Ecological site F006XD005WA
Frigid Xeric Mountain Slopes and Plateaus (Grand fir Warm Moderately Dry Shrub)

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

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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

Common Resource Area (CRA) 6.6 - Yakima Plateau and Slopes

This LRU occurs predominantly on mountain slopes, structural benches, canyons, and plateaus. The soils are dominantly in the Andisols taxonomic order, with some Alfisols, Inceptisols, and Mollisols. Soil parent materials are dominantly colluvium and residuum from basalt and andesite with a component of volcanic ash in the upper part. Taxonomic soil climate is a frigid temperature regime and xeric moisture regime with average annual precipitation of about 42 inches.

Other LRU'S where the site occurs:
CRA 6.7 - Grand Fir Mixed Forest

Classification relationships

Yakima Nation Plant Associations:
#7 – Grand fir/western hazel (ABGR/COCOC)

Ecological site concept

This ecological site is unique to the Yakima Indian Reservation in the southern area of CRA 6.8 mostly in Peavine Ridge and Toppenish Ridge areas. It occurs at elevations 2500 – 4500 feet on mostly north aspects. Stands are dominated by Douglas-fir with some ponderosa pine and western larch. Grand fir is in the sub-canopy and is the major regeneration species under the dense Douglas-fir canopy. This site can support good stocking of trees. Any canopy openings can become brushy. Main shrub species are western (California) hazel, spirea, snowberry, creeping snowberry, rose, and Douglas maple.

Associated sites

F006XB003WA	**Frigid Xeric Mountain Slopes (Grand fir Warm Moderately Dry Low Shrub/Herb)**
F006XC003WA	**Cool Frigid Moist Xeric Mountain Slopes (Grand fir Cool Moist Shrub/Herb)** On slightly cooler sites.

Similar sites

F006XD002WA	**Cool Frigid Xeric Ashy Slopes (Grand fir Cool Dry Grass)** On cooler sites.

Table 1. Dominant plant species

Tree	(1) *Abies grandis*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This LRU This ecological site is unique to the Yakima Indian Reservation in the southern area of CRA 6.8 mostly in Peavine Ridge and Toppenish Ridge areas. It occurs at elevations 2500 to 4500 feet on mostly north aspects on mountain slopes, structural benches, canyons, and plateaus.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Structural bench (3) Canyon (4) Plateau > Plateau
Flooding frequency	None
Ponding frequency	None
Elevation	2,500–4,200 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	1,500–5,200 ft
Slope	0–90%
Water table depth	Not specified

Climatic features

Mean Annual Air Temperature
Total Range: 3.9 to 8.3 degrees Celsius (39 to 47 degrees F)
Central tendency: 6.1 to 7.2 degrees Celsius (43 to 45 degrees F)

Table 4. Representative climatic features

Frost-free period (characteristic range)	85-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	30-45 in
Frost-free period (actual range)	70-125 days
Freeze-free period (actual range)	
Precipitation total (actual range)	20-60 in

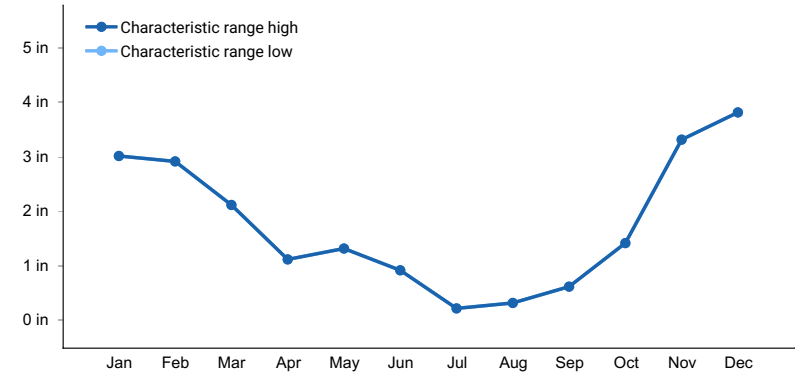


Figure 1. Monthly precipitation range

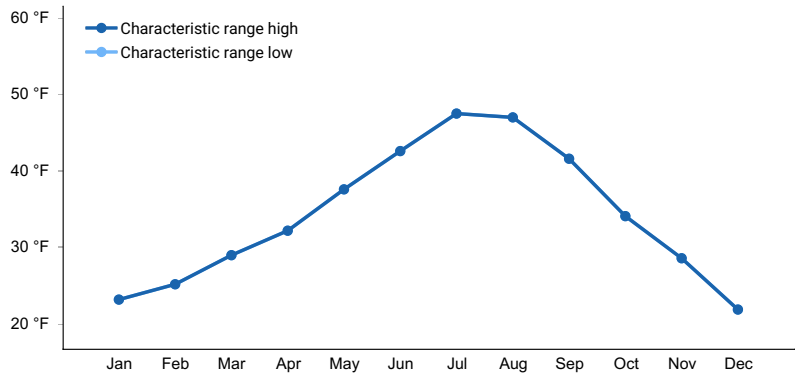


Figure 2. Monthly minimum temperature range

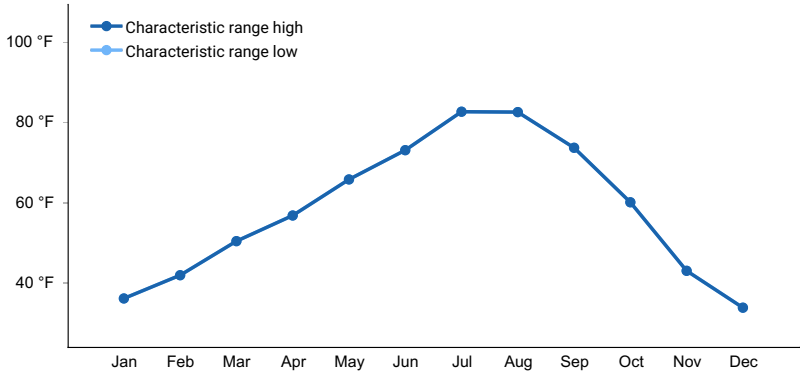


Figure 3. Monthly maximum temperature range

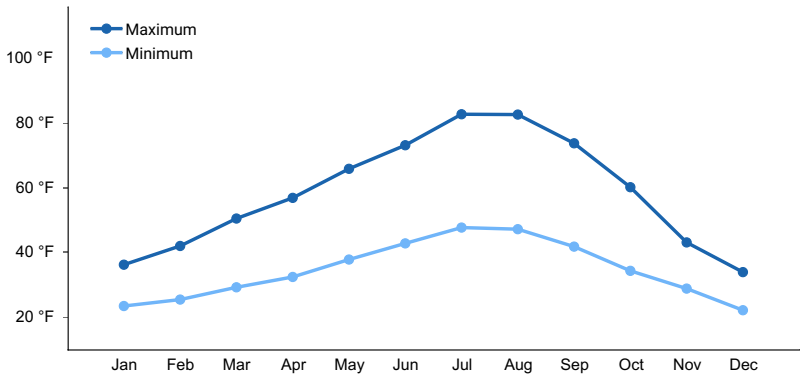


Figure 4. Monthly average minimum and maximum temperature

Climate stations used

- (1) SATUS PASS 2 SSW [USC00457342], Goldendale, 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 mapunit components. The components are dominantly Vitrixerands in the Andisols taxonomic order, Vitrandic Argixerolls in the Mollisols order, and Andic Haploxeralfs in the Alfisols order. Soils are dominantly moderately deep to very deep and have average available water capacity of about 4.5 inches (11.4 cm) in the 0 to 40-inches (0 to 100 cm) depth range. Soil parent materials are dominantly colluvium and residuum from basalt and andesite with a component of volcanic ash in the upper part.

Dominant Soil Series: Firoke, Kaat, Nchitaak, Satus, Singh, Stemilt, Yatama

Parent Materials:
Kind – volcanic ash, loess, colluvium, residuum, ash flow deposits
Origin – basalt, andesite, mixed sources

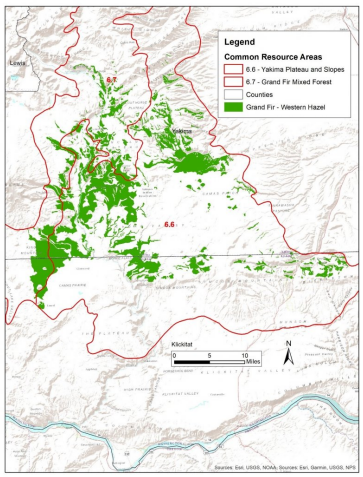


Figure 5. Map of soil mapunits with a major component linked to the Grand Fir - Western Hazel Ecological Site

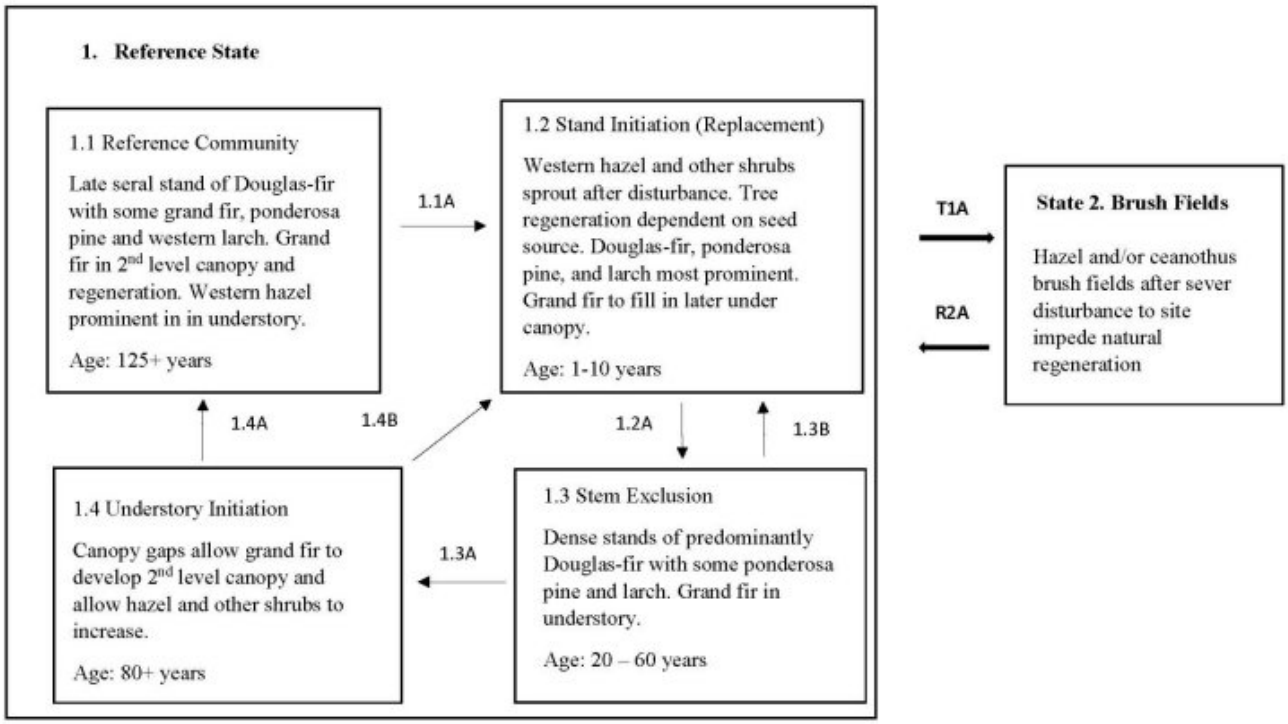
Table 5. Representative soil features

Surface texture	(1) Ashy sandy loam (2) Ashy sandy loamAshy fine sandy loam (3) Ashy loam
Family particle size	(1) Ashy-skeletal (2) Ashy over loamy-skeletal (3) Loamy-skeletal
Drainage class	Well drained to somewhat excessively drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–12%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	1.6–7.5 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)	5.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	10–42%
Subsurface fragment volume >3" (Depth not specified)	0–35%

Ecological dynamics

This ecological site is unique to the Yakima Indian Reservation in the southern area of CRA 6.8 mostly in Peavine Ridge and Toppenish Ridge areas. It occurs at elevations 2500 to 4500 feet on mostly north aspects. Stands are dominated by Douglas-fir with some ponderosa pine and western larch. Grand fir is in the subcanopy and is the major regeneration species under the dense Douglas-fir canopy. This site can support good stocking of trees. Any canopy openings can become brushy. Main shrub species are western (California) hazel, spirea, snowberry, creeping snowberry, rose, and Douglas maple. Ceanothus species can establish and compete after fires. Douglas-fir, ponderosa pine, and western larch can establish after stand replacing fires. Oregon white oak and quaking aspen can be present sporadically on the site, but not very abundant. Fire regimes would be mixed severity or stand replacing.

State and transition model



State 1
Reference State

The state is dominated with productive stands of Douglas-fir. Ponderosa pine and western larch can also be a component in the stand, along with grand fir. Grand fir is the dominant understory tree in the second level canopy and regeneration. Western hazel is the dominant understory shrub in all of the Plant Community Phases 1.1 to 1.4 and can sprout quickly after fire or release strongly after canopy gaps in mature stands. Fire regimes would be in the stand replacing or mix severity realm occurring 50 to 100 year range.

Dominant plant species

- Douglas-fir (*Pseudotsuga menziesii*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- western larch (*Larix occidentalis*), tree
- grand fir (*Abies grandis*), tree
- Oregon white oak (*Quercus garryana*), tree
- quaking aspen (*Populus tremuloides*), tree
- beaked hazelnut (*Corylus cornuta*), shrub
- white spirea (*Spiraea betulifolia*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- rose (*Rosa*), shrub
- mountain snowberry (*Symphoricarpos oreophilus*), shrub
- wintergreen (*Pyrola*), shrub
- pipsissewa (*Chimaphila umbellata*), shrub
- Geyer's sedge (*Carex geyeri*), grass

- pinegrass (*Calamagrostis rubescens*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- sweetroot (*Osmorhiza*), other herbaceous

Community 1.1
Reference Community

Mature stands of Douglas-fir dominate the overstory with some ponderosa pine, western larch, and grand fir. Grand fir is the dominant regeneration with some Douglas-fir. Western hazel dominates the understory in addition to snowberry, rose, and spirea, and ceanothus.

Community 1.2
Stand Initiation (Replacement)

Shrub stage with sprouting of western hazel. Natural regeneration dependent on tree species seed source. Most likely Douglas-fir, ponderosa pine, and western larch. Grand fir would fill in regeneration later when canopy develops.

Community 1.3
Stem Exclusion

Pole stands of Douglas-fir grow and canopy gaps occur allowing shrubs, herbs and tree regeneration to grow. Western hazel takes advantage of these gaps and can dominate. Most of the tree regeneration is grand fir, with some Douglas-fir.

Community 1.4
Understory Initiation

Stands of Douglas-fir and grand fir grow and canopy gaps occur with tree to tree competition allowing western hazel, other shrubs, tree regeneration, and forbs to increase.

Pathway 1.1A
Community 1.1 to 1.2

Stand replacing fire bringing plant community back to shrub stage with regeneration, depending on western hazel or ceanothus competition.

Pathway 1.2A
Community 1.2 to 1.3

Tree regeneration, most likely Douglas-fir and ponderosa pine grows into dense stands. Some grand fir present in the understory. Scattered western larch could be present.

Pathway 1.3B
Community 1.3 to 1.2

Stand replacing fire in dense pole stands revert back to shrub plant community phase.

Pathway 1.3A
Community 1.3 to 1.4

Time, pole stage grows into larger diameters with competition causing canopy gaps for understory vegetation release.

Pathway 1.4A
Community 1.4 to 1.1

Old growth dynamics start occurring in stand with large Douglas-fir dominating the overstory with some grand fir. Second level canopy dominated by grand fir. Scattered ponderosa pine and western larch may be present.

Pathway 1.4B
Community 1.4 to 1.2

Stand replacing fire or mixed severity fires create large openings for hazel and other shrubs to dominate.

State 2
Western Hazel/Ceanothus Brush Fields

Severe fires to site can cause hazel and other shrubs to dominate site impeding or preventing natural regeneration.

Transition T1A
State 1 to 2

Severe fires kill all standing trees and damage site allowing shrubs to sprout and dominate.

Restoration pathway R2A
State 2 to 1

Control of shrub competition and replanting Douglas-fir, ponderosa pine (drier sites), and western larch. Inspection of site qualities important before replanting e.g. soil organic matter and ash layer.

Additional community tables

Other information

Site index /Culmination of Mean Annual Increment (CMAI)

Overall, this site is productive for Douglas-fir, ponderosa pine, and grand fir. Douglas-fir and ponderosa pine being the preferred species for management. 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*	85	103	92	139	94	–	–	
grand fir	*ABGR*	81	91	116	135	106	–	–	
ponderosa pine	*PIPO*	97	113	97	128	40	–	–	
lodgepole pine	*PICO*	90	–	108	–	100	–	–	

Inventory data references

Yakima Indian Plant Associations:
#7 – Grand fir/western hazel (ABGR/COCOC)

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

Forest Plant Associations of the Yakima Indian Reservation, May 1988. Thomas, Hart, and Clausnitzer
Washington Natural Heritage Program. Ecosystems of Washington State, a Guide to Identification, Rocchio and Crawford, 2015 –
East Cascades Mesic Montane-Mixed Conifer Forest and Woodland
NRCS MLRA 6 Soil-Forest Productivity data base
NRCS Conservation Resource Area Maps (CRAs)
NRCS MLRA 6 Soil-Forest Plant Association data base
On site field reviews of Central and South CRAs with professional interpretation. June and July 2019. Kuhn, Campbell

Contributors

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Steve Campbell
Carri Gaines

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:

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17. **Perennial plant reproductive capability:**