

Ecological site R043CY804OR

Cool Mountain Bunchgrass (ARTRV/FEID)

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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 Engelmann 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) western juniper/Idaho fescue-bluebunch wheatgrass - CJG111 western juniper/mountain big sagebrush/Idaho fescue-bluebunch wheatgrass - CJS2 western juniper/bitterbrush/Idaho fescue-bluebunch wheatgrass - CJS321 mountain big sagebrush/Idaho fescue-bluebunch wheatgrass - SD2911 mountain big sagebrush/western needlegrass - SD2920 mountain big sagebrush/elk sedge - SS4911 USDA Forest Service Ecological Sub-region M332 "Blue Mountains" U.S. National Vegetation Classification Standard (NVCS) Group: G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland Alliance: A3207. *Artemisia tridentata* ssp. *spiciformis* - *Artemisia tridentata* ssp. *vaseyana* Steppe & Shrubland Alliance Association: *Artemisia tridentata* ssp. *vaseyana* / *Festuca idahoensis* Shrub Grassland

Ecological site concept

This site occurs on mountain slopes, hillslopes, plateaus and ridges of the Blue and Ochoco Mountains. Soils are typically moderately deep but range from shallow to very deep. Typically, total available water (either due to soil properties, or low precipitation) limits plant communities to drought resistant sagebrush and bunchgrass instead of large conifers. The reference state is characterized by a mix of mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Idaho fescue (*Festuca idahoensis*) and perennial forbs. Minor amounts of western juniper (*Juniperus occidentalis*) and ponderosa pine (*Pinus ponderosa*) may be present. Typically, periodic low intensity fire removes woody species and favors deep rooted perennial bunchgrasses. Fire suppression favors invasion by western juniper and shrubs. 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

R043CY808OR	Claypan (ARAR8/FEID-PSSPS) Adjacent soils with well developed claypan layers favoring low sagebrush
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Similar sites

R043CY802OR	Cool foothills and Mountains (FEID-KOMA-PSSPS) Influenced by maritime climate patterns, ARTR uncommon
R043CY805OR	Mountain Rockland (JUOC/CELE3/FEID) Greater large coarse fragment content, shallower soils with higher cover of cobbles and stones on the surface and areas of rock outcrop

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia tridentata ssp. vaseyana</i>
Herbaceous	(1) <i>Festuca idahoensis</i>

Physiographic features

This site occurs on all aspects of mountain slopes, hillslopes, plateaus and ridges of the Blue and Ochoco Mountains. Basalt of the Columbia River Group are most dominant, but sedimentary, metavolcanic, metamorphic, and other hard igneous extrusive geologies may also occur. Slopes are broad, ranging from 0 to 90% but average 15 to 35%. Elevation is typically from 5,350 to 6,300 feet (1,625 to 1,925 m) but ranges from 3,800 to 7,300 ft (1,150 to 2,225 m). With increased elevation, this site is more likely to occur on south slopes and conversely on north slopes with decreasing elevation. This site does not experience ponding or flooding and no water table is present within the upper two meters of soil.

Table 2. Representative physiographic features

Landforms	(1) Mountains > Hillside or mountainside (2) Mountains > Plateau (3) Mountains > Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,630 – 1,920 m
Slope	20 – 40 %
Ponding depth	0 cm
Water table depth	250 cm

Aspect	W, NW, N, NE, E, SE, S, SW
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Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	1,160 – 2,230 m
Slope	0 – 90 %
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Annual precipitation is 25 - 35 inches (635 - 890 mm), most of which occurs in the form of snow during the months of December through March. Localized convection storms occasionally occur during the summer but resulting precipitation does not generally have a significant effect on soil moisture. The soil temperature regime is frigid, and the soil moisture regime is xeric. The frost-free period ranges from less than 30 to 90 days. The optimum growth period for plant growth is late April through June. 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)	30-90 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	640-890 mm
Frost-free period (average)	60 days
Freeze-free period (average)	
Precipitation total (average)	790 mm

- (1) MASON DAM [USC00355258], Baker City, OR
- (2) AUSTIN 3 S [USC00350356], Prairie City, OR
- (3) MEACHAM [USW00024152], Pendleton, OR

Influencing water features

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

Soil features

The soils of this site are formed from residuum and colluvium derived from hard igneous extrusive geologies (basalt, andesite, rhyolite, tuff, etc.) with an influence of volcanic ash in the surface. Occasionally, sedimentary, metamorphic and metavolcanic geologies may be found associated with this site. These soils are typically moderately deep but range from shallow to very deep. The family particle size is typically loamy-skeletal but variable. Surface textures are variable. Subsurface textures range from loam to clay. The total volume of coarse fragments is variable depending on slope but is typically 15 to 40. See Ironside and Chochoco for modal series concepts.

Table 5. Representative soil features

Parent material	(1) Colluvium – volcanic and metamorphic rock (2) Residuum – volcanic and metamorphic rock (3) Colluvium – volcanic and sedimentary rock (4) Colluvium – volcanic and sedimentary rock
Surface texture	(1) Ashy silt loam (2) Extremely cobbly loam (3) Very gravelly sandy loam (4) Very gravelly silt loam
Family particle size	(1) Ashy over loamy-skeletal (2) Fine-loamy (3) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow to rapid
Depth to restrictive layer	50 – 100 cm
Soil depth	50 – 100 cm
Surface fragment cover ≤3"	20 – 60 %
Surface fragment cover >3"	10 – 20 %
Available water capacity (0-101.6cm)	1.27 – 13.56 cm

Soil reaction (1:1 water) (0-101.6cm)	5.4 – 7.3
Subsurface fragment volume <=3" (10.2-152.4cm)	0 – 40 %
Subsurface fragment volume >3" (10.2-152.4cm)	0 – 70 %

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 (0-101.6cm)	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 reference plant community is dominated by Idaho fescue in the understory and mountain big sagebrush in the overstory. Prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*) and a variety of forbs are also present.

Ecological Dynamics and Disturbance Response:

Ecological dynamics of this site are primarily driven by interactions between climatic patterns and disturbance regimes. Frequent low intensity fires were the historical disturbance that maintained the reference state and drove plant community shifts within the state. Intensity and frequency of these fires is strongly influence by drought cycles and/or insect or disease attacks on the plant community. Introduction of exotic annual grasses compromises the resistance and resiliency of the site, putting it at higher risk of crossing a threshold into another state.

Periodic drought regularly influences sagebrush ecosystems and drought duration and severity has increased throughout the 20th century in much of the Intermountain West. Major shifts away from historical precipitation patterns have the greatest potential to alter ecosystem function and productivity. Species composition and productivity can be altered by the timing of precipitation and water availability with the soil profile (Bates et al. 2006).

The invasibility of plant communities is often linked to resource availability. Disturbance can decrease resource uptake due to damage or mortality of the native species and depressed competition or can increase resource pools by the decomposition of dead plant material following disturbance. The invasion of sagebrush communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

This site is susceptible to western juniper encroachment; and to a lesser extent, ponderosa pine when the site is adjacent to mature conifers. The range and density of western juniper has increased since the middle of the nineteenth century (Tausch 1999, Miller and Tausch 2000). Causes for expansion of conifers into sagebrush ecosystems include wildfire suppression, historic livestock grazing, and climate change (Bunting 1994). Mean fire return intervals prior to European settlement in mountain big sagebrush ecosystems were 15 to 25 years (Burkhardt and Tisdale 1976, Young and Evans 1981), frequent enough to inhibit the encroachment of conifers into these big sagebrush cover types (Miller and Tausch 2000). With the increased suppression of wildfire and livestock grazing, which reduces ground fuels and understory competition, regeneration and establishment of conifers has expanded into suitable sites previously dominated by big sagebrush (Burns and Honkala 1990). An increase in crown density causes a decrease in understory perennial vegetation and an increase in bare ground. This allows for the invasion of non-native annual species such as cheatgrass (*Bromus tectorum*) and medusahead (*Taeniatherum caput-medusae*). With annual species in the understory wildfire can become more frequent and increase in intensity. With frequent wildfires, sagebrush will be reduced or eliminated and these plant communities can convert to annual species with a sprouting shrub and juvenile tree overstory.

Treatment Response:

North facing aspects respond positively to juniper removal if soil erosion is not significant. Seeding may be necessary if there is less than 1-2 bunchgrass plants per meter square in the understory. Sagebrush and forbs may also need to be seeded if adult plants are no longer present in the understory.

Adapted from: Stringham, et al. 2017

State and transition model

Additional community tables

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Contributors

Jennifer Moffitt - Original concept developed for 2020 PES initiative
Andrew Neary - Further concept development for 2020 PES initiative

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	04/04/2025
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:

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:
