USDA Natural Resources
Conservation Service

Ecological site F006XD003WA
Mesic Xeric Slopes and Flood Plains (Oregon white oak-Ponderosa Pine Hot Moderately Dry Shrub)

Last updated: 9/11/2023
Accessed: 04/24/2024

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 benches, slopes of hills, mountains, and canyons, and flood plains. The soils are dominantly in the Mollisols and Alfisols taxonomic order, with minor areas of Inceptisols. Soil parent materials are dominantly colluvium and residuum from basalt, and alluvium. Taxonomic soil climate is primarily a mesic or frigid temperature regime, and xeric moisture regime with average annual precipitation of about 28 inches.

Other LRU'S where the site occurs:
CRA 6.7 - Grand Fir Mixed Forest
CRA 6.8 - Oak-Conifer Eastern Cascades - Columbia Foothills

Classification relationships

HOG311 (WEN) – Oregon White Oak/western hazel/snowberry (QUGA/COCO2/SYAL)

Ecological site concept

This Oregon white oak – ponderosa pine / western hazel-snowberry community is located on dry river terraces adjacent to riparian areas at low elevations. More moisture is available than the drier pine-oak-elk sedge or bitterbrush sites. The overstory oak and pine are larger and tree density is greater. The main identifying shrubs are common snowberry and western hazel.

Associated sites

F006XB004WA	**Mesic Xeric Foothills and Mountain Slopes (Ponderosa Pine Hot Dry Shrub Grass)** On slightly cooler sites.

Similar sites

F006XD004WA	**Mesic Xeric Slopes and Plateaus (Oregon White Oak-Ponderosa pine Hot Dry Herb/Shrub)** On slightly drier 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 mountain slopes, hillslopes, canyons, benches, and flood plains. It is found between 100 feet and 4,600 feet in elevation on all aspects. Slope gradients generally range from 0 to 50 percent, but can be found on slopes up to 75 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Hills > Hillslope (3) Valley > Flood plain (4) Bench
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	900–3,500 ft
Slope	0–50%
Water table depth	6–80 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
Ponding frequency	None
Elevation	100–4,600 ft
Slope	0–75%
Water table depth	80 in

Climatic features

Mean Annual Air Temperature
Total Range: 4.4 to 11.1 degrees Celsius (40 to 52 degrees F)
Central tendency: 6.1 to 10.0 degrees Celsius (43 to 50 degrees F)

Table 4. Representative climatic features

Frost-free period (characteristic range)	100-135 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	25-35 in
Frost-free period (actual range)	70-150 days
Freeze-free period (actual range)	
Precipitation total (actual range)	15-50 in

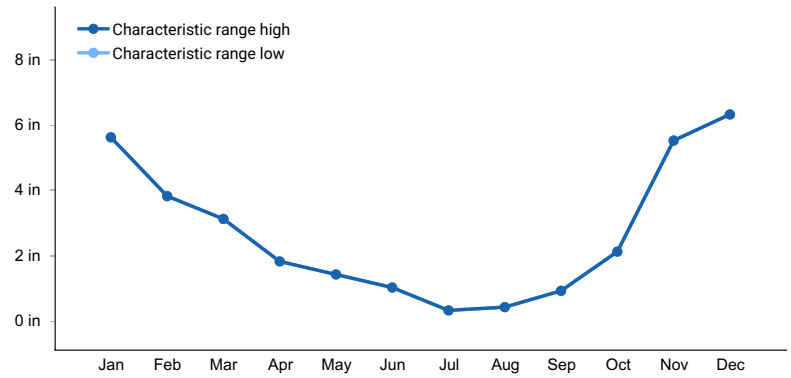


Figure 1. Monthly precipitation range

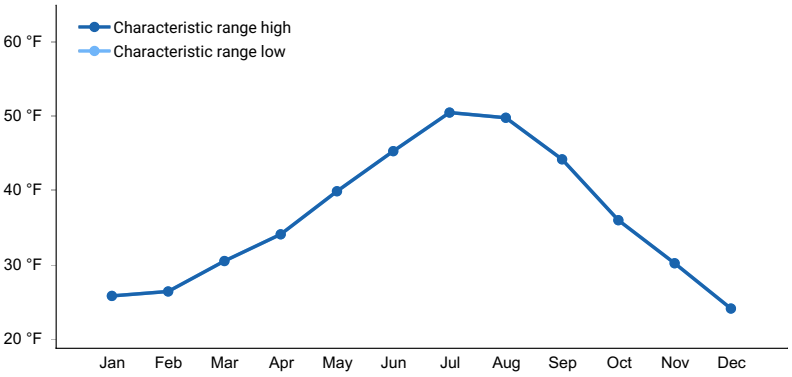


Figure 2. Monthly minimum temperature range

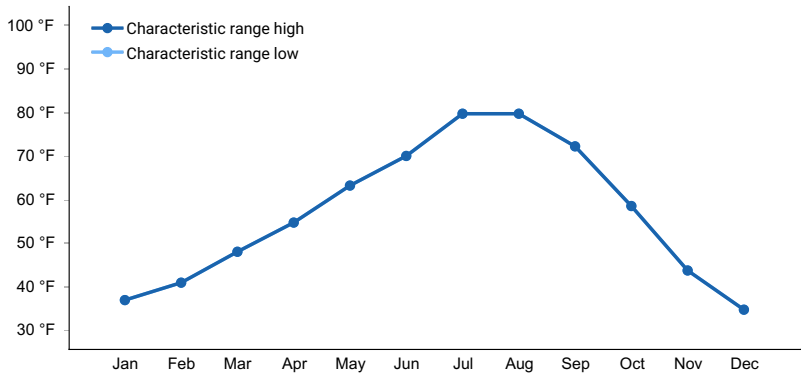


Figure 3. Monthly maximum temperature range

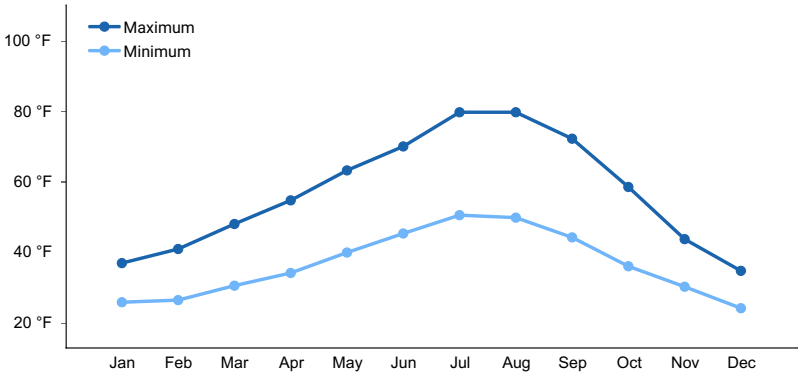


Figure 4. Monthly average minimum and maximum temperature

Climate stations used

- (1) APPLETON [USC00450217], Appleton, WA

Influencing water features

This site is adjacent to and in relation to dry stream terraces and riparian areas, but is not influenced by water from wetland or stream.

Wetland description

N/A

Soil features

This ecological site is associated with several soil map unit components. The components are dominantly Andic and Ultic taxonomic subgroups of Haploxeralf and Argixeroll great groups. Soils are dominantly moderately deep to very deep and have average available water capacity of about 6.1 inches (14.7 cm) in the 0 to 40-inches (0 to 100 cm) depth range.
Dominant Soil Series: Beezee, Bercumb, Berson, Dalig, Legall, Oreoke

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

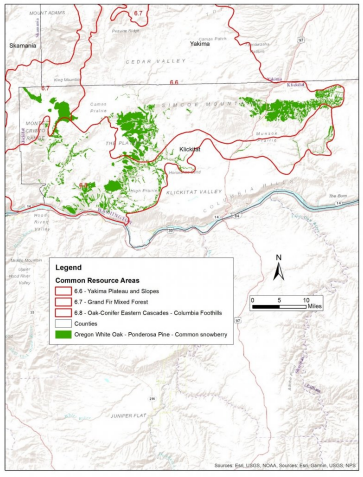


Figure 5. Map of soil mapunits with a major component linked to the Oregon white oak - ponderosa pine - common snowberry Ecological Site.

Table 5. Representative soil features

Surface texture	(1) Loam (2) Ashy loam
Drainage class	Well drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–23%
Surface fragment cover >3"	0–22%
Available water capacity (0-40in)	2.8–7.9 in
Electrical conductivity (Depth not specified)	0 mmhos/cm
Soil reaction (1:1 water) (0-10in)	5.1–6.6
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–40%

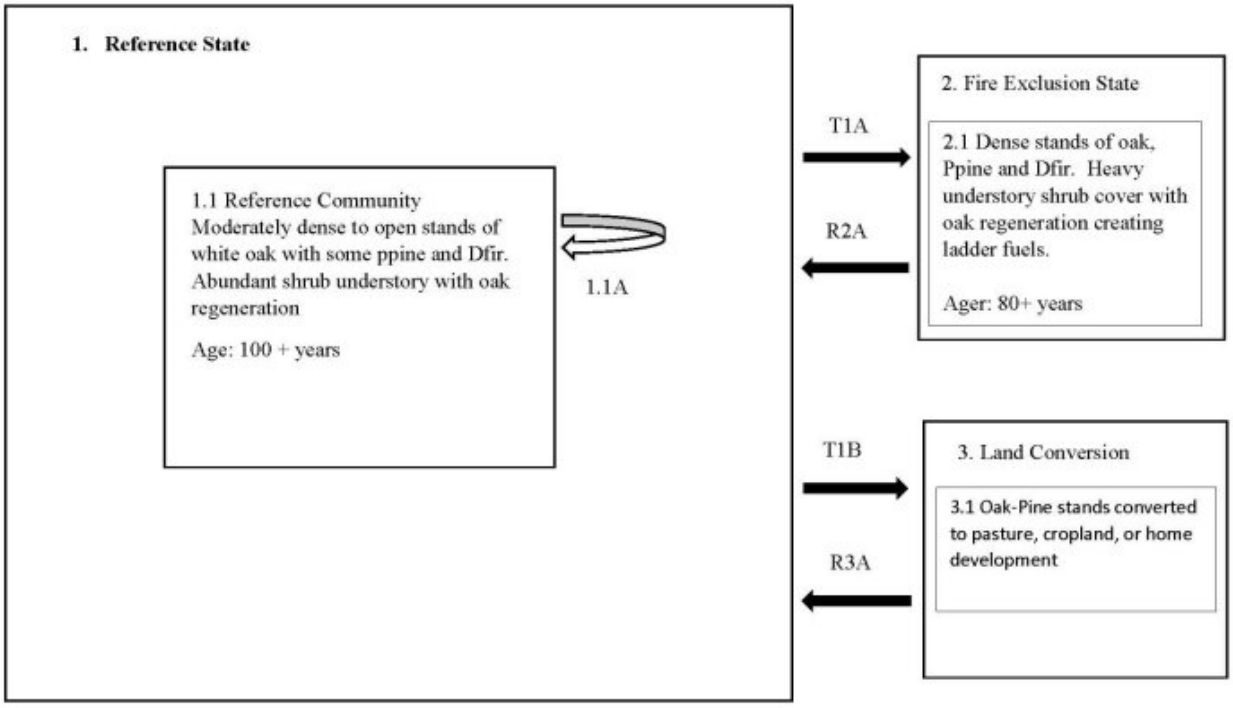
Table 6. Representative soil features (actual values)

Drainage class	Poorly drained to well drained
Depth to restrictive layer	20–60 in
Surface fragment cover <=3"	0–23%
Surface fragment cover >3"	0–22%
Available water capacity (0-40in)	2.8–7.9 in
Electrical conductivity (Depth not specified)	0 mmhos/cm
Soil reaction (1:1 water) (0-10in)	5.1–6.6
Subsurface fragment volume <=3" (Depth not specified)	0–40%
Subsurface fragment volume >3" (Depth not specified)	0–40%

Ecological dynamics

This Oregon white oak – ponderosa pine / western hazel-snowberry community is located on dry river terraces adjacent to riparian areas at low elevations. More moisture is available than the drier pine-oak-elk sedge or bitterbrush sites. It is mainly located in the southern area of CRAs 6.6 and 6.8 near the Columbia River Gorge. The overstory oak and pine are larger and tree density is greater. Both ponderosa pine and Oregon white oak regenerate well in the understory. Several brush species are found in the understory. Main shrub species are snowberry, Western hazel, chokecherry, bittercherry and rose (See Plant List for all species). Douglas-fir, quaking aspen and black cottonwood can be present. Fires would be sporadic of mixed severity. Oak and shrub species would recover quickly. The main identifying shrubs are common snowberry and western hazel.

State and transition model



State 1
Reference State

Figure 6. Open grown white oak

Figure 7. White Oak mixed with some ponderosa pine

In pre-European times oak stands were more open due to frequent low intensity ground fires every 5 to 30 years, 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. Major insects affect white are western oak looper, western tent caterpillar, and Pacific tent caterpillar. Major diseases are armillaria and oak anthracnose. Major insects that cause mortality in ponderosa pine are the western pine beetle, mountain pine beetle, and pine engraver beetle. The western and mountain pine beetles can kill mature to old growth pine. The pine engraver beetles attack and kill young pole size stands. Drought and tree to tree competition cause stress which increases bark beetle mortality. Other insect concerns in pine include the following defoliators: Pandora moth, pine butterfly, sawflies, and needle miners. Major ponderosa pine diseases include Annosum and Armillaria root rot, commandra rust, and elytroderma needle disease, Dwarf mistletoe is a major concern infecting over 25 percent of ponderosa pine acreage. It is more serious in the drier ponderosa pine sites. It also can spread more readily in dense stands lacking frequent fire cycles. Douglas-fir mistletoe can also be a concern when Douglas-fir occurs.

Dominant plant species

- Oregon white oak (*Quercus garryana*), tree
- ponderosa pine (*Pinus ponderosa*), tree
- Douglas-fir (*Pseudotsuga menziesii*), tree
- common snowberry (*Symphoricarpos albus*), shrub
- beaked hazelnut (*Corylus cornuta*), shrub
- bitter cherry (*Prunus emarginata*), shrub
- chokecherry (*Prunus virginiana*), shrub
- redstem ceanothus (*Ceanothus sanguineus*), shrub
- antelope bitterbrush (*Purshia tridentata*), shrub
- Woods' rose (*Rosa woodsii*), shrub
- oceanspray (*Holodiscus discolor*), shrub
- pinegrass (*Calamagrostis rubescens*), grass
- Geyer's sedge (*Carex geyeri*), grass
- Idaho fescue (*Festuca idahoensis*), grass
- blue wildrye (*Elymus glaucus*), grass
- common yarrow (*Achillea millefolium*), other herbaceous
- lupine (*Lupinus*), other herbaceous
- nineleaf biscuitroot (*Lomatium triternatum*), other herbaceous

Community 1.1
Reference Community

Open to moderately open stand of white oak with limited amount of ponderosa pine or Douglas-fir. Understory shrubs 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 most conifer

regeneration and also thinning out oak density. Native grasses, sedges, and shrubs would increase.

State 2
Fire Suppression

Figure 8. Dense stand of white oak with heavy shrub understory

Long intervals of fire exclusion have increased stand density in oaks and advanced the encroachment of pine and fir. Ladder fuels increased by shrub layer Much of the area in this condition. Stand replacing or mixed severity fires are the norm with the loss of larger diameter oaks. Oak can replenish site through sprouting, however, wildlife habitat loss due to large oak mortality.

Community 2.1

Dense stands of white oak with ponderosa pine and limited Douglas-fir. Snowberry, hazel, and other shrubs increase in size. 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 the indigenous people 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

Reference State **Fire Suppression**

Fire suppression increased both stand density in oaks and also the abundance of ponderosa pine and Douglas-fir in the overstory. Native understory shrubs increase in size producing ladder fuels.

Transition T1B
State 1 to 3

Oak stands converted to other land uses throughout history

Restoration pathway R2A
State 2 to 1

Fire Suppression Reference State

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 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)

This site has moderate productivity and denser stands than the drier oak sites due to more moisture and landscape position. 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 can grow larger, however provides valuable wildlife habitat and is a good source of 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 7. 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*	73	127	44	159	45	–	–	
Douglas-fir	*PSME*	61	105	–	–	–	–	–	

Inventory data references

Forest Service Plant Associations:
HOG311 (WEN) – Oregon White Oak/western hazel/snowberry (QUGA/COCO2/SYAL)

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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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	04/24/2024
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:**