Ecological site F009XY004WA
Warm-Frigid Xeric Loamy Foothills of Basalt Mountains and Plateaus Douglas-fir Warm Dry Shrub

Last updated: 3/31/2025
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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): 009X–Palouse and Nez Perce Prairies

Almost all of MLRA 9 lies within the Walla Walla Plateau Section of the Columbia Plateaus Province of the Intermontane Plateaus. The area is characterized by an undulating basalt plateau that has been highly dissected. The major streams have cut deep, steep-walled canyons. The plateau is nearly level to steeply sloping, and its surface is moderately dissected or strongly dissected. Slopes are mostly hilly and steep. Some areas in the southeastern portion of this MLRA are in the Blue Mountain Section of the Columbia Plateaus Province. Small areas on the eastern edge of the area are in the Northern Rocky Mountains Province of the Rocky Mountain System.

Classification relationships

Section I: Ecological Site Characteristics Ecological Site Identification and Concept Site ID: F009XY004WA Site name: Warm-Frigid, Xeric Loamy, Foothills of Basalt Mountains and Plateaus, Douglas fir/Warm Dry Shrub (“DF-WDS”) Plant association: PSMEG/PHMA, PSMEG/SYAL and PSMEG/Unknown series Major land resource area (MLRA): 9 - Palouse & Nez Perce Prairie LRU – Common Resource Area (CRA): 9.2 - Palouse and Nez Perce Prairies - Palouse Hills Relationship to other identified classification systems This ecological site is aligned to the following classification systems: • U.S. National Vegetation/NatureServe and Washington NHP Classification Matrix: Plant Association Group* Alliance** Association*** PSME/PHMA (modal) G-215 A-3463 CEGL 000447 PSME/SYAL G-215 A-3462 CEGL 000459 * G-215 is the U.S. National Vegetation Classification (NVC) Standard Middle Rocky Mountain Montane Douglas-fir Forest & Woodland ** Alliance-3463 is the Middle Rocky Mountain Douglas-fir Mesic Wet Forest Alliance-3462 is the Middle Rocky Mountain Dry Mesic Forest & Woodland *** CEGL 000447 is the Douglas-fir/Mallow Ninebark Forest CEGL 000459 is the Douglas-fir/Common Snowberry Forest • USDA Forest Service Ecological Sub-region M332 “Blue Mountains”. • LANDFIRE BpS model 10450: Northern Rocky Mountain Dry-Mesic Montane Mixed-Conifer Forest (primary model). • Ecoclass Code(s): PSME/PHMA-CDS711; PSME/SYAL-CDS624 (both are in the Blue-Ochoco PA, 1991), and PSME/SPBE-CDS634 (Wallowa-Snake PA, 1987).

Ecological site concept

The Warm-Frigid Xeric Loamy Foothills of Basalt Mountains and Plateaus, Douglas-fir/Warm Dry Shrub ecological site (ES) is mainly found in Spokane County, but occurs in Whitman County as well. It consists of Douglas-fir/ninebark, Douglas-fir/snowberry, and “Douglas-fir series”: (PSMEG/PHMA, PSMEG/SYAL, and PSMEG/unknown phase).

Associated sites

F009XY005WA	**Frigid Xeric Loamy Basalt Mountains and Plateaus Douglas-fir Cool Dry Grass**

Similar sites

F009XY005WA	**Frigid Xeric Loamy Basalt Mountains and Plateaus Douglas-fir Cool Dry Grass**

Figure 1.

Table 2. Dominant plant species

Tree	(1) *Pseudotsuga menziesii var. glauca*
Shrub	(1) *Symphoricarpos albus*
Herbaceous	Not specified

Physiographic features

This site occurs predominately on backslope of hills of basalt plateaus. The landscape is part of the Columbia basalt plateaus and Northern Rocky foothills. They occur on shoulders, backslopes, and summits, in all slope shapes.

Physiographic Division: Intermontane Plateau and Northern Rocky Mountain System
Physiographic Province: Columbia Plateau and Northern Rocky Mountains
Physiographic Sections: Walla Walla Plateau and Blue Mountain Section

Landscapes: hills
Landform: loess hills, buttes and possible earth flows

Table 3. Representative physiographic features

Landforms	(1) Hills > Loess hill (2) Butte (3) Earthflow
Flooding frequency	None
Ponding frequency	None
Elevation	610 – 1,220 m
Slope	10 – 40 %
Aspect	Aspect is not a significant factor

Table 4. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified

Slope	0 – 60 %

Climatic features

Taxonomic soil climate is primarily a frigid temperature regime and xeric moisture regime.

Table 5 Representative climatic features

Frost-free period (characteristic range)	100-120 days
Freeze-free period (characteristic range)	130-160 days
Precipitation total (characteristic range)	510-610 mm
Frost-free period (actual range)	90-130 days
Freeze-free period (actual range)	120-170 days
Precipitation total (actual range)	460-710 mm
Frost-free period (average)	90 days
Freeze-free period (average)	140 days
Precipitation total (average)	530 mm

- (1) SPOKANE 17 SSW [USW00004136], Cheney, WA
- (2) DAYTON 1 WSW [USC00452030], Dayton, WA
- (3) ELGIN [USC00352597], Elgin, OR

Influencing water features

N/A

Wetland description

N/A

Soil features

This ecological site components are dominantly Vitrandic and Ultic taxonomic subgroups of Argixerolls and Haploxerolls great groups of the Mollisol taxonomic order. Soils are dominantly moderately deep to very deep and have average available water capacity of about 5.0 inches (12.7 cm) in the 0 to 40 inches (0 to 100 cm) depth range.

Soil parent material is dominantly loess over colluvium and residuum from basalt with influence of volcanic ash deposits in upper horizon.

The associated soils are Xerolls, Taney, Scoap and similar soils.

Dominate soil surface is silt loam to gravelly ashy sandy loam.

Dominant particle-size class is fine-silty, but includes loamy-skeletal

Table 6. Representative soil features

Parent material	(1) Loess – basalt
Surface texture	(1) Silt loam (2) Gravelly, ashy sandy loam
Family particle size	(1) Fine-silty (2) Loamy-skeletal
Drainage class	Moderately well drained to well drained
Soil depth	150 cm
Surface fragment cover <=3"	0 – 30 %
Surface fragment cover >3"	Not specified
Available water capacity (Depth not specified)	4.57 – 18.03 cm
Calcium carbonate equivalent (Depth not specified)	Not specified
Electrical conductivity (Depth not specified)	Not specified
Sodium adsorption ratio (Depth not specified)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	6.1 – 7.3

Subsurface fragment volume <=3" (Depth not specified)	0 – 50 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

This site is largely composed of the Douglas-fir (Pseudotsuga menziesii)/ninebark (Physocarpus malvaceus) plant association (PSME/PHMA) which is the largest representative plant association in this group. The less abundant Douglas-fir/Common Snowberry (Symphoricarpos albus) (PSME/SYAL) and the “Douglas-fir series” (PSME/unknown) are included in this provisional ESD.

This warm dry Douglas-fir forest type occurs above Ponderosa pine (Pinus ponderosa) forest types on a moisture gradient. The Douglas-fir Warm Dry Shrub ecological site has more favorable effective moisture utilization when compared to the Douglas-fir/pinegrass (Carex rubescens) plant association (PSME/CARU). Douglas-fir/pinegrass is within the same plant association series as the modal plant association for this ecological site.

The ecological site was characterized by a ponderosa pine dominated overstory in the historic, naturally occurring ecological setting. Mature stands typically contained large, widely spaced ponderosa pine along with similar age and size class Douglas-fir. Adapted shrubs and grasses were found in the understory.

Other conifers found in this ecologic site included very limited expressions of grand fir (most likely found on favorable micro-sites), and early seral western larch (Larix occidentalis) which typically persist in the mature stand as scattered remnants. Larch begins to occur in greater proportions compared to the dryer and warmer grass dominated Douglas-fir plant associations (the pinegrass and elk sedge associations) but is still a relatively minor component.

Pre-European frequent, low intensity surface fires (also called “under-burns”) maintained long-lived stands of fire-resistant late seral conifers in the older, more open stands. Less frequent mixed-severity and stand replacement fires resulted in mosaics of older and larger trees, intermingled with younger patches of regenerating forests. The early development (regeneration) plant community phase of this ecological site was dominated by Ponderosa pine seedling development with lesser amounts of larch regeneration, along with fire adapted understory brush species including snowbrush ceanothus (Ceanothus velutinus), Scouler’s willow (Salix scouleriana), and ninebark (found only in the PHMA phase). Understory grass species included pinegrass, elk sedge, western fescue (Festuca occidentalis) and various bromes (Bromus spp.).

Young, newly regenerated stands would normally progress to mid-development phases in time, given an absence of major disturbance impacts which could halt successional progression. The developing stands were dominated by large pole to small and intermediate sawtimber sized individual conifers. The stands expressed varying degrees of canopy closure depending on the initial seedling establishment success and succeeding stocking levels, coupled with the impacts of minor, small scale disturbance events that occurred over the course of development. Mid-development stands could in turn progress to mature stands with the passing of additional time and under favorable conditions. In the absence of significant surface fire, a disproportionate establishment of mid-seral Douglas-fir seedlings and saplings would begin to dominate the understory conifer layer as shade levels increased.

Understory infill of mid and late seral conifers (the occasional grand fir) is now a common and widespread condition across the west, a direct result of a policy of complete fire suppression. This policy of forest fire suppression was implemented in the Post-European era of settlement in the western United States and became progressively effective in extinguishing the majority of wildfires across dry western landscapes. This policy eliminated the beneficial aspects of naturally occurring wildfire (natural thinning, pruning and the reduction of overabundant late seral conifers), and lead to elevated fuel levels and increased present day catastrophic wildfires.

The expressions of the historical stands in this ecological site contained various tree species, ages and sizes. In the context of the large-scale landscape, these unique phases were found in a mosaic pattern across the landscape. Clumps, gaps and individual trees were common at the larger scale.

Although fire was the major disturbance factor in the historic context of this ecological site, insects (such as bark beetles and defoliators) and root diseases impacted and changed the forest over time. Less frequent abiotic disturbances such as high windstorms also occurred, locally altering structural and functional attributes of the stand.

Characteristics of the major tree species:
Ponderosa pine (an early seral species) is resistant to low and moderate severity fires, with resistance developing at a very young growth stage. Thick bark, high and open crowns, and the ability to develop self- and fire-induced pruning of lower branches are among the

natural adaptations of this species. Ponderosa pine is a sporadic seed producer, and generally requires mineral soil under open, sunny conditions to germinate and establish. The natural longevity of the species is advantageous. Fire exclusion curtails the necessary recruitment of ponderosa pine seedlings, eliminating much of the younger age and size classes of the species over time.

Ponderosa pine is susceptible to mortality from western and mountain pine beetle at various age and stocking thresholds. Fire impacts that damage the cambial layer of this species will increase the likelihood of bark beetle infestation and mortality as a secondary fire impact.

Western larch (also an early seral species) is the most fire-resistant species in this ecologic site. Younger age and size classes are susceptible to fire kill, developing moderate fire resistance in the late pole size class, but older and larger trees typically survive the various impacts of wildfires of all types.

Western larch shares many of the natural fire adaptations of Ponderosa pine. The species thick bark and self-pruning adaptations are beneficial, and it is also long lived. Larch has an open foliar crown consisting of young, moist deciduous needles, allowing mature larch to survive crown fire events that would be lethal to many other conifer species.

Larch is also well adapted to regenerate under the favorable conditions that typically result from non-lethal fire: Light weight seeds are well dispersed, and establish best under open, sunny conditions on burned mineral soils. After establishment, larch experiences rapid juvenile growth.

Dwarf mistletoe and needlecast are common damaging agents. Insects such as the Western spruce budworm, larch sawfly(s) and occasional bark beetle infestation are biotic sources of disturbance in larch.

Rocky Mountain Douglas-fir (a mid-seral species) becomes resistant to low and moderately severe fires once it passes through the pole size class (which takes longer when compared to Ponderosa pine or Western larch—up to 40 years). Healthy individuals develop thick, corky bark which insulates against cambial scorch under surface fire conditions.

Douglas-fir is susceptible to dwarf mistletoe infestations which develop into dense brooms on the tree branches; these in turn increase the risk of crown and branch torching. Endemic Douglas-fir beetle and root disease impacts can decrease the health and vigor of individual trees and whole stands, increasing the likelihood of direct mortality, or of “secondary fire order” mortality in the period of time closely following the fire (example: where fire weakened trees fall prey to bark beetle attacks, leading to localized epidemic outbreaks).

All three of these conifer species are long-lived and have the potential to persist into the mature and over-mature plant community phases under favorable conditions.

State and transition model

Additional community tables

Table 7. Community 1.1 plant community composition

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

Table 8. Community 1.2 plant community composition

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

Table 9. Community 1.3 plant community composition

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

Table 10. Community 1.4 plant community composition

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

Table 11. Community 2.1 plant community composition

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

Table 12. Community 3.1 plant community composition

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

Table 13. Community 4.1 plant community composition

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

Table 14. Community 5.1 plant community composition

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

Other information

Appendix 1 Tree-Size Class Tree size classes are based on the diameter measurement taken at the “Diameter Breast Height” (abbreviated as DBH). DBH is the diameter of a tree (the bole) measured at 4.5 feet above ground, on the uphill side if on sloping ground. It is a measurement of the outside of the tree bark. The DBH is given in inches. The following Tree size class(s) are referred to in this ecological site: Class Name DBH Range Seedling 0-1” Sapling 1-5” Pole 5-9” Sawtimber: > 9” ? Small Sawtimber 9-16” ? Large Sawtimber 16-21” ? Very Large Sawtimber > 21” Note: Some classification systems denote “mature and over mature” at 20 to 30” DBH and larger. This system is likely derived from an economic production basis rather than on forest health size/age thresholds.

Inventory data references

Data was collected from forestry references, and vegetative experience from within the NRCS field professionals.

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Approval

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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	03/31/2025
Approved by	
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:**
