figure 1. Map of soil mapunits with a major component linked to the Subalpine Fir Cool Dry Grass Ecological Site

Table 5. Representative soil features

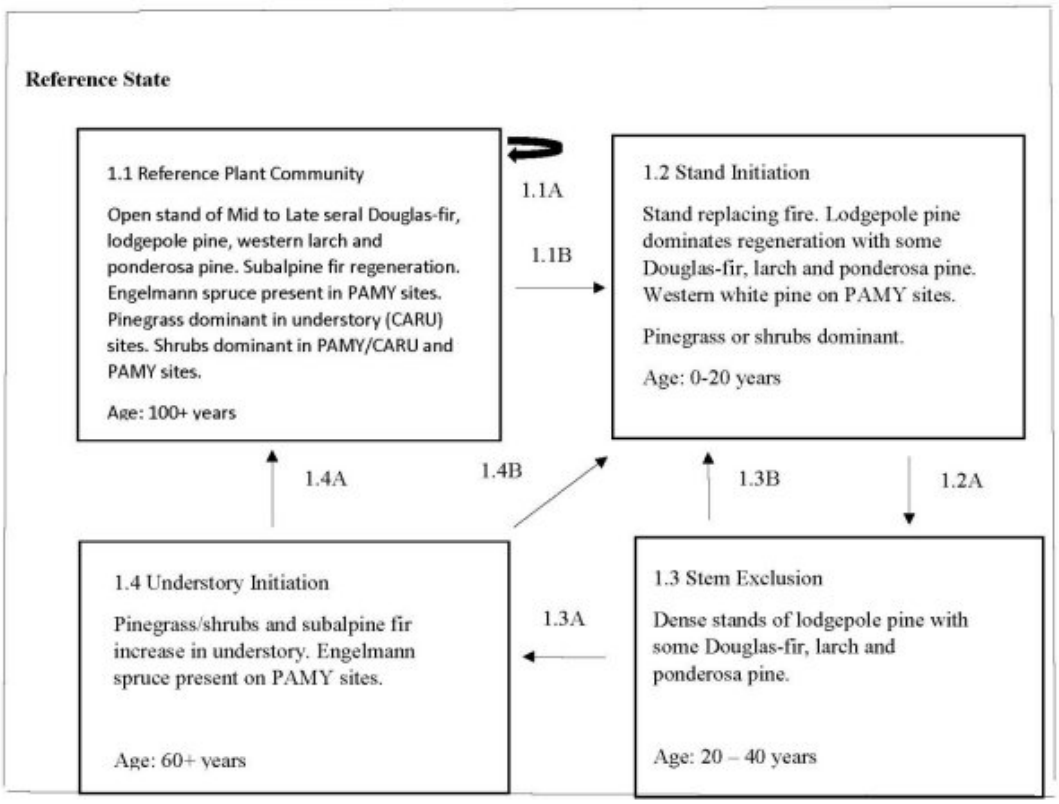
Surface texture	(1) Ashy fine sandy loam (2) Ashy sandy loam
Family particle size	(1) Ashy-skeletal (2) Ashy (3) Ashy over loamy (4) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–16%
Available water capacity (0-40in)	2.2–6.9 in
Calcium carbonate equivalent (Depth not specified)	0%
Electrical conductivity (Depth not specified)	0 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0
Soil reaction (1:1 water) (0-40in)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	17–40%
Subsurface fragment volume >3" (Depth not specified)	2–34%

Ecological dynamics

These are the warmest of the subalpine fir ecological sites. Elevation ranges from less than 2,880 to 5,700 feet. Most landscape locations are upper to middle slopes on warmer south to west landscapes. A big distinction in these sites is ponderosa pine can be more than a minor component in the stand. This site compasses three USFS plant associations: ABLA/CARU, ABLA/PAMY/CARU, and ABLA/PAMY. Its biophysical designation is Subalpine fir Cool Dry Grass. Pinegrass (CARU) will be the dominant herb and form a dominant sod bound condition in CARU sites. In the PAMY/CARU and PAMY (pachistima) sites shrubs will dominate. Douglas-fir, lodgepole pine, and ponderosa pine are the major seral species. Subalpine fir is the shade tolerant climax species usually found in the understory. In the PAMY site western white pine and quaking aspen can be found. The CARU and PAMY/CARU sites are too dry for Engelmann spruce.

Most of this ecological site is located on the north border of CRA 6.4 which occurs at the higher elevation on the north side of Lake Chelan. It also located in adjacent CRA 6.1.
ABLA/CARU sites also occur in CRA 6.7 east of Mt. Adams. They are warmer than the northern sites and have a whole array of shade tolerant and shade intolerant species. Pinegrass and other grasses are the dominant vegetation.

State and transition model



State 1
Reference State

The stand dynamics depend on whether low intensity fires occur frequently to keep an open stand with older mature Douglas-fir, ponderosa pine, and larch. Scattered subalpine fir, lodgepole pine, and Engelmann spruce may be present. In this condition it looks similar to the Douglas-fir and pinegrass ecological site. If there is long low intensity fire intervals overstory and understory fuel loads buildup a stand replacing fire can revert site back to a grass and shrub site with a lodgepole pine the main regenerating tree species. In low intensity fires Douglas-fir remains the dominant overstory with some ponderosa pine and larch. This is typical on the pinegrass and pinegrass/Oregon boxleaf boxwood sites. On the Oregon boxleaf boxwood site there is greater tree stocking and mixed severity fires and stand replacing fires are normal. Here there is a mixed forest of Douglas-fir, Engelmann spruce, Western white pine, ponderosa pine, and quaking aspen. On both scenarios subalpine fir is the climax species and is the main overstory and understory component if long fire intervals exist. This seldom occurs. Pinegrass is the dominant herb in the Pinegrass sites and shrubs like pachistima, spirea, serviceberry, scouler willow, rose, and big huckleberry are dominant over pinegrass in the pinegrass/Oregon boxleaf boxwood and Oregon boxleaf boxwood sites.

Dominant plant species

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

- quaking aspen (*Populus tremuloides*), tree
- thinleaf huckleberry (*Vaccinium membranaceum*), shrub
- whortleberry (*Vaccinium myrtillus*), shrub
- Oregon boxleaf (*Paxistima myrsinites*), shrub
- Douglas maple (*Acer glabrum var. douglasii*), shrub
- dwarf rose (*Rosa gymnocarpa*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- Scouler's willow (*Salix scouleriana*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- russet buffaloberry (*Shepherdia canadensis*), shrub
- pipsissewa (*Chimaphila umbellata*), shrub
- pinegrass (*Calamagrostis rubescens*), grass
- western rattlesnake plantain (*Goodyera oblongifolia*), other herbaceous
- heartleaf arnica (*Arnica cordifolia*), other herbaceous
- lupine (*Lupinus*), other herbaceous

Community 1.1
Reference PC

Frequent ground fires create an open stand of mature Douglas-fir with some western larch, ponderosa pine, and lodgepole pine. Pinegrass dominates the understory. This is perpetuated with continual ground fires. In the Oregon boxleaf boxwood sites mixed severity fires create a mixed species stand with pachistima and other shrubs dominating the understory. Subalpine fir is the main regeneration species with long fire intervals. Frequent ground fires favor Douglas-fir, ponderosa pine, and western larch. Severe stand replacing fires favor quick lodgepole pine establishment.

Resilience management. Plant Community Pathway 1.1A Frequent ground fires maintain open stand.

Community 1.2
Stand Initiation

Frequent ground fires would reduce subalpine fir regeneration and favor scattered Douglas-fir, ponderosa pine, western larch, and lodgepole pine. Lack of fire would favor subalpine fir and Engelmann spruce (Oregon boxleaf boxwood sites). Severe fires would favor lodgepole pine. Pinegrass would dominate the understory in frequent ground fires on pinegrass sites. In shrub dominated Oregon boxleaf boxwood sites shrubs would re-sprout and increase.

Community 1.3
Stem Exclusion

Dense stands of mixed species or lodgepole pine depending on fire severity.

Community 1.4
Understory Reinitiation

Dense stand thins out from competition and insect/disease mortality allowing understory tree regeneration and pinegrass or shrub species to increase. Stands could be mixed or composed of mainly lodgepole pine. Subalpine fir and Engelmann spruce (Oregon boxleaf boxwood sites) would be main regeneration.

Pathway 1.1B
Community 1.1 to 1.2

Stand replacing fire due to lack of frequent ground fires and fuel load buildup.

Pathway 1.2A
Community 1.2 to 1.3

Time. Tree regeneration grows into dense stands.

Pathway 1.3B
Community 1.3 to 1.2

Stand replacing fire back to plant community phase 1.2

Pathway 1.3A
Community 1.3 to 1.4

Time. Dense stands grow and thin out creating canopy gaps. Understory vegetation and tree regeneration increases.

Pathway 1.4A
Community 1.4 to 1.1

Time. Tree overstory matures. Frequent fires create open stand with old Douglas-fir. Mixed severity fires create a mosaic of mixed tree species. Severe fire creates an old lodgepole pine stand. Subalpine fir is major regeneration species.

Pathway 1.4B
Community 1.4 to 1.2

Stand replacing fire back to plant community phase 1.2. This could be perpetuated by consistent lodgepole pine establishment and burns.

Additional community tables

Other information

Site index /Culmination Mean Annual Increment (CMAI)

Overall, this ecological site has moderate productivity. Site indexes are measured on 50 year and 100 year tables based on Breast Height Age (BA) or Total Age (TA). CMAI indicates the sites ability to produce wood at a certain age of a stand's maximum annual growth measured in cubic feet per acre.

Table 6. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
Douglas-fir	*PSME*	50	92	29	109	116	–	–	
ponderosa pine	*PIPO*	63	92	49	88	55	–	–	
lodgepole pine	*PICO*	55	75	43	79	100	–	–	
subalpine fir	*ABLA*	55	75	44	70	125	–	–	
Engelmann spruce	*PIEN*	80	–	76	–	100	–	–	

Inventory data references

Relationship to Other Established Classifications:

United States National Vegetation Classification (2008) – A3643 Subalpine fir – Engelmann Spruce Rocky Mt. Dry-Mesic Forest Alliance.

Washington Natural Heritage Program. Ecosystems of Washington State, A Guide to Identification, Rocchio and

Crawford, 2015 –
Rocky Mountain Subalpine fir Dry-Mesic Spruce-fir Forest and Woodland Group.

USDA NRCS Common Resource Areas 6.1, 6.4
Level III and IV Ecoregions of WA, US EPA, June 2010 – 77c, 77f, 9b

This ecological site includes the following USDA Forest Service Plant Associations: ABLA/CARU, ABLA/PAMY/CARU, ABLA/PAMY. Lillibridge e. al. PNW GTR – 359, Oct. 1995, Williams et al. R6-Ecol-132b-1983, September 1983

Other references

Forest Plant Associations of the Wenatchee National Forest, PNW-GTR-359. October 1995. Lillybridge et al.
Forest Plant Associations of the Okanogan National Forest, R6-Ecol-132b-1983, September 1983
NRCS Soil and Site Index data for MLRA B6 in form of excel spreadsheets.
SSURGO MLRA B6 Soil Component Forest Ecoclasses (Plant Associations)

Contributors

Gary Kuhn
Carri Gaines
Steven Campbell

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):**

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:**