

Ecological site F006XB004WA

Mesic Xeric Foothills and Mountain Slopes (Ponderosa Pine Hot Dry Shrub Grass)

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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

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) 6.5 - Chiwaukum Hills and Lowlands This LRU occurs predominantly on slopes of hills and mountains. The soils are dominantly in the Mollisols taxonomic order with less extensive areas of Andisols, Alfisols and Inceptisols . Soil parent materials are dominantly colluvium and residuum from igneous, sedimentary, and metamorphic rock, glacial outwash, and glacial till, with a mantle or mixture of volcanic ash and loess in the upper part. Taxonomic soil climate is primarily a mesic temperature regime and xeric moisture regime with average annual precipitation of about 19 inches. Other LRU'S where the site occurs: CRA 6.3 - Okanogan Pine / Fir Hills CRA 6.4 - Chelan Tephra Hills CRA 6.6 - Yakima Plateau and Slopes CRA 6.8 - Oak-Conifer Eastern Cascades - Columbia Foothills

Classification relationships

CPS241 - ponderosa pine/bitterbrush/ bluebunch wheatgrass (PIPO/PUTR/PSSP) (WEN)

Ecological site concept

This ecological site can be highly variable depending on fire occurrence and severity, and seed source of shrubs and pine. It includes two plant associations: Ponderosa pine/bitterbrush/bluebunch wheatgrass and Ponderosa pine/bitterbrush. Pine savannahs are the transition from forest to range and are considered part of the range ecological site. For this ecological site Ponderosa pine and bitterbrush are the main cover species with Idaho fescue and bluebunch wheatgrass inversely proportionate to bitterbrush depending on fire disturbance. Soils will vary from sandy to loamy.

Associated sites

F006XA007WA	Warm Frigid Xeric Mountain Slopes (Douglas-fir Warm Dry Shrub/Herb) On northerly aspects.
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F006XB001WA	Frigid Xeric Mountain Slopes (Douglas-fir Moderately Dry Shrub/Herb) Little moister.
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Similar sites

F006XA002WA	Mesic Xeric Hill Slopes and Terraces (Ponderosa Pine Hot Dry Grass) This site lacks bitterbrush in the understory.
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Table 1. Dominant plant species

Tree	(1) <i>Pinus ponderosa</i>
Shrub	(1) <i>Purshia tridentata</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i>

Physiographic features

This ecological site occurs mainly on plateaus, and back slopes, shoulders and foot slopes of hills and mountains, glacial outwash terraces, and alluvial fans. It is found between 900 feet and 3800 feet in elevation on all aspects. Slope gradients generally range from 8 to 45 percent but can be found on slopes up to 90 percent.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Hillslope (2) Mountains > Mountain slope (3) Foothills > Structural bench (4) Alluvial fan (5) Outwash terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	370 – 980 m
Slope	10 – 50 %
Water table depth	200 cm

Aspect	W, NW, N, NE, E, SE, S, SW
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Table 3. Representative physiographic features (actual ranges)

Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	270 – 1,160 m
Slope	0 – 90 %
Water table depth	90 – 200 cm

Climatic features

Mean Annual precipitation
Total Range: 12 - 35 inches
Central tendency: 16 - 23 inches

Mean Annual Air Temperature
Total Range: 6 - 11 C (43 - 52 F)
Central tendency: 7 - 10 C (45 -50 F)

Frost-free period (days)
Total range: 90 - 170
Central tendency: 110 - 160

Table 4 Representative climatic features

Frost-free period (characteristic range)	110-160 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	410-580 mm
Frost-free period (actual range)	90-170 days
Freeze-free period (actual range)	
Precipitation total (actual range)	310-890 mm

Climate stations used

- (1) LEAVENWORTH 3 S [USC00454572], Leavenworth, WA

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 map unit components. The components are dominantly Haploxerolls in the Mollisols taxonomic order, with less extensive areas of Haploxeralfs in the Alfisols order and Vitrixerands in the Andisols order. Soils range from shallow to very deep and have average available water capacity of about 4.4 inches (11.2 cm) in the 0 to 40-inches (0 to 100 cm) depth range. Soil parent material is dominantly colluvium and residuum from granitic, volcanic, metamorphic, and sedimentary rock , glacial outwash, and glacial till, with minor amounts of volcanic ash and loess.

Dominant Soil Series: Blag, Brisky, Cle Elum, Leiko Lyville, Tekison, Thowson

Parent Materials:

Kind – colluvium, residuum, glacial outwash, glacial till, minor amounts of volcanic ash and loess

Origin – granitic, volcanic, metamorphic, and sedimentary rock

Figure 7. Map of soil mapunits with a major component linked to the Ponderosa Pine Warm Dry Shrub Grass Ecological Site

Table 5. Representative soil features

Surface texture	(1) Ashy loam (2) Ashy sandy loam (3) Ashy fine sandy loam
Family particle size	(1) Loamy-skeletal (2) Sandy-skeletal (3) Fine-loamy
Drainage class	Well drained
Depth to restrictive layer	30 – 150 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	0 – 30 %
Available water capacity (Depth not specified)	1.52 – 24.89 cm

Calcium carbonate equivalent (Depth not specified)	0 – 10 %
Soil reaction (1:1 water) (0-25.4cm)	5.6 – 7.8
Subsurface fragment volume <=3" (Depth not specified)	0 – 40 %
Subsurface fragment volume >3" (Depth not specified)	0 – 40 %

Ecological dynamics

This ecological site can be highly variable depending on fire occurrence and severity, and seed source of shrubs and pine. It includes two plant associations: Ponderosa pine/bitterbrush/bluebunch wheatgrass and Ponderosa pine/bitterbrush. It is found scattered throughout CRA 6.3, on foothills and side slopes of Lake Chelan in CRA 6.4, large acreages in the north half of CRA 6.5 and on the eastern edge of CRA 9a. It is very similar to the ecological site Ponderosa Pine Warm Dry Shrub Grass in MLRA 430 along the Columbia and Spokane Rivers. Through the ages it has had much human disturbance from Native Americans and from European settlement. Sites can be described as open pine/woodland with the overstory pine cover less than 40 percent. As the landscape becomes hotter and drier the overstory pine stocking drops below 10 percent, due to site conditions, this is considered a pine savanna. Pine savannas are the transition from forest to range and are considered part of the range ecological site. For this ecological site Ponderosa pine and bitterbrush are the main cover species with Idaho fescue and bluebunch wheatgrass inversely proportionate to bitterbrush depending on fire disturbance. Soils will vary from sandy to loamy.

Ponderosa pine/shrub woodland will occur when fire intervals are 20 to 30 years allowing the bitterbrush to dominate the cover with scattered pine clusters. Frequent ground fires every 7 to 10 years will lead to a ponderosa pine/grass savanna with the bitterbrush killed by fire and bunchgrasses increasing. When fire occurrence is extended in the pine/shrub woodland pine cover increases with a mosaic of medium density pine stands with bitterbrush in the openings. Mix severity fires maintain this mosaic pine/shrub woodland and/or pine/grass woodland. In long extended fire intervals, a multi-story dense ponderosa pine forest will establish with shrubs and grass in small percentages in the understory.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 10. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 11. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 12. Community 4.1 plant community composition

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

Relationship to Other Established Classifications: United States National Vegetation Classification (2008) – A3446 Ponderosa Pine / Shrub Understory Central Rocky Mt. Forest & Woodland Alliance Washington Natural Heritage Program. Ecosystems of Washington State, A Guide to Identification, Rocchio and Crawford, 2015 – Northern Rocky Mountain Ponderosa Pine Woodland and Savanna Description of Ecoregions of the United States, USFS PN # 1391, 1995 - M332 Middle Rocky Mountain Steppe– Coniferous Forest –Alpine Meadow Province USDA NRCS WA Common Resource Areas. CRA 6.3 Okanogan Pine/Fir Hills. CRA 6.4 Chelan Tephra Hills, CRA 6.5 Chiwaukum Hills and Lowlands, CRA 6.6 Yakima Plateau and Slopes Level III and IV Ecoregions of WA, US EPA, June 2010 – 77e Okanogan Pine/Fir Hills, 77f Chelan Tephra Hills, 77h Chiwaukum Hills and Lowlands, 9a Yakima Plateau and Slopes This ecological site includes the following USDA Forest Service Plant Associations: PIPO/PUTR, PIPO/PUTR/PSSP. (Lillybridge et. al. 1995) Wenatchee National Forest Plant Association: CPS241 - ponderosa pine/bitterbrush/ bluebunch wheatgrass (PIPO/PUTR/PSSP) Yakama Nation Habitat Type: 35 - Pinus ponderosa /Purshia tridentata (PIPO/PUTR)

Other references

Forest Vegetation of Eastern Washington and Northern Idaho. Washington State University, College of Agriculture, Tech. Bulletin 60, R. Daubenmire and J. Daubenmire, 1968

Fire Ecology of the Forest Habitat Types of Northern Idaho. USFS Intermountain Research Station, GT Report INT – GTR – 363, Smith and Fischer, 1997.

Forested Plant Associations of the Okanogan National Forest, R6-Ecol-132b-1983. Williams, Lillybridge, September 1983

Forest Plant Associations of the Wenatchee National Forest, PNW-GTR-359. Lillybridge et al, October 1995

NRCS Nat. Forestry Manual, 1998

NRCS Soil and Site Index data for NE WA and N. Idaho in form of excel spreadsheets.

NRCS Range 5 Forage Production plots from Okanogan County, 1990 South Summit CRM, 1992 Chiliwist CRM

Contributors

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Approval

Kirt Walstad, 4/01/2025

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	04/01/2025
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):

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:
