Ecological site F043CY607OR
Cool Moist Conifer Foothills and Mountains (PIPO-PSME/SYAL)

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): 043C–Blue and Seven Devils Mountains

This MLRA covers the Blue and Seven Devils Mountains of Oregon, Washington and Idaho. The area is characterized by thrust and block-faulted mountains and deep canyons composed of sedimentary, metasedimentary, and volcanic rocks. Elevations range from 1,300 to 9,800 feet (395 to 2,990 meters). The climate is characterized by cold, wet winters and cool, dry summers. Annual precipitation, mostly in the form of snow, averages 12 to 43 inches (305 to 1,090 millimeters) yet ranges as high as 82 inches (2,085 millimeters) at upper elevations. Soil temperature regimes are predominately Frigid to Cryic and soil moisture regimes are predominately Xeric to Udic. Mollisols and Andisols are the dominant soil orders. Ecologically, forests dominate but shrub and grass communities may occur on south aspects and lower elevations as well as in alpine meadow environments. Forest composition follows moisture, temperature and elevational gradients and typically ranges from ponderosa pine and Douglas-fir plant associations at lower elevations, grand fir at middle elevations and subalpine fir and Engelman spruce at upper elevations. Historical fire regimes associated with these forest types range from frequent surface fires in ponderosa pine - Douglas Fir forest types to mixed and stand replacing fire regimes in grand fir and subalpine fir types. A large percentage of the MLRA is federally owned and managed by the U.S. Forest Service for multiple uses.

Classification relationships

Plant Assoc. of Blue and Ochoco Mountains (R6 E TP-036-92) Ponderosa pine/common snowberry - CPS524 (modal) Ponderosa pine/elk sedge - CPG222 Ponderosa pine/pinegrass - CPG221 Douglas-fir/elk sedge - CDG111 Douglas-fir/mountain snowberry - CDS625 Plant Assoc. of Wallowa-Snake Province (R6 E 255-86) Ponderosa pine/common snowberry - CPS522 (modal) Douglas-fir/mountain snowberry - CDS623 Ponderosa pine/spiraea - CPS523 United States National Vegetation Classification (2008) Alliance (A3446) Central Rocky Mountain Ponderosa Pine/Shrub Woodland and Association USDA Forest Service Ecological Sub-region M332 “Blue Mountains”. LANDFIRE BpS model 0710531 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna – Mesic Natureserve Terrestrial Ecological System (2020) Northern Rocky Mountain Ponderosa Pine Woodland and Savanna, CES306.030e

Ecological site concept

This site represents a commonly occurring ponderosa pine (Pinus ponderosa) site in the foothills of the Blue, Ochoco and Wallowa mountains of Oregon. The overstory is composed of ponderosa pine, which is occasionally codominant with Douglas-fir (Pseudostuga menziesii). The herbaceous layer is dominated by grasses such as elk sedge (Carex geyeri), pinegrass (Calamagrostis rubescens) and forbs such as strawberry (Fragaria spp.), and heartleaf arnica (Arnica cordifolia). Unlike ponderosa forests nearby on droughtier soils, this site often hosts a characteristic shrub component of snowberry (Symphoricarpus spp.), with minor amounts of other low shrubs including creeping Oregon grape (Berberis repens). Forested sites at higher elevations and with greater proportions of volcanic ash, experience higher soil moisture retention which facilitates understory regeneration of grand fir (Abies grandis) and greater composition and productivity of Douglas-fir. The soil moisture regime of this site is xeric and the soil temperature regime is frigid. Disturbance was historically influenced by a fire regime characterized by relatively frequent surface fires. Frequent fire, as well as bark beetles, was historically a critical element of the disturbance regime of this site, acting to thin crowded understories and allow fire resistant mature ponderosa and Douglas-fir trees to attain an open, savanna-like forest structure. This is a provisional ecological site that groups characteristics at a broad scale with little to no field verification and is subject to extensive review and revision before final approval. All data herein was developed using existing information and literature and should be considered provisional and contingent upon field validation prior to use in conservation planning.

Associated sites

F043CY608OR	**Cool Dry Conifer Foothills and Mountains (PIPO/FEID-PSSPS)** Occupying adjacent soils with somewhat shallower depth to a restrictive layer and droughty properties
F043CY605OR	**Cool Moist Conifer Mountains and Plateaus (PSME-PIPO/CARU)** Occupying adjacent somewhat deeper soils with greater soil moisture retention

Similar sites

F043CY608OR	**Cool Dry Conifer Foothills and Mountains (PIPO/FEID-PSSPS)** Lower available water content, somewhat shallower soils, higher coarse fragment content, andic soil properties less common
F043CY605OR	**Cool Moist Conifer Mountains and Plateaus (PSME-PIPO/CARU)** Somewhat deeper soils, cooler climate, fewer dry days (45-60)
F043CY609OR	**Warm Dry Conifer Foothills and Mountains (PIPO-PSME/SYAL/CAGE)** Occupying lower elevations

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa* (2) *Pseudotsuga menziesii*
Shrub	(1) *Symphoricarpos albus*
Herbaceous	Not specified

Physiographic features

This site occurs on forested backslopes, shoulders and summits of foothills and mountain slopes. This site occurs on all aspects with slopes typically ranging from 5-50%. Elevations are typically between 4,000 to 5,200 (1,225 to 1,600 m) but may range from 3,400 to 6,000 (1,025 to 1,825 m). This site does not experience flooding or ponding and no water table is present within the upper two meters of soil.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Mountain slope (2) Foothills > Hillside or mountainside
Flooding frequency	None
Ponding frequency	None

Elevation	1,220 – 1,590 m
Slope	10 – 50 %
Ponding depth	0 cm
Water table depth	250 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	1,040 – 1,830 m
Slope	0 – 70 %
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

This site experiences an intermountain climate with cool, wet winters and warm, dry summers. Mean annual precipitation is typically 17 - 25 inches (430 - 635 mm) but can range from 15 to 29 inches (380 - 735 mm). Mean annual temperatures are typically 43°F (6°C) but range from 39 - 45 °F (3 - 7°C). The soil temperature regime is Frigid and the soil moisture regime is Xeric typically experiencing 60 – 90 dry days per year. Frost free days average 30 to 120 per year. Climate graphs are populated from the closest available weather station and are included to represent general trends rather than representative values.

Table 4 Representative climatic features

Frost-free period (characteristic range)	30-120 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	430-640 mm
Frost-free period (average)	70 days

Freeze-free period (average)	
Precipitation total (average)	480 mm

- (1) AUSTIN 3 S [USC00350356], Prairie City, OR
- (2) MASON DAM [USC00355258], Baker City, OR

Influencing water features

This site is not influenced by water from a wetland or stream.

Soil features

Soils on this site are typically moderately deep (but range from shallow to very deep). Surface textures are varied with subsurface coarse fragment content ranging from gravelly to extremely gravelly or stony. The family particle size class is typically loamy-skeletal but may vary. These soils are typically derived from basalt colluvium and residuum and commonly have some influence of volcanic ash throughout or in the upper part, yet lack a deep ash cap in the surface horizon. These are well drained soils, typified by an average representative available water capacity ranging from 1.2 – 2.0 in the 0 – 10 inch depth. See Fivebeaver, Klicker, and Humarel for modal series concepts.

Table 5. Representative soil features

Parent material	(1) Colluvium – volcanic and sedimentary rock (2) Residuum – volcanic and sedimentary rock (3) Volcanic ash – volcanic rock
Surface texture	(1) Ashy silt loam (2) Ashy sandy loam (3) Silt loam (4) Gravelly silt loam (5) Stony silt loam
Family particle size	(1) Clayey-skeletal (2) Fine (3) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow to moderately rapid
Depth to restrictive layer	50 – 100 cm

Soil depth	50 – 100 cm
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-25.4cm)	3.05 – 5.08 cm
Soil reaction (1:1 water) (0-101.6cm)	5.6 – 7.3
Subsurface fragment volume <=3" (10.2-152.4cm)	0 – 40 %
Subsurface fragment volume >3" (10.2-152.4cm)	0 – 30 %

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	30 – 200 cm
Soil depth	30 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-25.4cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	Not specified

Subsurface fragment volume <=3" (10.2-152.4cm)	Not specified
Subsurface fragment volume >3" (10.2-152.4cm)	Not specified

Ecological dynamics

The modal plant association that defines this ecological site group concept is the widespread Ponderosa pine/Common snowberry association (PIPO/SYAL as described in Johnson and Clausnitzer 1992, and Johnson and Simon 1987). Additional closely related plant associations include Ponderosa pine/Elk sedge and Douglas-fir/Elk sedge. Within MLRA 43c in Oregon, these communities exist toward the moist end of the climate range supporting ponderosa pine forests and the warm and dry end of the climate range supporting Douglas-fir forests. As such, productivity is higher than other ponderosa pine forests in these mountains. This site group corresponds to the USFS potential vegetation group “Dry Upland Forest” and plant association group “Warm Dry Upland Forest”.

In its reference phase, these mature forests would been dominated by an overstory of large ponderosa pine, occasionally codominant with Douglas-fir, and a shrub/grass understory. Common shrubs include common snowberry, rose (Rosa spp.) birchleaf spiraea (Spiraea betulifolia), and creeping Oregon grape. Common members of the herbaceous component include pinegrass, elk sedge, Idaho fescue, heartleaf arnica, strawberry, common yarrow (Achillea millefolium) and lupine (Lupinus sp.). Douglas-fir is often found codominant with ponderosa pine on steeper slopes across varied aspects whereas ponderosa pine dominates across flat to steep slopes on primarily east to south facing aspects. Grand fir (Abies grandis) may be found occasionally in the understory of these forests in protected microsites where cooler temperatures and greater soil moisture are found.

Ponderosa pine forests were historically subject to frequent surface fires primarily ignited by lightning strikes and Native American cultural burning practices. These fires would have likely occurred at less than 35-year intervals and approximated Landfire fire regime group 1 (0-35 year frequency, surface severity). These low intensity fires would have decreased the density of young regenerating understory conifers which are less tolerant of fire when young and may otherwise act as ladder fuels to ignite crown fires and lead to stand replacing events. Overtime, frequent low intensity fires, as well as occasional mixed severity fires, would have favored the development of mature, uneven-aged stands with open canopies. Mixed severity fires, where direct overstory mortality was patchy, were less common than surface fires, and true stand replacement fires were rare. Fire-resistant ponderosa is well-adapted to these conditions, developing increasing fire resistance with age by growing thick bark and self-thinning lower limbs. Douglas-fir is also tolerant of fire at maturity, with very thick bark and a deep rooting habit. With longer time between fire, increased development of understory fuels such as young pine, Douglas-fir, occasional grand fir and down wood, along with the development of a closed canopy, can promote an increased frequency of stand replacing fires and insect outbreaks. In addition to direct impacts of wildfire, disturbance factors that resulted in the death of mature trees included injury from lightning strikes, wind events, weather extremes, and the collective influence of various damage agents such as bark beetles, pine engraver, mistletoe, and other adapted insects and diseases associated with injury or competitive stressors.

Understory species in these forests were adapted to respond to this fire driven disturbance regime. Many plants, such as elk sedge, pinegrass and snowberry, would resprout from crowns following fire. Understory forbs, such as common yarrow, may resprout from rhizomes while others, such as lupine, can effectively respond to post fire conditions that may delay the reestablishment of other species, such as low soil nutrient levels, by fixing their own nitrogen.

As a forested site with a productive herbaceous component in the understory, much of these forests were historically subject to livestock grazing, especially cattle and sheep. Prolonged historical use by these ungulates may have altered the composition of understory herbaceous and shrub communities. A decrease in palatable perennial grasses such as Idaho fescue and pinegrass may have paralleled increases in forbs such as lupine and yarrow and exotic annual grasses such as cheatgrass (Bromus tectorum), Medusahead rye (Taeniatherum caput-medusae), and North Africa grass (Ventenata dubia). Increases in exotic grasses have been associated with other impacts as well, including off highway vehicle use and proximity to human development. At high levels, the impacts of these invasions on nutrient cycling, wildlife habitat and fire cycles may be severe.

Current stand conditions in this ecological site do not, in most instances, conform to the historic range of variability (as represented by the reference state below) in terms of the expected frequency and severity of future wildfire events. Since the arrival of Euro-American settlers to the region in the late 1880’s, the character and function of these forests have changed. Logging, grazing, conversion to other uses, and fire exclusion have impacted the natural processes of this fire-dependent ecosystem. Depending on the severity and degree of impact, alternative states (which function outside of the parameters of the reference state), have developed. In many cases, significant infill of young trees (especially those with greater shade tolerance such as Douglas-fir and grand fir) has occurred due to the factors stated above. In this forest type across the western US, fire regimes are considered to have experienced “moderate” to “high” departure from historical conditions (Natureserve 2020).

The state and transition model below represents a generalized and simplified version of forest change in response to major disturbance types in this ecological site. It does not attempt to model the potential effects of climate change on ecosystem function or process. Emerging evidence is suggesting that climate change is leading to hotter and drier conditions in western forests that will increase fire frequency and extent and lengthen fire seasons (Halofsky et al. 2020). When combined with the interacting impacts of fire suppression, drought, and insect outbreaks, it is possible that this ecological system will experience unpredictable ecosystem shifts and additional alternative states. As evidence increases, this model will likely undergo alterations and updates to reflect our emerging understanding.

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 1.5 plant community composition

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

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Contributors

Andrew Neary - Concept development for 2020 PES initiative
Kurt Moffit - Initial PES grouping

Approval

Kirt Walstad, 3/31/2025

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	02/12/2025
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):**

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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:**
