USDA Natural Resources Conservation Service

Ecological site F006XD004WA
Mesic Xeric Slopes and Plateaus (Oregon White Oak-Ponderosa pine Hot Dry Herb/Shrub)

Last updated: 9/11/2023
Accessed: 05/12/2025

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) 6.8 - Oak-Conifer Eastern Cascades - Columbia Foothills

This LRU occurs predominantly on structural benches, hillslopes, plateaus, canyons, and terraces. The soils are dominantly in the Mollisols and Alfisols taxonomic order, with minor areas of Inceptisols and Andisols. Soil parent materials are dominantly colluvium and residuum from basalt with a component of loess and volcanic ash. Taxonomic soil climate is primarily a mesic temperature regime with minor areas with a frigid temperature regime. The moisture regime is xeric with average annual precipitation of about 23 inches.

Other LRU'S where the site occurs: CRA 6.6 - Yakima Plateau and Slopes

Classification relationships

HOG211 (WEN) – Oregon White Oak/pinegrass-elk sedge (QUGA/CARU/CAGE)
Yakima Nation
#30 – Ponderosa pine – Oregon White Oak/elk sedge (PIPO-QUGA/CAGE)

#31 – Ponderosa pine – Oregon White Oak/bitterbrush (PIPO-QUGA/PUTR2)

Ecological site concept

These ponderosa pine – Oregon white oak sites are located on the foot slopes and mid – steep slopes on the southern portion of CRA 6.6 and eastern half of CRA 6.8. Two plant associations are included in this ecological site: QUGA-PIPO/CAGE and QUGA-PIPO/PUTR. The CAGE site is located on moderate to flat terrain and the PUTR site is located on steeper south facing slopes. The dominant overstory is a mix of ponderosa pine and Oregon white oak and the dominant understory regeneration is oak with some pine. Quaking aspen clumps can occur and Douglas-fir can be found in the overstory and understory, however the site is too hot and dry for Douglas-fir dominance.

Associated sites

F006XB004WA	**Mesic Xeric Foothills and Mountain Slopes (Ponderosa Pine Hot Dry Shrub Grass)** On cooler sites, slightly moister sites.
F006XB001WA	**Frigid Xeric Mountain Slopes (Douglas-fir Moderately Dry Shrub/Herb)** On cooler, moister sites with northerly aspects.

Similar sites

F006XD003WA	**Mesic Xeric Slopes and Flood Plains (Oregon white oak-Ponderosa Pine Hot Moderately Dry Shrub)** On moister sites.

Table 1. Dominant plant species

Tree	(1) *Quercus garryana* (2) *Pinus ponderosa*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This ecological site occurs mainly on structural benches, hillslopes, plateaus, canyons, and terraces. It is found between 200 feet and 4,500 feet in elevation on all aspects. Slope gradients generally range from 0 to 40 percent, but can be found on slopes up to 65 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Structural bench (2) Plateau > Plateau (3) Hillslope (4) Canyon (5) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	152–1,067 m
Slope	3–40%
Water table depth	203 cm
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	61–1,372 m
Slope	0–65%
Water table depth	203 cm

Climatic features

Mean Annual Air Temperature
Total Range: 40 to 50 degrees Fahrenheit
Central tendency: 43 to 48 degrees Fahrenheit

Table 4. Representative climatic features

Frost-free period (characteristic range)	90-150 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	508-762 mm
Frost-free period (actual range)	75-180 days
Freeze-free period (actual range)	
Precipitation total (actual range)	381-1,016 mm

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 in the Haploxeralfs, Haploxerepts, Palexerolls, and Argixerolls taxonomic great groups. Soils are dominantly moderately deep to very deep and have average available water capacity of about 5.2 inches (13.2 cm) in the 0 to 40-inches (0 to 100 cm) depth range. Soil parent material is dominantly residuum and colluvium from basalt with a component of loess and volcanic ash.
Dominant Soil Series: Berson, Guler, Gunn, Itat, Kusshi, Lyville, Odo, Tekison

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

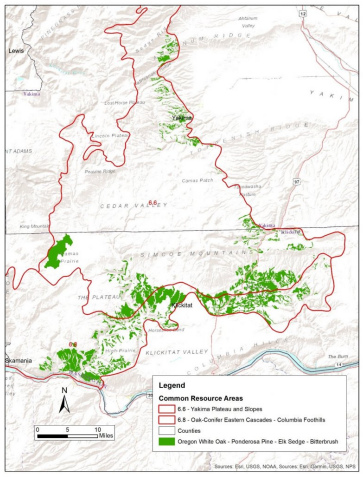


Figure 1. Map of soil mapunits with a major component linked to the Oregon White Oak - Ponderosa Pine - Elk sedge - Bitterbrush Ecological Site

Table 5. Representative soil features

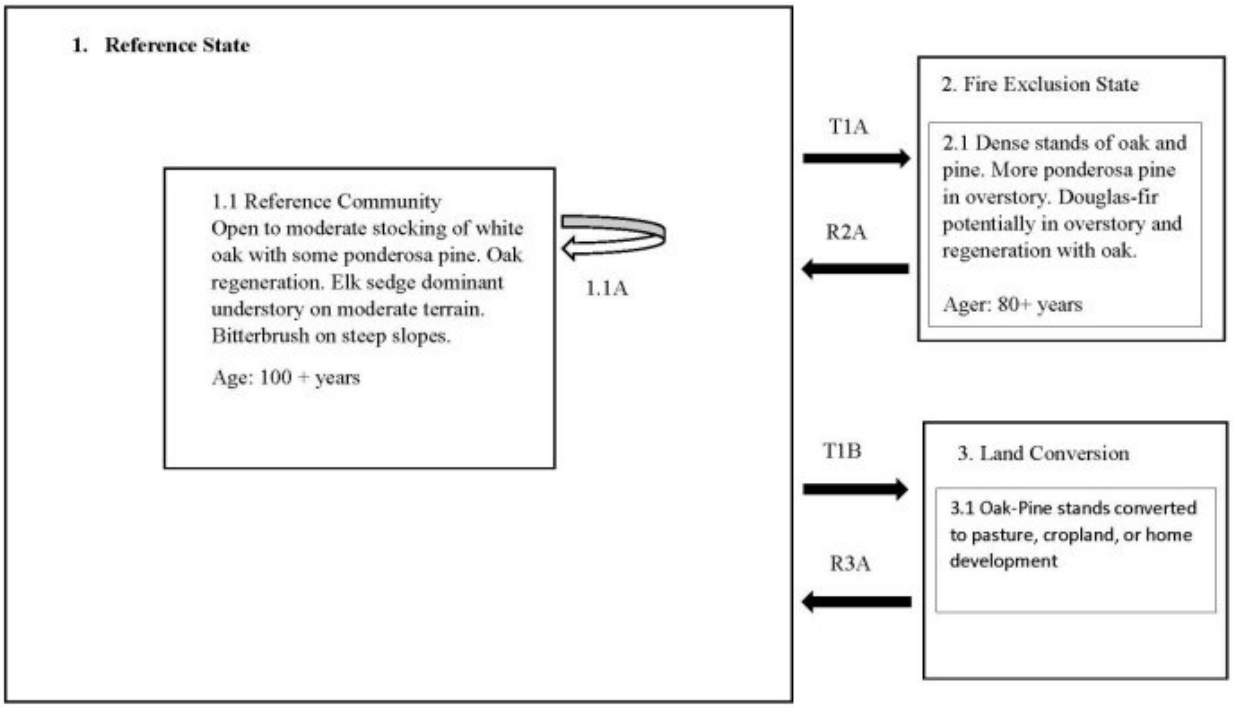
Surface texture	(1) Loam (2) Sandy loam (3) Silt loam
Family particle size	(1) Fine-loamy (2) Loamy-skeletal
Drainage class	Well drained
Depth to restrictive layer	51–152 cm
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–15%
Available water capacity (0-101.6cm)	6.1–19.56 cm
Calcium carbonate 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) (0-101.6cm)	4.5–7.3
Subsurface fragment volume <=3" (Depth not specified)	0–60%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

These ponderosa pine – Oregon white oak sites are located on the foot slopes and mid – steep slopes on the southern portion of CRA 6.6 and eastern half of CRA 6.8. Two plant associations are included in this ecological site: QUGA-PIPO/CAGE and QUGA-PIPO/PUTR. The CAGE site is located on moderate to flat terrain and the PUTR site is located on steeper south facing slopes. The dominant overstory is a mix of ponderosa pine and Oregon white oak and the dominant understory regeneration is oak with some pine. Quaking aspen clumps can occur and Douglas-fir can be found in the overstory and understory, however the site is too hot and dry for Douglas-fir dominance. Most of these sites are overgrown due to fire exclusion with more pine in the overstory than normal. More open oak stands were the norm before pre-European settlement with frequent low intensity ground fires maintaining open oak stands.

These are hot and dry sites which transition to Douglas-fir or grand fir sites at higher elevations or north aspects. Many of these sites have been overgrazed or converted to pasture. Elk sedge will occur in the understory throughout the moderate to flat terrain and bitterbrush will be prevalent in the steeper terrain. Low intensity to mixed severity fires will occur on these sites. White oak is somewhat tolerant of these fires and will re-sprout maintaining an oak presence with pine reseeding in later.

State and transition model



State 1
Reference State

In pre-European times oak stands were open due to frequent low intensity ground fires, many started by native Americans. Conifers like ponderosa pine and Douglas-fir were not a dominant part of the overstory. Native grasses, sedges, and shrubs were abundant in the understory. Large diameter oaks existed due to less competition from other oaks and conifers.

Dominant plant species

- ponderosa pine (*Pinus ponderosa*), tree
- Oregon white oak (*Quercus garryana*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- Scouler's willow (*Salix scouleriana*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- white spirea (*Spiraea betulifolia*), shrub

- redstem ceanothus (*Ceanothus sanguineus*), shrub
- snowbrush ceanothus (*Ceanothus velutinus*), shrub
- common snowberry (*Symphoricarpos albus*), shrub
- hollyleaved barberry (*Mahonia aquifolium*), shrub
- wax currant (*Ribes cereum*), shrub
- Geyer's sedge (*Carex geyeri*), grass
- pinegrass (*Calamagrostis rubescens*), grass
- spreading dogbane (*Apocynum androsaemifolium*), grass
- bluegrass (*Poa*), grass
- common yarrow (*Achillea millefolium*), other herbaceous
- lupine (*Lupinus*), other herbaceous
- desertparsley (*Lomatium*), other herbaceous

Community 1.1
Reference Community

Figure 2. Ponderosa pine – White oak / Elk Sedge

Open to moderately open stand of white oak with limited amount of ponderosa pine. Understory vegetation abundant along with oak regeneration.

Resilience management. Plant Community Pathway 1.1A This is not a true pathway, but a system maintenance caused by frequent low intensity ground fires maintaining an open oak stand. Ground fires killing any conifer regeneration and also thinning out oak density. Native grasses, sedges, and shrubs would increase.

State 2
Fire Suppression

Figure 3. Ponderosa pine – White Oak /Bitterbrush

Long intervals of fire exclusion have increased stand density in oaks and advanced the encroachment of pine and

fir. Much of the area in this condition. Stand replacing or mixed severity fires are the norm with the loss of larger diameter oaks.

Community 2.1

Dense stands of white oak with ponderosa pine and limited Douglas-fir. Elk sedge swards or bitterbrush scattered understory. Some white oak regeneration along with Douglas-fir.

State 3
Land Conversion

Throughout the history of settlement these oak stands were near lower elevation areas used by natives and European settlers. Respective to that these oak stands have been altered by cutting, overgrazing, and conversion to other land uses.

Community 3.1
Land conversion

Pasture, crops, or home development.

Transition T1A
State 1 to 2

Fire suppression increased both stand density in oaks and also the abundance of ponderosa pine and Douglas-fir in the overstory. Native understory vegetation decreased with more shade along with oak regeneration.

Transition T1B
State 1 to 3

Oak stands converted to other land uses throughout history

Restoration pathway R2A
State 2 to 1

Selective thinning of white oak and conifer removal followed by prescribed burning. Fuel loads assessed before any prescribed burning.

Restoration pathway R3A
State 3 to 1

Cropland or Pastureland conversion through intensive planting of oak and inter seeding native shrubs and grasses/sedges. Long-term maintenance needed for establishment and growth.

Additional community tables

Other information

Site index /Culmination Mean Annual Increment (CMAI)

Overall, these sites are lower in productivity due to dryness and lower stand density. Site indexes for ponderosa pine and Douglas-fir have wide ranges due to microsite variability as shown below. Therefore, individual site measurements would be wise before forest management investments. White oak rarely reaches merchantable size, other than for firewood. 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
ponderosa pine	*PIPO*	61	127	47	159	43	–	–	
Douglas-fir	*PSME*	60	105	–	–	–	–	–	

Inventory data references

Forest Service Plant Associations:
HOG211 (WEN) – Oregon White Oak/pinegrass-elk sedge (QUGA/CARU/CAGE)

Yakima Nation Plant Associations:
#30 – Ponderosa pine – Oregon White Oak/elk sedge (PIPO-QUGA/CAGE)
#31 – Ponderosa pine – Oregon White Oak/bitterbrush (PIPO-QUGA/PUTR2)

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 Wenatchee National Forest. PNW-GTR-359, October 1995. Lillybridge et.al.
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 Oak-Ponderosa Pine 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. June and July 2019. Kuhn, Campbell

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	05/12/2025
Approved by	Kirt Walstad
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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3. **Number and height of erosional pedestals or terracettes:**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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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:

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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):**

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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:**
