# Ecological site F043CY603OR
# Cool Wet Conifer Mountains and Plateaus
# (ABGR/VAME/LIBO)

Last updated: 4/04/2025
Accessed: 08/20/2026

## 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

U.S. National Vegetation Classification Standard (NVCS) Central Rocky Mountain Grand fir - Douglas-fir Forest & Woodland Alliance (A-3362) Central Rocky Mountain Grand fir - Douglas-fir-Western larch Forest Group (G211) USDA Forest Service Ecological Sub-region M332 “Blue Mountains” LANDFIRE BpS model 10470: Northern Rocky Mountain Mesic Montane Mixed-Conifer Forest Plant Assoc. Of Blue and Ochoco Mountains (R6 E TP-036-92) Grand fir/big huckleberry -CWS212 (modal) Grand fir/grouse huckleberry - CWS811 Grand fir/grouse huckleberry/twinflower - CWS812 Grand fir/Pacific yew/twinflower - CWC812 Grand fir/Pacific yew/twinflower/queencup beadlily - CWC811 Grand fir/twinflower - CWF312 (modal) Lodgepole pine(grand fir)/big huckleberry - CLS513 Lodgepole pine(grand fir)/big huckleberry/pinegrass - CLS512 Lodgepole pine(grand fir)/big huckleberry/twinflower - CLS5 Plant Assoc. Of Wallowa-Snake Province (R6 E 255-86) Grand fir/big huckleberry - CWS211 Grand fir/queencup beadlily - CWF421 Grand fir/Rocky Mountain maple - CWS912 Grand fir/Rocky Mountain maple-ninebark - CWS412 Grand fir/twinflower - CWF311

## Ecological site concept

This ecological site occurs mainly on forested backslopes of mid to high elevation mountain slopes, and plateaus. Typically, this site is found on soils with a frigid temperature regime and udic moisture regime. Parent materials are derived from basalt or other igneous extrusive geologies (andesite, dacite, ignimbrites, etc.) with a thick mantle of volcanic ash and loess. They are well drained with adequate available water capacity. Grand fir generally represents late seral stages however other species such as western larch and Douglas-fir, and lodgepole pine may be present. Major understory species may range from grouse whortleberry, thinleaf huckleberry, and twinflower, to elk sedge, pinegrass and Columbia brome. 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

| | |
|---|---|
| **F043CY605OR** | **Cool Moist Conifer Mountains and Plateaus (PSME-PIPO/CARU)**<br><br>Occupying adjacent soils with lower soil moisture due to aspect or landscape position |

| | |
|---|---|
| F043CY601OR | **Cold Wet Conifer Mountains and Plateaus (ABLA/VASC-VAME)**<br>Occupying adjacent soils with cooler temperatures due to aspect or landscape position |
| F043CY503OR | **Mountain Riparian Forest (PIEN/ALIN)**<br>Occupying adjacent moderate to high-energy riparian areas |

### Similar sites

| | |
|---|---|
| F043CY605OR | **Cool Moist Conifer Mountains and Plateaus (PSME-PIPO/CARU)**<br>Greater number of dry days (45 - 60), Engelman spruce and grand fir less common. |
| F043CY601OR | **Cold Wet Conifer Mountains and Plateaus (ABLA/VASC-VAME)**<br>Cryic soil temperature regime, subalpine fir common |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Abies grandis* |
| Shrub | (1) *Vaccinium membranaceum* |
| Herbaceous | (1) *Linnaea borealis* |

### Physiographic features

This site occurs on forested backslopes of plateaus and mountain slopes within the Blue and Wallowa mountains of Oregon. This site occurs predominately on north aspects with typical slopes between 7.5 - 45% but occasionally as steep as 65%. Slope profiles are most commonly concave across slopes and linear down slope, and rarely convex. These surface features help to consolidate soil moisture and in combination with north aspects protected from solar radiation, preserve soil moisture longer into the summer season. Elevations are typically between 4,450 - 5,350 ft (1,350 - 1,625 m) but can range from 3,650 - 6,000 ft (1,100 - 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<br>(2) Mountains > Plateau |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 1,360 – 1,630 m |

| | |
|---|---|
| Slope | 10 – 50 % |
| Ponding depth | 0 cm |
| Water table depth | 250 cm |
| Aspect | W, NW, N, NE, E |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Flooding frequency | Not specified |
| Ponding frequency | Not specified |
| Elevation | 1,110 – 1,830 m |
| Slope | 0 – 70 % |
| Ponding depth | Not specified |
| Water table depth | Not specified |

### Climatic features

The climate of this site is characterized by intermountain weather patterns. Winters are cold and wet with considerable snowfall and summers are cool and dry with occasional convective thunderstorms bringing measurable precipitation. Compared to continental systems influencing interior Rocky Mountain landscapes, these storms are less frequent and therefore summer precipitation is lower. Mean annual precipitation is typically between 25 – 30 in (635 – 760 mm.) but ranges from 20 – 40 in (510 – 1,010 mm). Mean annual temperatures are typically 39 - 43 °F (3 - 6°C) but range from 37 – 45°F (2.5 - 7°C). The soil temperature regime is Frigid and the moisture regime is typically Udic with fewer than 45 dry days per year. Frost free days average 25 to 100 per year. Climate graphs are populated from the closest available weather stations and are included to represent general trends rather than representative values.

**Table 4 Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 30-100 days |
| Freeze-free period (characteristic range) | |
| Precipitation total (characteristic range) | 640-760 mm |
| Frost-free period (average) | 70 days |
| Freeze-free period (average) | |

| | |
|---|---|
| Precipitation total (average) | 660 mm |

- (1) MEACHAM [USW00024152], Pendleton, OR
- (2) SENECA [USC00357675], Seneca, OR

### Influencing water features

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

### Soil features

Soils that typify this site concept are typically Andisols that are moderately deep to very deep and well drained. Surface textures are most commonly ashy silt loam but may range from silt loam, to gravelly ashy silt loam. Subsurface horizons are typically skeletal with coarse fragment ranges from very gravelly to extremely cobbly or stony. The family particle size is typically ashy over loamy skeletal but may vary. Soils moisture control sections are usually moist but are dry for less than 45 days following the summer solstice. These soils have developed in colluvium and/or residuum from basalt or other hard igneous extrusive geologies as well as metasedimentary and metavolcanic rocks. These soils are often mantled with a thick layer of ash from the eruption of Mount Mazama. See Limberjim, Syrupcreek and Gutridge for modal series concepts.

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Colluvium – volcanic rock<br>(2) Residuum – volcanic rock<br>(3) Residuum – metasedimentary rock<br>(4) Residuum – metavolcanics<br>(5) Volcanic ash – volcanic rock |
| Surface texture | (1) Ashy silt loam<br>(2) Silt loam<br>(3) Gravelly silt loam |
| Family particle size | (1) Ashy over clayey<br>(2) Ashy over loamy<br>(3) Loamy-skeletal |
| Drainage class | Well drained |
| Permeability class | Moderately slow to moderately rapid |
| 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) | 11.68 – 27.94 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 % |

**Ecological dynamics**

The modal plant associations that define this ecological site group concept are the widespread Grand fir/Twinflower and Grand fir/ Big huckleberry associations (as described in Johnson and Clausnitzer 1992, and Johnson and Simon 1987). Additional closely related plant associations include Grand fir/grouse huckleberry and Grand fir/queencup beadlily. Within MLRA 43c in Oregon, these communities exist in areas receiving greater moisture than ponderosa pine - Douglas-fir forests and at lower elevations and warmer conditions than subalpine fir dominated forests. This site group corresponds to the USFS potential vegetation group “Moist Upland Forest” and plant association group “Cool Moist Upland Forest”.

In its historical reference condition, the most widespread expression of this ecological site was a mature forest with a closed canopy. In this representative stage, mature grand fir (Abies grandis) dominates with Douglas-fir (Pseutotsuga menziesii) very common and Engelmann spruce (Picea engelmannii), western larch (Larix occidentalis) and scattered ponderosa pine (Pinus ponderosa) also commonly found. Limited amounts of western white pine (Pinus monticola) and lodgepole pine (Pinus contorta var. lat.) may also occur. Understory regeneration of grand fir is common. A diverse number of understory plants may be found, yet the presence of thinleaf huckleberry (Vaccinium membranaceum), especially in openings, and twinflower (Linnaea borealis), in shaded understories, characterizes the site. In this mature forest, shade tolerant forbs such as sidebells wintergreen (Orthilia secunda), miterwort (Mitella spp), bride's bonnet (Clintonia uniflora) and western rattlesnake plantain (Goodyera oblongifolia) are commonly found. Other herbaceous and shrub species may include Columbia brome (Bromus vulgaris), northwestern sedge (Carex concinnoides), pipsissewa (Chimaphila umbellata), pinegrass (Calamagrosis rubescens), elk sedge (Carex geyeri), strawberry (Fragaria spp.), heartleaf arnica (Arnica cordifolia), white hawkweed (Hieracium albiflorum), baldhip rose (Rosa gymnocarpa), birchleaf spirea (Spirea betulifolia) and violet (Viola spp.). Within the range of this site, dominance of either bride’s bonnet or grouse huckleberry (Vaccinium scoparium) can represent soil moisture microsites with higher or lower relative moisture respectively.

In comparison to adjacent and associated mixed conifer forests occupying drier aspects, lower elevations or droughty exposures, this forest type historically was subject to less frequent fire. Fire return interval estimates suggest that surface fires were rare, mixed fires occurred at a roughly 150 year cycle and replacement fires on a 200 year cycle approximating Landfire fire regime 3, 35-100+ year frequency, mixed severity (Landfire 2017). These conditions would have allowed the otherwise fire intolerant grand fir to attain canopy dominance overtime and reduced the relative cover of more fire tolerant species such as Douglas-fir and western larch. When fire does occur, lodgepole pine often responds and may dominate early regeneration phases. This may be especially common on gentle topography where cold air pooling favors this cold tolerant conifer. Western larch may also be highly successful during early forest development stages and is often more competitive on steeper slope positions than lodgepole pine. As a shade intolerant species, ponderosa pine will often be more common during early forest development stages, yet may also withstand high severity fire and persist as mature trees in the canopy. Engelman spruce is common in mature stands and increases in areas with higher soil moisture.

Understory species in these forests were adapted to respond to the progression of forest changes from early to late successional phases.

Many shrubs found on site including thinleaf huckleberry, spiraea and common snowberry (Symphoricarpus albus), would also resprout from crowns or rhizomes following fire. These and other shrub species may respond to high severity fire by forming dense shrubfields on sites where they were present prior to disturbance. Thinleaf huckleberry will often dominate following fire then decline as canopy closure progresses. Thinleaf huckleberry may provide solar cover for shade tolerant subshrubs and forbs such as twinflower to establish. Grazing by both livestock and native ungulates will decrease the cover of these two common species with subsequent increases in some forbs such as violets and longstalk clover (Trifolium longipes).

Douglas-fir is weakened or killed from Douglas-fir beetle (sometimes as secondary fire mortality), wood borers, tussock moth, and western spruce budworm. Western larch is susceptible to damage from dwarf mistletoe, needlecast and a host of fungi. Larch casebearer, sawfly, spruce budworm and tussock moth are common larch defoliators. Western white pine is greatly reduced from its historic expression by the impacts of white pine blister rust. Lodgepole pine is commonly impacted by western gull rust, mistletoe, and bark beetles, among other agents. Both Douglas-fir and grand-fir are very susceptible to root diseases (i.e. annosus and armillaria) and subsequent insect mortality, especially where stands become overstocked in combination with lower quality soils, and when seasonal climatic or weather conditions are poor. Common causes of insect damage to grand fir is from spruce budworm, tussock moth and the fir engraver beetle. Grand fir is also susceptible to a variety of pathogens and other injurious agents. Engelmann spruce is commonly impacted by wood-rotting fungi and broom rusts. Spruce beetle can cause serious mortality during outbreaks. The impact from diseases or subsequent insect infestation can be small and endemic, or larger scaled over time when these root disease and damage agents actually become epidemic.

Fire exclusion within the past 100 years has drastically changed the structural expression of the present forest in this ecological site, resulting in an increase in the proportion of mid to late seral tree species, and corresponding in increases in crown density and continuity. Fuel loads have increased at all levels on the majority of present day stands.

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

## 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:**

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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:**

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