Ecological site R043CY502OR
Cool Moist Mountain Meadow
(DECE/CAREX)

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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

USDA Forest Service Ecological Sub-region M332 “Blue Mountains” U.S. National Vegetation Classification Standard (NVCS) Macrogroup: Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh Riparian and Wetland Vegetation of Central and Eastern Oregon (2004): CEGL001599 - Deschampsia caespitosa Association - Tufted hairgrass Association Mid-Montane Wetland Plant Associations of the Malheur, Umatilla and Wallowa-Whitman National Forests (1997): MM1912 - Tufted Hairgrass Plant Association – (Deschampsia cespitosa) SW5113 - Shrubby Cinquefoil/Tufted Hairgrass Plant Association – (Potentilla fruticosa/Deschampsia cespitosa)

Ecological site concept

This ecological site represents cool moist meadow environments of the Blue and Wallowa mountains of Oregon and Washington. These communities are dominated by tufted hairgrass (Deschampsia caespitosa), and other facultative wetland graminoid and forb species. This site is found among forested communities at moderate to high elevations, often occupying depositional floodplains, low terraces and swales. Deep, fine textured mineral soils promote high water holding capacity and seasonally high water tables that drop below 30cm by mid to late summer. These conditions favor plant species that can tolerate soil saturation but can also survive soil drying. Historically, climatic cycles acting on watershed hydrology would have controlled ecological dynamics and geomorphic processes. 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

R043CY501OR	**Cold Wet Mountain Meadow (CAREX)** Occupying adjacent landforms with meadow communities at somewhat lower positions relative to stream channels or more consistent sources of subsurface moisture

F043CY503OR	**Mountain Riparian Forest (PIEN/ALIN)** Adjacent forested riparian areas with higher energy soils

Similar sites

R043CY501OR	**Cold Wet Mountain Meadow (CAREX)** Water table remains within 30 cm of the soil surface throughout the year. Carex dominated.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Deschampsia cespitosa* (2) *Carex*

Physiographic features

This meadow site occurs on depositional floodplain areas in mountain valleys and on mountain plateaus. The site also occurs on swales; upland areas adjacent to springs and seeps; and low terraces adjacent to wet meadow depression areas and stream channels. When located near active stream channels this site is subject to rare to occasional (1 to 50 times in 100 years) flooding that typically lasts from a few hours to a week. In reference condition, the floodplain is well connected to the primary channel. Subsurface water is often near the surface during spring, yet often falls to between 30 and 100 cm below the soil surface by mid-summer. Valley gradients typically range from 0 to 3 percent. Elevations typically range from 4,000 to 4,800 feet (1,200 to 1,450 meters) but this site may be found up to 7,000 ft (2,150 meters).

Table 2. Representative physiographic features

Landforms	(1) Mountains > Flood plain (2) Mountains > Terrace--stream or lake (3) Mountains > Swale
Flooding duration	Extremely brief (0.1 to 4 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding frequency	None
Elevation	1,220 – 1,460 m
Slope	0 %

Ponding depth	Not specified
Water table depth	0 – 80 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	1,220 – 2,130 m
Slope	Not specified
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

The annual precipitation ranges from 18 – 30 inches (460 – 760 mm), most of which occurs in the form of rain and snow during the months of November through March. The soil moisture regime is typically Xeric or Udic. The soil temperature regime is Frigid to Cryic with a mean air temperature between 41 to 45 degrees F (5 to 7 degrees C). The frost-free period ranges from less than 50 to more than 100 days. 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)	50-100 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	460-760 mm
Frost-free period (average)	70 days
Freeze-free period (average)	

Precipitation total (average)	610 mm

- (1) AUSTIN 3 S [USC00350356], Prairie City, OR
- (2) MEACHAM [USW00024152], Pendleton, OR
- (3) UKIAH [USC00358726], Pilot Rock, OR

Influencing water features

Frequent surface flows and long duration seasonal sub-surface flows from adjacent perennial and seasonal streams and associated uplands augment the precipitation. Duration and volume of flows during spring and summer will be dependent on snowpack within contributing watersheds, as well as vegetation type and cover, geology and geomorphology. These processes will in part be controlled by the interactions of spring and summer air temperature and spring precipitation on melting and runoff. The water table typically fluctuates between 30 and 100 cm from March through July.

Soil features

The soils of this site are typically recent, deep to very deep and well drained to somewhat poorly drained. Surface layers may be formed in loess; volcanic ash; colluvium or residuum from basalt, tuff or andesite; or alluvium. Subsurface layers are formed in alluvial or lacustrine deposits. The surface horizon is typically a loam or silt loam between 10 and 25 inches thick and may be very gravelly. The subsurface horizon is typically a silty clay or clay but may range to a coarser sandy loam and exhibit a stony or gravelly coarse fragment modifier. During wet periods, soils are unstable due to prolonged saturated conditions. The erosion potential is moderate to severe.

Table 5. Representative soil features

Parent material	(1) Volcanic ash – volcanic rock (2) Colluvium – volcanic rock (3) Residuum – volcanic rock (4) Alluvium – volcanic and metamorphic rock (5) Lacustrine deposits
Surface texture	(1) Gravelly sandy clay loam (2) Gravelly loam (3) Very stony very fine sandy loam (4) Extremely stony coarse sandy loam
Family particle size	(1) Coarse-loamy (2) Loamy (3) Loamy-skeletal (4) Sandy-skeletal
Drainage class	Somewhat poorly drained
Permeability class	Slow to rapid

Depth to restrictive layer	100 – 200 cm
Soil depth	100 – 200 cm
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-101.6cm)	4.57 – 14.73 cm
Soil reaction (1:1 water) (0-101.6cm)	5.8 – 7.8
Subsurface fragment volume <=3" (10.2-152.4cm)	10 – 50 %
Subsurface fragment volume >3" (10.2-152.4cm)	0 – 30 %

Table 6. Representative soil features (actual values)

Drainage class	Well drained to somewhat poorly drained
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
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

In its reference state, this site is dominated by tufted hairgrass with cover ranging from 25 – 100%. Common forbs found on this site may include common camas (Camassia quamash ssp. Breviflora), tall groundsel (Senecio hydrophiloides), american bistort (Polygonum bistortoides), slender cinquefoil (Potentilla gracilis), and alpine leafybract aster (Symphyotrichum foliaceum). Common graminoids may include baltic rush (Juncus balticus), smallwing sedge (Carex microptera), Nebraska sedge (Carex nebrascensis), and alpine timothy (Phleum alpinum). Bareground is low and litter cover is high. In soils with cobbly or stony subsurface horizons or on terrace positions, shrubby cinquefoil (Dasiphora fruticosa subsp. Floribunda) may be common.

Production of tufted hairgrass is dependent on the extent and duration of subsurface water flows. Within the range of this site, increased subsurface flows and higher water tables favor sedges over tufted hairgrass. Dominance of sedges and persistent water tables over 30cm indicate a Wet Meadow site rather than a Moist Meadow site. Production may decrease on the upper end of watersheds where perennial streams change to ephemeral, and in bottomland areas receiving limited subsurface flows.

Historically, the ecological dynamics of the site would have been influenced largely by climate cycles affecting seasonal snowpack, runoff, droughts and flood. These processes would have been partly controlled by the type and cover of upland and forest vegetation throughout the watershed which would have modified water capture, storage and sediment supply. These upland dynamics would have been altered by historical fire regimes and subsequently vegetation succession, erosion and runoff. Beaver also had widespread impacts on water table depth and seasonality, frequency and duration of ponding and flooding, and stream channel structure.

Prolonged disturbance by grazing animals will favor a decrease in tufted hairgrass and an increase in sedges, rushes, non-native grasses and some forbs. Impactful In this condition, non-native meadow grasses such as Kentucky bluegrass (Poa pratensis), common timothy (Phleum pretense), and meadow foxtail (Alopecurus pratensis) are commonly found. Forbs that may increase include long-stalk clover (Trifolium longipes), western yarrow (Achillea millefolium), and western mountain aster (Symphyotrichum spathulatum). Prolonged improperly managed livestock grazing will increase bareground, erosion and pedestalling, and decrease litter cover. The site may also be invaded by exotic annual grasses and forbs and exotic taprooted perennials such as Canada thistle (Cirsium arvense).

Where sites are connected to stream networks, these impacts may lead to decreased streambank stability and eventually degradation of stream channels. Overtime, with increased depth and incision of channels, water tables may drop and floodplains may become disconnected from stream courses. If these effects are not mitigated, floodplains may convert to abandoned terraces and vegetation may shift to drought adapted perennial grasses such as bluebunch wheatgrass (Pseudoroegneria spicata) and shrubs such as big sagebrush (Artemesia tridentata). High energy runoff events will accelerate this transition if banks have been destabilized by loss of vegetation. Site hydrology may also be altered by modifications to the stream channel by disturbances such as impoundment, removal of beaver, flow alteration for irrigation, channel realignment or terrace modifications for agricultural use. Chanel straightening, deepening and drainage practices may be implemented to convert the site to agricultural use or facilitate transportation corridors. These impacts may be less common in these higher elevation meadows compared to low elevation bottom lands. When implemented, these land uses often increase stream gradients, decrease sinuosity and increase channel depths, leading to disconnected floodplains overtime.

Emerging evidence suggests that montane meadows are experiencing conifer encroachment within the last century. Hypotheses for processes driving these vegetation changes range from climate cycles, alterations in fire regime and reductions in sheep grazing. While much of this site have soil moisture too high to accommodate significant conifer encroachment, populations of conifers such as lodgepole pine (Pinus contorta) and grand fir (Abies grandis) may become established due to climate or altered disturbance regimes.

This site may be vulnerable to alterations in surface and ground water hydrology as a result of climate change. Snowpack is expected to decline across the mountains of Oregon with a warming climate (Mote et al. 2005) and shifts from snow to rain is expected to be most pronounced at middle elevations of the Cascade and Blue Mountains. Research suggests that expected shifts in precipitation timing and type will have far reaching effects on blue mountain riparian, wetland and ground-water-dependent ecosystems and that wet meadows may experience shifts in dominant vegetation as a result of altered water tables (Dwire et al 2018). The state and transition model below

does not take into account the potential impacts of a changing climate and instead represents an approximation of ecological dynamics resulting from a simplified model of this meadow system. Further work is needed to better understand community response to climate shifts as well as the existence of alternative states and plant communities that may exist within these states.

State and transition model

Additional community tables

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Contributors

Andrew Neary - Original concept for 2020 PES initiative

Approval

Kirt Walstad, 2/12/2025

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):**

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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:**
