USDA Natural Resources Conservation Service

Ecological site R006XB208OR
Shallow Slopes 14-20 PZ

Last updated: 9/11/2023
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): 006X–Cascade Mountains, Eastern Slope

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Stretching from northern Washington to southern Oregon, MLRA6 encompasses the mountain slopes, foothills, elevated plateaus and valleys on the eastern slopes of the Cascade mountains. This MLRA is a transitional area between the Cascade Mountains to the west and the lower lying Columbia Basalt Plateau to the east. Situated in the rain shadow of the Cascade Crest, this MLRA receives less precipitation than portions of the cascades further west and greater precipitation than the basalt plateaus to the east. Geologically, the majority of the MLRA is dominated by Miocene volcanic rocks, while the northern portion is dominated by Pre-Cretaceous metamorphic rocks and the southern portion is blanketed with a thick mantle of ash and pumice from Mount Mazama. The soils in the MLRA dominantly have a mesic, frigid, or cryic soil temperature regime, a xeric soil moisture regime, and mixed or glassy mineralogy. They generally are moderately deep to very deep, well drained, and loamy or ashy. Biologically, the MLRA is dominated by coniferous forest, large expanses of which are dominated by ponderosa pine, Douglas-fir or lodgepole pine. Areas experiencing cooler and moister conditions include grand fir, white fir, and western larch while the highest elevations include pacific silver fir, subalpine fir and whitebark pine. Economically, timber harvest and recreation are important land uses in these forests. Historically, many of these forests would have experienced relatively frequent, low and mixed severity fire favoring the development of mature forests dominated by ponderosa pine or Douglas-fir. In the southern pumice plateau forests, less frequent, higher severity fire was common and promoted the growth of large expanses of lodgepole pine forests.

LRU notes

This unit is characterized by ash mantled lava flows and glacial outwash plains on lower mountain slopes and foothills of the East Cascades in Oregon. Vegetation is largely dominated by forests of ponderosa pine with transitional dry mixed conifer forests where Douglas-fir and grand fir are sub dominant occurring in areas with greater effective precipitation. Historically, these forests have been influenced by a fire regime whereby frequent to moderately frequent, low and mixed severity fires would have favored the development of open stands of mature ponderosa pine. The climate of this unit is cool and dry with a predominately xeric soil moisture regime and frigid soil temperature regime. Geologically, underlying lithologies are dominated by Quaternary and late Tertiary basalt and basaltic andesite as well as mixed grain sediments deposited during Pleistocene glacial retreat. Unlike the nearby pumice plateau, this unit lacks the coarse pumice fragments that dominate the soil profile and cooler temperatures that favor lodgepole pine. This unit is south of the climate influences of the Columbia gorge and therefore does not support woodlands of Oregon white oak.

Ecological site concept

This site represents a dry shrubland community at the transition zone between the eastside foothills of the Oregon Cascades and the Columbia plateau. The Reference Plant Community is a bunchgrass shrubland with a composition largely dominated by bluebunch wheatgrass (Pseudoroegneria spicata) and antelope bitterbrush

(Purshia tridentata) with occasional incidences of western juniper (Juniperus occidentalis). East Cascade foothill plant communities are moisture and temperature limited and therefore highly influenced by aspect. This site occupies shallow, cobbly south slopes within a precipitation range (14 to 20 in) that would otherwise support higher cover of western juniper or ponderosa pine (Pinus ponderosa). South slope sites within this precipitation range further north are influenced by weather systems entering from the Columbia river gorge and support higher cover of white oak due to fewer frost-free days. Nearby sites with more gentle slopes and deeper soils generally support forests and woodlands dominated by western juniper, ponderosa pine (Pinus ponderosa), and Douglas-fir (Pseudotsuga menziesii).

This is a provisional ecological site and is subject to extensive review and revision before final approval. All data herein should be considered provisional and contingent upon field validation prior to use in conservation planning.

Development of this site as a range site was based on field data collection completed in 1999. It was revised and updated with information regarding ecological dynamics in 2020.

Associated sites

F006XB802OR	**Mesic Xeric North Slopes 15-25 PZ** Adjacent north aspects with deeper soils soils, forested plant community
F006XY709OR	**Mesic Xeric Foothills 20-25 PZ** Deeper soils, all aspects, forested plant community
F006XY710OR	**Mesic Xeric Foothills 14-20 PZ** Adjacent non-south aspects with deeper soils, forested plant community
R006XA308OR	**Moist Scabland 14-18 PZ** Adjacent gentle slopes, all aspects, herbaceous community

Similar sites

R006XA308OR	**Moist Scabland 14-18 PZ** More gentle slopes, lower elevation range, all aspects
R006XA310OR	**Juniper-Oak Clayey** Deeper soils, clayey textures

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Purshia tridentata*
Herbaceous	(1) *Pseudoroegneria spicata*

Physiographic features

This site occurs on south facing slopes of foothills. Slopes range from 10 to 65 percent. Elevations are typically between 2,500 and 3,500 feet (800 to 1,050 meters) but may range from 1,000 to 3,750 feet (300 to 1,150 meters). This site is not subject to ponding or flooding and no water table is present within the upper 100 inches of soil.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Hillslope
Flooding frequency	None
Ponding frequency	None
Elevation	762–1,067 m
Slope	10–65%
Ponding depth	0 cm
Water table depth	254 cm

Aspect	SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	305–1,143 m
Slope	Not specified
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

This site has a xeric soil moisture regime with mean annual precipitation ranging from 14 to 20 inches (350 to 500 mm), most of which occurs during the months of October through June in the form of rain and snow. The soil temperature regime is mesic with a mean annual air temperature of about 48 degrees Fahrenheit (9 degrees C). Historical annual temperature extremes range from -16 to 105 degrees Fahrenheit (-27 to 40 degrees C). The optimum period for plant growth is March through June. The graphs below are populated from the closest available weather station to representative site locations and are provided to indicate general climate patterns.

Table 4. Representative climatic features

Frost-free period (characteristic range)	90-120 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	356-508 mm
Frost-free period (average)	105 days
Freeze-free period (average)	
Precipitation total (average)	432 mm

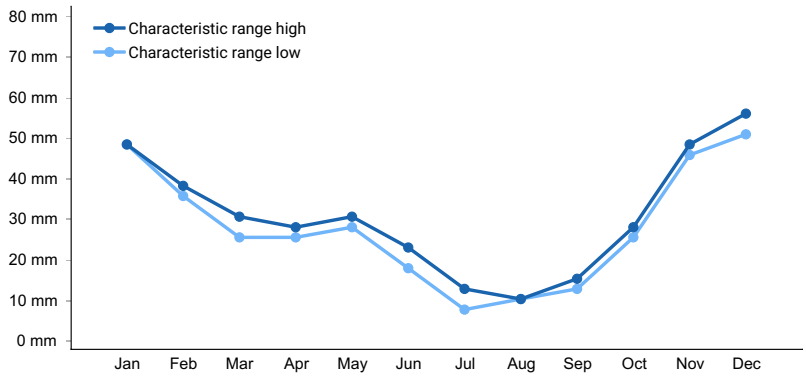


Figure 1. Monthly precipitation range

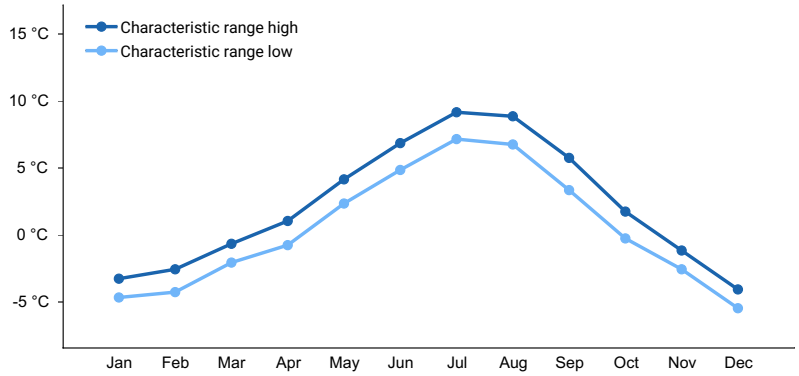


Figure 2. Monthly minimum temperature range

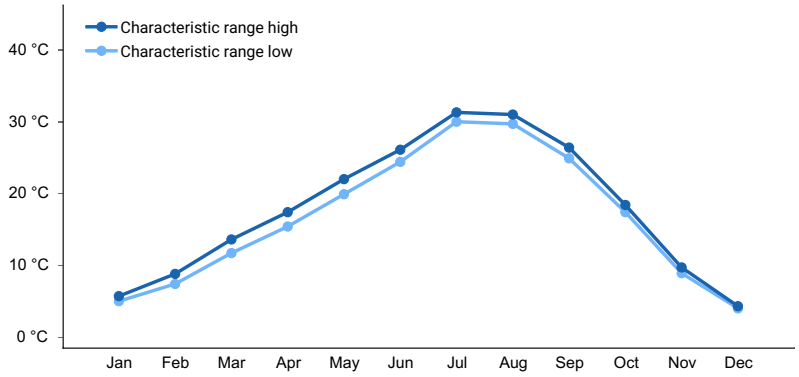


Figure 3. Monthly maximum temperature range

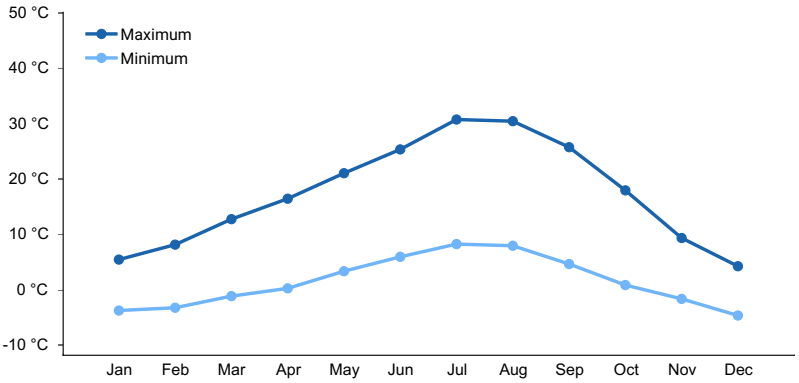


Figure 4. Monthly average minimum and maximum temperature

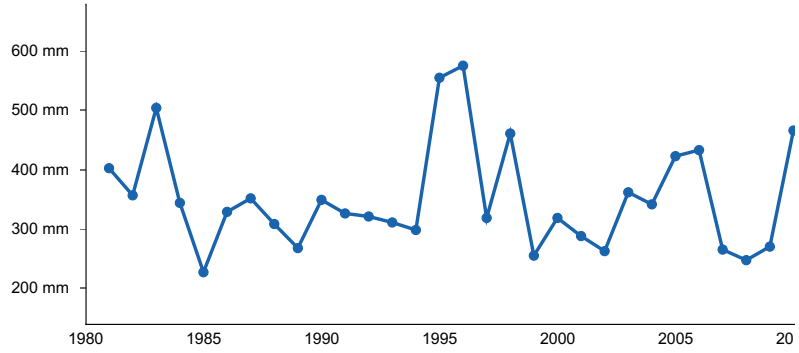


Figure 5. Annual precipitation pattern

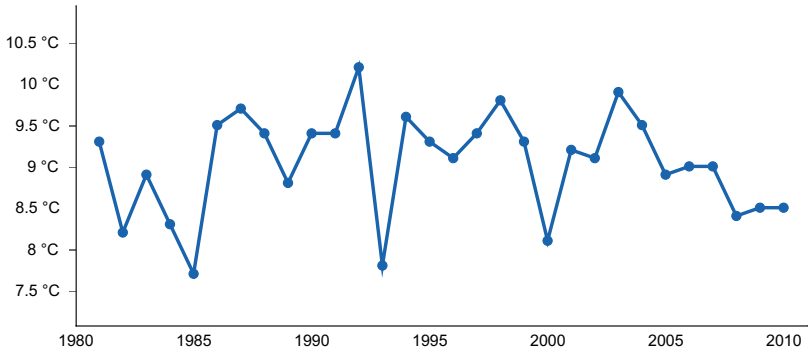


Figure 6. Annual average temperature pattern

Climate stations used

- (1) DUFUR [USC00352440], Dufur, OR

Influencing water features

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

Wetland description

N/A

Soil features

The soils that typify this site concept are shallow, well drained and medium textured. They are generally formed in loess, volcanic ash and basalt colluvium. Surface textures are commonly cobbly loams over extremely cobbly loams or clay loams. Depth to bedrock or an indurated pan is about 12 to 20 inches. Permeability is moderate. The available water holding capacity is about 1 to 2 inches for the profile. The potential for water erosion is high.

Table 5. Representative soil features

Parent material	(1) Loess (2) Volcanic ash (3) Colluvium–basalt
Surface texture	(1) Cobbly loam (2) Very cobbly loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	30–51 cm
Soil depth	30–51 cm
Surface fragment cover <=3"	0–45%
Surface fragment cover >3"	0–45%
Available water capacity (0-50.8cm)	2.54–5.08 cm
Soil reaction (1:1 water) (0-50.8cm)	6.6–7.3
Subsurface fragment volume <=3" (10.2-50.8cm)	30–45%
Subsurface fragment volume >3" (10.2-50.8cm)	5–25%

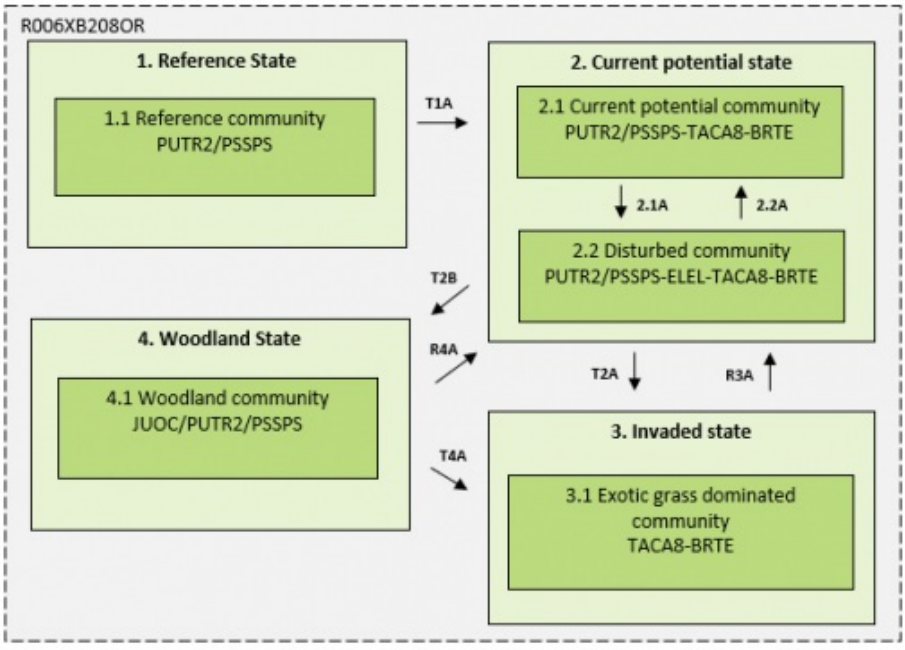
Ecological dynamics

The reference native plant community is dominated by bluebunch wheatgrass and bitterbrush, with a wide variety of forbs such as arrowleaf balsamroot (Balsamorhiza sagittate), bighead clover, desert parsley (Lomatium spp.), heartleaf buckwheat (Erioganum compositum), and common yarrow (*Achillea millefolium*). Except for an occasional juniper, conifer, or scrub oak patch, this site is without tree cover. Vegetative composition is approximately 75 percent grasses, 15 percent forbs, and 10 percent shrubs and trees. Areas of deeper soil and more favorable aspect have a greater proportion of Idaho fescue and less bluebunch wheatgrass.

Disturbance:

Burning decreases the stand of bitterbrush and usually stimulates the production of bluebunch wheatgrass. Western juniper has thin bark and is readily killed by low to moderate severity fires, yet develops increasing resistance with age (Fryer and Tirmenstein 2019). It is well documented that expansion of western juniper in the Western US is in part associated with the suppression of fire (Miller et al. 2019). Overgrazing damages or reduces the cover of bluebunch wheatgrass and increases cover of bottlebrush squirreltail (*Elymus elymoides*). Other native increaser species include fiddleneck (Amsinckia spp.), cryptantha (Cryptantha spp.), and Pacific fescue (*Vulpia microstachys*). Exotic invader species include cheatgrass (*Bromus tectorum*), medusahead (*Taeniatherum caput-medusae*), and filaree (Erodium circutarium).

State and transition model



Community Pathways

2.1A	Improper grazing management
2.2A	Extended rest from grazing

Transitions / Restoration Pathways

T1A	Introduction of invasive annual grasses
T2A	Prolonged improper grazing management, catastrophic fire
T2B	Prolonged fire suppression
T4A	Failed juniper reduction treatment, catastrophic fire
R3A	Treatment of exotic grasses, restoration of perennial grasses
R4A	Mechanical treatment of juniper, prescribed fire

State 1
Historical Reference State

This grass-shrub site is characterized by a high cover of palatable perennial grasses and shrubs in the Reference State. Multiple communities may exist with varying compositions of grasses and shrubs driven by fire, climate cycles and ungulate grazing. A variety of forbs are common. No invasive annual grasses are present in this state.

Dominant plant species

- antelope bitterbrush (*Purshia tridentata*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Community 1.1
Reference Community PUTR2/PSSPS

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	723	885
Shrub/Vine	112	140	174
Forb	101	129	157
Tree	11	17	17
Total	**784**	**1009**	**1233**

State 2
Current potential state

This state is similar to the Reference State. Ecological function and structure has not changed fundamentally, however the resiliency of the site has been reduced by the presence of invasive plants. Non-native plant species may increase in abundance but will not become dominant or control ecological processes within this state.

Dominant plant species

- antelope bitterbrush (*Purshia tridentata*), shrub
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass

Community 2.1
Current potential community PUTR2/PSSPS - TACA8 - BRTE

Plant community similar to Reference Community 1.1 yet with the addition of weedy annual forbs and exotic annual grasses.

Community 2.2
Disturbed community PUTR2/PSSPS - ELEL - TACA8 - BRTE

Overgrazing will lead to an increase in cheatgrass, bottlebrush squirreltail, medusahead, fiddleneck, cryptantha, filaree and Pacific fescue. Perennial grasses and seed sources still present on site.

Pathway 2.1A
Community 2.1 to 2.2

Inappropriate grazing management and overutilization beyond acceptable limits of the site’s carrying capacity.

Pathway 2.2A
Community 2.2 to 2.1

Extended rest from grazing allowing native grasses to increase in cover.

Context dependence. Excessive grazing leading to a loss of species diversity or reproductive output or altering abiotic conditions by significantly compacting or eroding soil, for example, will not recover by rest alone and will require additional inputs

State 3
Invaded state

Much of the perennial grasses have been lost and replaced by medusahead and cheatgrass. This may result in an increase in increase in fire frequency and size thereby maintaining the site in this state (Archer 2001, Zouhar 2003).

Dominant plant species

- cheatgrass (*Bromus tectorum*), grass
- medusahead (*Taeniatherum caput-medusae*), grass

State 4
Woodland state

Juniper encroachment has progressed to a woodland state. As woodland development progresses, cover of perennial bunchgrasses and shrubs will decline, bare ground may increase and erosion may occur.

Dominant plant species

- western juniper (*Juniperus occidentalis*), tree
- antelope bitterbrush (*Purshia tridentata*), shrub

Transition T1A
State 1 to 2

An introduction of invasive annual grasses due to factors such as overgrazing, recreational use, dispersal from invaded sites, or transport via mechanical means will alter the resilience and resistance of the site to disturbance (Archer 2001).

Transition T2A
State 2 to 3

Prolonged improper grazing management leading to a loss of most perennial grasses and a widespread invasion of medusahead and cheatgrass. This may also occur following catastrophic fire if exotic annuals were high in cover before disturbance (Archer 2001).

Context dependence. A seed source of exotic annuals is required to be on site or adjacent sites for invasion to occur following these disturbances

Transition T2B
State 2 to 4

With prolonged fire suppression, western juniper will continue to establish and recruit into the canopy.

Context dependence. This dynamic may be further accelerated by continued livestock grazing of herbaceous and shrub communities.

Restoration pathway R3A
State 3 to 2

Restoration of native grasses on the site may be achieved in some cases. Techniques may include prescribed burning, mechanical treatment herbicide application and reseeding (Archer 2001). Steep slopes may restrict some activities.

Restoration pathway R4A
State 4 to 2

Reduction of juniper is possible yet may be costly and time consuming at large scale. Mechanical reduction of juniper followed by prescribed fire may be effective on some sites.

Transition T4A
State 4 to 3

Depending on site resiliency, treatment techniques used and the prior presence of exotic annual grasses,

restoration actions may encourage exotic annual grass expansion. Catastrophic fire in the presence of significant cover of exotic annual grasses may also result in expansion of cover.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grass and Grasslike plants**			594–958	
	bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	504–656	–
	Sandberg bluegrass	POSE	*Poa secunda*	50–151	–
	Idaho fescue	FEID	*Festuca idahoensis*	22–101	–
	Lemmon's needlegrass	ACLEL	*Achnatherum lemmonii var. lemmonii*	22–50	–
Forb					
2	**Forbs**			78–151	
	arrowleaf balsamroot	BASA3	*Balsamorhiza sagittata*	30–50	–
	yarrow	ACHIL	*Achillea*	20–50	–
	largehead clover	TRMA3	*Trifolium macrocephalum*	30–50	–
3	**Other perennial forbs**			11–39	
	onion	ALLIU	*Allium*	–	–
	Scouler's woollyweed	HISC2	*Hieracium scouleri*	–	–
	purple leptotaenia	LOCO	*Lomatium columbianum*	–	–
	barestem biscuitroot	LONU2	*Lomatium nudicaule*	–	–
	silver lupine	LUAL4	*Lupinus albifrons*	–	–
	spreading phlox	PHDI3	*Phlox diffusa*	–	–
	trumpet	COLLO	*Collomia*	–	–
Shrub/Vine					
4	**Shrubs**			90–213	
	antelope bitterbrush	PUTR2	*Purshia tridentata*	50–151	–
	arrowleaf buckwheat	ERCO12	*Eriogonum compositum*	22–28	–
	buckwheat	ERIOG	*Eriogonum*	22–28	–
Tree					
5	**Trees**			11–22	
	western juniper	JUOC	*Juniperus occidentalis*	11–22	–

Inventory data references

Information presented here has been derived from NRCS data. Field observations from range trained personnel were also used. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties.

References

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Other references

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Miller, R., & Heyerdahl, E. 2008. Fine-scale variation of historical fire regimes in sagebrush-steppe and juniper woodland: An example from California, USA. International Journal of Wildland Fire, 17(2), 245-254.Zouhar, Kris. 2003. *Bromus tectorum*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: https://www.fs.fed.us /database/feis/plants/graminoid/brotec/all.html [2020, June 25].

Contributors

Andrew Neary - 2020/2021 PES update of draft site

Approval

Kirt Walstad, 9/11/2023

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:**