Ecological site F043CY609OR Warm Dry Conifer Foothills and Mountains (PIPO-PSME/SYAL/CAGE)

Last updated: 4/04/2025
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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 Wallowa-Snake Province (R6 E 255-86): CPS522 - ponderosa pine/common snowberry (modal) CDS622 - Douglas-fir/common snowberry Plant Assoc. of Blue and Ochoco Mountains (R6 E TP-036-92): CDS611 - Douglas-fir/oceanspray CDS711 - Douglas-fir/ninebark CPG222 - ponderosa pine/elk sedge CPG112 - ponderosa pine/Idaho fescue 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

In reference state, this site supports a mature stand of Ponderosa pine (Pinus ponderosa) or ponderosa pine codominant with Douglas-fir (Pseudotsuga menzesii) and an understory characterized by the presence of shrubs such as common snowberry (Symphoricarpos albus), mallow ninebark (Physocarpus malvaceus) and oceanspray (Holodiscus discolor) and graminoids such as elk sedge (Carex geyeri) and Idaho fescue (Festuca idahoensis). In contrast to forested sites of similar composition, this site is characterized by lower elevations and a mesic (rather than frigid) soil temperature regime. 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)** Upslope positions with cooler soil climates

Similar sites

F043CY608OR	**Cool Dry Conifer Foothills and Mountains (PIPO/FEID-PSSPS)** Upslope positions with cooler soil climates, frigid soil temperature regime
F043CY607OR	**Cool Moist Conifer Foothills and Mountains (PIPO-PSME/SYAL)** Occupying higher elevations, frigid soil temperature regime

Table 1. Dominant plant species

Tree	(1) *Pinus ponderosa* (2) *Pseudotsuga menziesii*
Shrub	(1) *Symphoricarpos albus*
Herbaceous	(1) *Carex geyeri* (2) *Festuca idahoensis*

Physiographic features

This site occurs on footslopes, summits, and backslopes of foothills, mountain slopes, and canyon walls. Occurring on all aspects, slopes typically ranging from 7.5 - 45%. Elevations are typically between 2,200 to 3,500 (675 to 1,150 m) but may range as high as 4,000 (1,425 m). Hillslope profiles are typically linear across and down slope. This site does not experience flooding or ponding but some sites in favorable slope positions may support a water table from 18 - 36 inches below the surface during spring runoff.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Hillside or mountainside (2) Mountain valleys or canyons > Hillside or mountainside (3) Foothills > Hillside or mountainside
Flooding frequency	None
Ponding frequency	None
Elevation	670 – 1,070 m
Slope	10 – 50 %
Ponding depth	0 cm
Water table depth	50 – 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	670 – 1,220 m
Slope	0 – 60 %
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 19 - 23 inches (480 - 585 mm) but can range from 16 to 24 inches (405 - 610 mm). Mean annual temperatures are typically 7 - 8 °C (44 - 47 °F). The soil temperature regime is Mesic and the soil moisture regime is Xeric typically experiencing 60 – 90 dry days per year. Frost free days average 80 to 150 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)	80-150 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	480-580 mm
Frost-free period (average)	110 days
Freeze-free period (average)	
Precipitation total (average)	510 mm

- (1) AUSTIN 3 S [USC00350356], Prairie City, OR
- (2) ELGIN [USC00352597], Elgin, OR

Influencing water features

This site is not influenced by water from a wetland or stream. However, due to landscape position, some areas may accumulate subsurface moisture and develop a water table during spring months.

Soil features

Soils on this site are typically moderately deep to deep. Surface textures are varied but range from ashy sandy loam, silt loam, stony ashy loam, to stony loam. These soils are typically composed of colluvium from basalt and tuff commonly have either a thin mantle of ash or ash mixed through the profile. These are well to moderately well drained soils. See lookingglass, sopher, and emily for modal series concepts.

Table 5. Representative soil features

Parent material	(1) Colluvium – basalt (2) Residuum – tuff (3) Volcanic ash – volcanic rock
Surface texture	(1) Ashy sandy loam (2) Silt loam (3) Stony loam (4) Stony loam
Family particle size	(1) Fine (2) Clayey-skeletal (3) Loamy-skeletal (4) Coarse-loamy (5) Ashy over loamy
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Depth to restrictive layer	50 – 200 cm
Soil depth	50 – 200 cm
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-101.6cm)	10.16 – 17.78 cm

Soil reaction (1:1 water) (0-101.6cm)	6.1 – 7.3
Subsurface fragment volume <=3" (10.2-152.4cm)	0 – 30 %
Subsurface fragment volume >3" (10.2-152.4cm)	0 – 30 %

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). However, this broadly defined group spans ponderosa pine and Douglas-fir plant communities with indicator species that range from mallow ninebark, oceanspray and elk sedge in areas with greater soil moisture to drier soils that are characterized by common snowberry and Idaho fescue presence. Ninebark and oceanspray are most common on canyon sites with ninebark most common on northerly aspects and oceanspray more common on southerly aspects.

Ponderosa pine and dry Douglas-fir 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. When allowed to grow without fire these young conifers may 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 ponderosa pine and Douglas-fir stands with open canopies. Historically, these forest communities would have often lacked a dominant shrub component due to this frequent fire interval (Natureserve 2020). 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 pine 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 cool season perennial grasses, such as bluebunch wheatgrass, would resprout from crowns following fire. Understory forbs, such as common yarrow and peavine, 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.

Understory species in these forests were adapted to respond to this fire driven disturbance regime. Many plants, such as elk sedge, oceanspray, mallow ninebark and snowberry would resprout from crowns following fire. Understory forbs, such as common yarrow (Achillea millefolium) and peavines (Lathyrus spp.) may resprout from rhizomes while others, such as lupine (Lupinus spp.), 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 dominant herbaceous component in the understory and often bordering rangelands, many 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 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. Within this forest type across the Blue Mountains, fire regimes are considered to have experienced “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. For warm and dry sites, this may include the possibility of regeneration failure following wildfire disturbance (Halofsky et al. 2020). As evidence increases, this model will likely undergo alterations and updates to reflect our emerging understanding.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

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

Table 7. Community 1.2 plant community composition

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

Table 8. Community 1.3 plant community composition

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

Table 9. Community 1.4 plant community composition

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

Table 10. Community 1.5 plant community composition

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

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Contributors

Andrew Neary - Original concept developed for PES initiative 2020/2021

Approval

Kirt Walstad, 4/04/2025

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):**

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:**
