Ecological site R043CY809OR
Warm Foothills and Mountains (PSSPS-POSE)

Last updated: 9/08/2023
Accessed: 05/20/2024

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)
bluebunch wheatgrass-Sandberg bluegrass - GB41

Plant Assoc. of Wallowa-Snake Province (R6 E 255-86)
bluebunch wheatgrass-Sandberg bluegrass-narrowleaf skullcap- GB4112
bluebunch wheatgrass-Sandberg bluegrass (basalt) - GB4113
bluebunch wheatgrass-Sandberg bluegrass-shaggy fleabane - GB4115

USDA Forest Service Ecological Sub-region
M332 “Blue Mountains”

U.S. National Vegetation Classification Standard (NVCS)
Group: G273. Central Rocky Mountain Lower Montane, Foothill & Valley Grassland
Alliance: A3987. Festuca idahoensis - Pseudoroegneria spicata - *Poa secunda* Dry Grassland Alliance
Association(s):
Pseudoroegneria spicata - *Poa secunda* Grassland
Pseudoroegneria spicata - *Poa secunda* Lithosolic Grassland

Ecological site concept

This site occurs on hillslopes, mountain slopes, and ridgetops with shallow to deep soils over hard igneous extrusive geologies (generally basalt, but also includes andesite, rhyolite, tuff, etc.) Occasionally, this site may occur with metamorphic, metavolcanic or sedimentary geologies. In the reference state, the site is characterized by bluebunch wheatgrass (Pseudoroegneria spicata) and Sandberg bluegrass (*Poa secunda*). Production is limited by the low water holding capacity of the soil or lower precipitation. Precipitation comes in the form of snow and rain primarily in the winter and early spring. Historically, plant community dynamics were driven primarily by disturbances such as localized fire and drought.

This ecological site and associated plant communities cover a broad range of elevations, soil climate regimes and soil depth classes. Further investigation will be needed to separate differences between these groups.

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

R043CY807OR	**Scabland (PSSPS-POSE-DAUN)** Occupying adjacent shallow and very shallow soils on scablands
R043CY810OR	**Open Canyon Slopes and Fans (PSSPS-SPCR)** Warmer, lower elevation

Similar sites

R043CY810OR	**Open Canyon Slopes and Fans (PSSPS-SPCR)** Warmer, lower elevation

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pseudoroegneria spicata* (2) *Poa secunda*

Physiographic features

This site occurs on hillslopes, mountain slopes, and ridgetops with shallow to moderately deep soils over hard igneous extrusive geologies (generally basalt, but also includes andesite, rhyolite, tuff, etc.). Occasionally, this site may occur with metamorphic, metavolcanic or sedimentary geologies. Slopes are generally 5 to 15% however the total range is 0 to 100%. The elevation range of this site is broad, typically 4,200 to 5,150 ft (1,275 to 1,575 m), but ranging from 3,600 to 6,000 ft (1,100 to 1,850 m). This site occurs on all aspects, however, with increased elevation, this site is more likely to occur on south slopes. 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 > Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	1,280–1,676 m
Slope	5–15%
Ponding depth	0 cm
Water table depth	254 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	1,219–1,981 m
Slope	0–100%
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

The annual precipitation ranges from 20 - 30 inches (510 – 755 mm). The precipitation occurs as rain and snow during the months of November through April. Localized, occasionally severe, convection storms may occur during the summer. The mean annual air temperature is approximately 48 degrees F (9 degrees C). Soil temperature regimes include frigid and mesic near frigid while soil moisture regimes are typically xeric. The frost-free period ranges from 80 to 120 days. The period of optimum plant growth is from April through mid-July. 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)	80-120 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	508-762 mm
Frost-free period (average)	90 days
Freeze-free period (average)	
Precipitation total (average)	635 mm

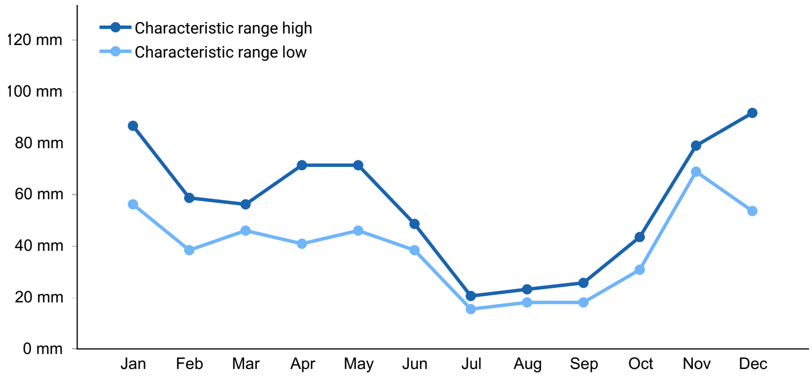


Figure 1. Monthly precipitation range

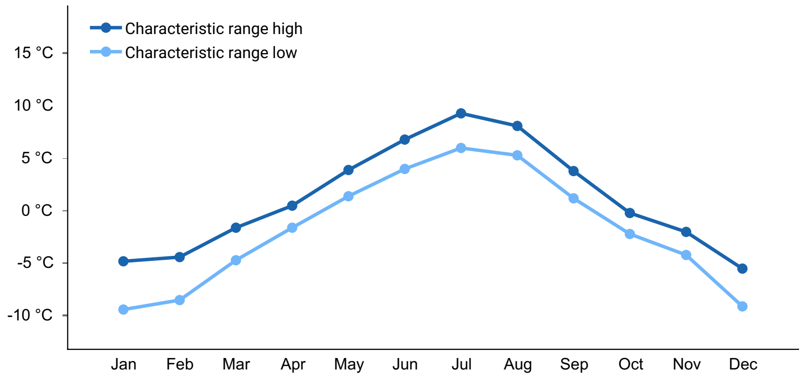


Figure 2. Monthly minimum temperature range

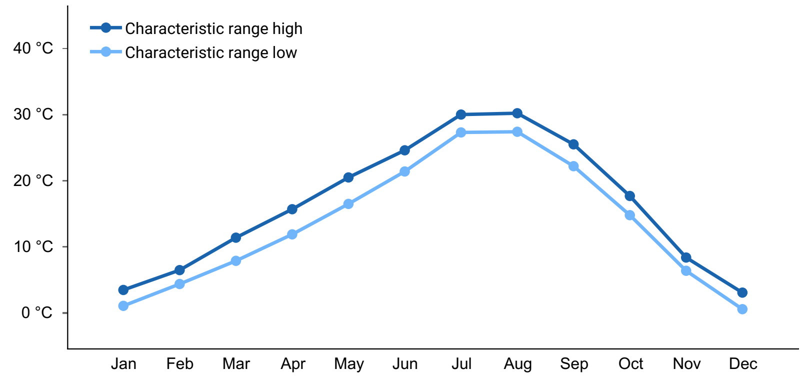


Figure 3. Monthly maximum temperature range

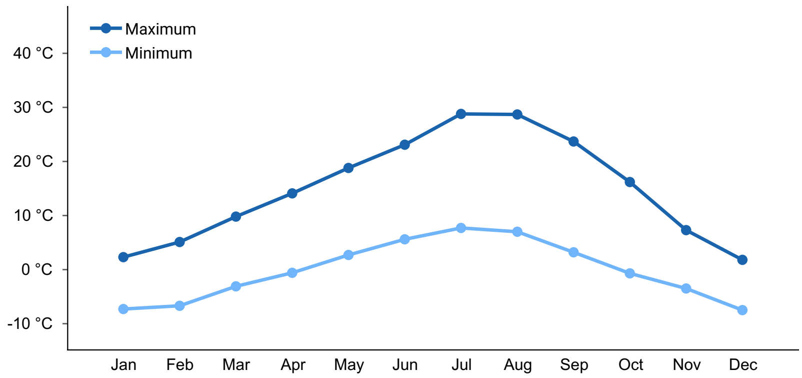


Figure 4. Monthly average minimum and maximum temperature

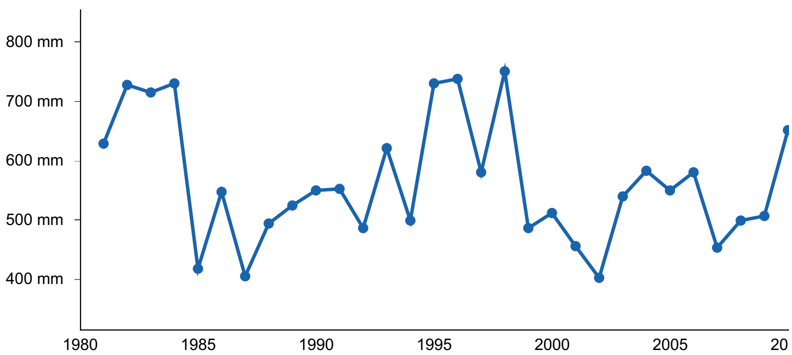


Figure 5. Annual precipitation pattern

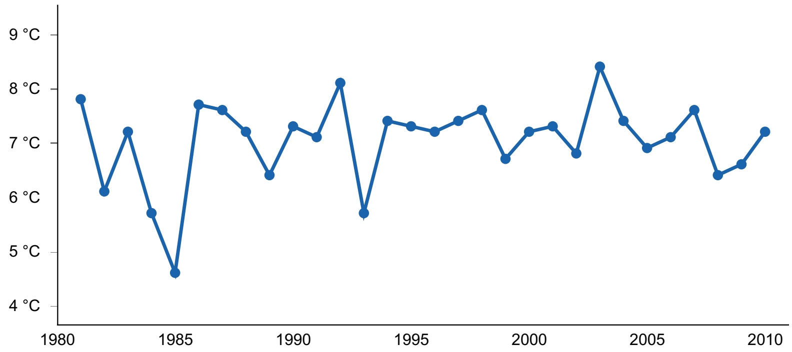


Figure 6. Annual average temperature pattern

Climate stations used

- (1) ELGIN [USC00352597], Elgin, OR
- (2) MASON DAM [USC00355258], Baker City, OR
- (3) AUSTIN 3 S [USC00350356], Prairie City, OR
- (4) HALFWAY [USC00353604], Halfway, OR
- (5) MEACHAM [USW00024152], Pendleton, OR
- (6) COVE 1 E [USC00351926], Cove, OR

Influencing water features

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

Soil features

Soils of this site range from shallow to deep and developed from colluvium and/or residuum derived typically from basalt and other hard igneous extrusive geologies, often with a minor influence of volcanic ash. Occasionally, sedimentary, metamorphic and metavolcanic geologies may be found associated with this site. Surface textures are typically extremely cobbly ashy loam to extremely cobbly silt loam but may vary. Subsurface textures range from sandy loam to clay. The family particle size is typically loamy-skeletal but may occasionally be clayey-skeletal. Total volume of coarse fragments within the profile is variable depending on slope but is typically 15 to 60%. See Anatone (low elevation or warm phases) and Gwin for modal series concepts.

Table 5. Representative soil features

Parent material	(1) Colluvium–volcanic rock (2) Residuum–volcanic rock (3) Colluvium–metamorphic and sedimentary rock (4) Residuum–metamorphic and sedimentary rock
Surface texture	(1) Extremely cobbly loam (2) Extremely cobbly silt loam (3) Gravelly silt loam (4) Very stony loam
Family particle size	(1) Loamy-skeletal (2) Clayey-skeletal
Drainage class	Well drained
Permeability class	Moderate to slow
Depth to restrictive layer	25–152 cm
Soil depth	25–152 cm
Surface fragment cover <=3"	15–70%
Surface fragment cover >3"	10–25%

Available water capacity (0-101.6cm)	1.52–4.06 cm
Soil reaction (1:1 water) (0-101.6cm)	6.1–7.3
Subsurface fragment volume <=3" (10.2-152.4cm)	10–45%
Subsurface fragment volume >3" (10.2-152.4cm)	20–40%

Ecological dynamics

Range in Characteristics:

Variability in plant composition and yield is dependent on soil depth and bedrock fracture rather than on precipitation and elevation ranges that occur within the site. The highest yield and most bluebunch wheatgrass occurs over deeper soils with higher water holding capacities.

Ecological Dynamics:

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. 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 these 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 bunchgrass communities by cheatgrass (*Bromus tectorum*) has been linked to disturbances (fire, abusive grazing) that have resulted in fluctuations in resources (Chambers et al. 2007).

The species most likely to invade these sites are cheatgrass, medusahead (*Taeniatherum caput-medusae*), and North Africa grass (*Ventenata dubia*); cool-season annual grasses that germinate in the fall, overwinter as seedlings, and initiate growth in the spring (Miller et al. 1999a). Expansion of these grasses creates seed reserves that can infest adjoining areas and cause changes to the fire regime. These grasses create fuel continuity in the understory, often resulting in increased fire frequency and more uniform burn patterns (less mosaic).

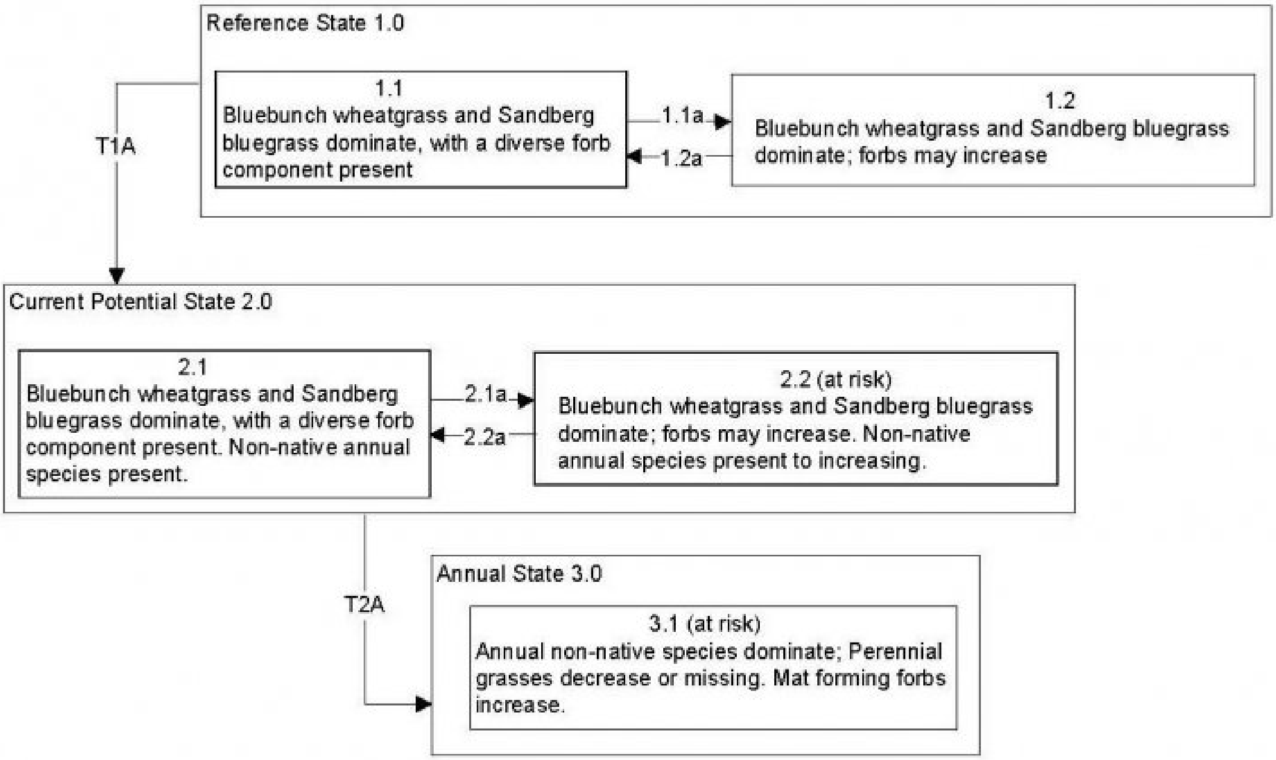
Fire Ecology:

Fire will remove aboveground biomass from bluebunch wheatgrass but plant mortality is generally low (Robberecht and Defossé 1995) because the buds are underground (Conrad and Poulton 1966) or protected by foliage. Uresk et al. (1976) reported burning increased vegetative and reproductive vigor of bluebunch wheatgrass. Thus, while bluebunch wheatgrass may experience slight damage to fire, it is more susceptible in drought years (Young 1983). Plant response will vary depending on season, fire severity, fire intensity and post-fire soil moisture availability.

Sandberg bluegrass (*Poa secunda*), has been found to increase following fire likely due to its low stature and productivity (Daubenmire 1975). Sandberg bluegrass may retard reestablishment of deeper rooted bunchgrass.

(Adapted from: Stringham, T.K. et al., 2016)

State and transition model



Reference State 1.0 Community Pathways
1.1a: Low severity fire creates grass/forb mosaic
1.2a: Time and lack of disturbance allows for perennial grasses to increase.

Transition T1A: Introduction of non-native species

Current Potential State 2.0 Community Pathways
2.1a: Low severity fire creates grass/forb mosaic
2.2a: Time and lack of disturbance allows for perennial grasses to increase.

Transition T2A: Severe or continuous disturbance in the presence of non-native annual species, may be combined with higher than normal spring precipitation. (e.g. Catastrophic fire and/or soil disturbing treatments and/or inappropriate grazing management resulting in soil compaction due to grazing while soils are wet and/or utilization of perennial grasses that impact the plant's ability to recover)

State 1
Historical reference state

The Reference State 1.0 is representative of the natural range of variability under pristine conditions. The reference state is bunchgrass dominated with a diverse forb component. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These are maintained by elements of ecosystem structure and function such as the presence of all structural and functional groups, and retention of organic matter and nutrients. Plant community phase changes are primarily driven by fire and/or periodic drought.

Dominant plant species

- bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), grass
- Sandberg bluegrass (*Poa secunda*), grass

State 2
Current Potential State

This state is similar to the Reference State 1.0. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-native plant species may increase in abundance but will not become dominant within this State. These species can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These are maintained by elements of ecosystem structure and function such as the presence of all structural and functional groups, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. Processes and characteristics that contribute to positive feedbacks include the non-natives species' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Dominant plant species

- bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), grass
- Sandberg bluegrass (*Poa secunda*), grass

State 3
Exotic annual grass state

This community is characterized by the dominance of annual non-native species such as medusahead, cheatgrass, and ventenata.

Dominant plant species

- medusahead (*Taeniatherum caput-medusae*), grass
- cheatgrass (*Bromus tectorum*), grass
- North Africa grass (*Ventenata dubia*), grass

Transition T1A
State 1 to 2

Introduction of non-native species

Transition T2A
State 2 to 3

Severe or continuous disturbance in the presence of non-native annual species, may be combined with higher than normal spring precipitation. (e.g Catastrophic fire and/or soil disturbing treatments and/or inappropriate grazing management resulting in soil compaction due to grazing while soils are wet and/or utilization of perennial grasses that impact the plant’s ability to recover).

References

Johnson Jr, C.G. and R.R. Clausnitzer. 1992. Plant Association of the Blue and Ochoco Mountains. Tech. Publ. R6-ERW-TP-036-92.. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallow-Whitman National Forest, Portland, OR.

Johnson, C.G. and S.A. Simon. 1987. Plant Association of the Walla-Snake Province, Wallowa-Whitman National Forest. R6-ECOL-TP-225A-86.. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallow-Whitman National Forest.

Other references

Bates, J.D., T. Svejcar, R.F. Miller and R.A. Angell. 2006. The effects of precipitation timing on sagebrush steppe vegetation. Journal of Arid Environments 64 (2006): 670-697.

Chambers, J., B. Bradley, C. Brown, C. D’Antonio, M. Germino, J. Grace, S. Hardegree, R. Miller, and D. Pyke. 2013. Resilience to Stress and Disturbance, and Resistance to *Bromus tectorum* L. Invasion in Cold Desert Shrublands of Western North America. Ecosystems:1-16.

Conrad, C. E. and C. E. Poulton. 1966. Effect of a wildfire on Idaho fescue and bluebunch wheatgrass. Journal of Range Management:138-141.

Daubenmire, R.F. 1975. Plant succession on abandoned fields, and fire influences, in a steppe area in southeastern Washington. Northwest Science 49(1):36-48.

Miller, H.C., D. Clausnitzer, and M.M Borman. 1999a. Medusahead. In: Sheley, R.L. and J.K. Petroff (eds.). Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, OR.

Robberecht, R. and G. Defossé. 1995. The relative sensitivity of two bunchgrass species to fire. International Journal of Wildland Fire 5:127-134.

Stringham, T.K., D. Snyder, and A. Wartgow. 2016. State-and-Transition Models for USFS Crooked River National Grassland Major Land Resource Area B10 Oregon. DRAFT Report. University of Nevada Reno.

Uresk, D. W., J. F. Cline, and W. H. Rickard. 1976. Impact of wildfire on three perennial grasses in south- central Washington. Journal of Range Management 29:309-310.

USNVC [United States National Vegetation Classification]. 2020. United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [http://usnvc.org/ accessed 9/25/2020}

Young, R.P. 1983. Fire as a vegetation management tool in rangelands of the Intermountain region. In: Monsen, S.B. and N. Shaw (Eds). Managing Intermountain rangelands—improvement of range and wildlife habitats: Proceedings of symposia; 1981 September 15-17; Twin Falls, ID; 1982 June 22-24; Elko, NV. Gen. Tech. Rep. INT-157. Ogden, UT. U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. Pp. 18-31.

Contributors

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

Approval

Kirt Walstad, 9/08/2023

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	05/20/2024
Approved by	Kirt Walstad
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:**