Ecological site EX043B23B142
Saline Subirrigated (SS)
Absaroka
Upper Foothills

Last updated: 3/06/2025
Accessed: 09/11/2026

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): 043B–Central Rocky Mountains

43B – Central Rocky Mountains – The Central Rocky Mountains extends from northern Montana to southern extent of Wyoming and from Idaho to central Wyoming. The southern extent of 43B is comprised of a combination of metamorphic, igneous, and sedimentary mountains and foothills. Climatic changes across this extent are broad and create several unique breaks in the landscape. Further information regarding MLRAs, refer to: United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Available electronically at: http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/ref/?cid=nrcs142p2_053624#handbook.

LRU notes

Land Resource Unit (LRU) 43B23B: Absaroka Upper Foothills Based on the shifts in geology, precipitation patterns and other climatic factors, as well as elevations and vegetation, the Absaroka Range was divided into LRU 23. Further division of this LRU is necessary due to the gradient moving from the foothills to the summit, as well as aspect shifts (north/east face versus south/west face). Subset B is set for the higher elevations within the foothills, with 15 to 19 inches of precipitation. To verify or identify Subset B (the referenced subset for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This particular LRU/Subset occurs along the eastern foothills of the Absaroka Range. This LRU starts north of Clark, WY and runs to the Thermopolis, WY area. Once the foothills cross into the Northern Beartooth Range, the climatic patterns and elevational changes shifts the plant community and allows for a break in LRU's near the Montana state line. As the LRU follows to the south and then tracks east to the intersection of the Absaroka Range and the Owl Creek Range, the face changes aspect and geology creating a shift in plant dynamics and a break in the LRU. The extent of soils currently correlated to this ecological site does not fit within the digitized boundary. Many of the noted soils are provisional and will be reviewed and corrected in mapping update projects. Other map units are correlated as small inclusions within other MLRA’s/LRU’s based on elevation, landform, and biological references. Moisture Regime: Typic Ustic Temperature Regime: Frigid Dominant Cover: Rangeland – Sagebrush Steppe (major species is Mountain Big Sagebrush) Representative Value (RV) Effective Precipitation: 15-19 inches (381 – 483 mm) RV Frost-Free Days: 37 - 80 days

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 2 Shrub & Herb Vegetation Class 2.B Temperate & Boreal Grassland & Shrubland Subclass 2.B.2 Temperate Grassland & Shrubland Formation 2.B.2.Na Western North American Grassland & Shrubland Division Division M048 Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup G273 Central Rocky Mountain Lower Montane, Foothill & Valley Grassland Group Ecoregions (EPA): Level I: 10 North American Deserts Level II: 10.1 Cold Deserts Level III: 10.1.18 Wyoming Basin Level IV: 10.1.18.d Foothills and Low Mountains

Ecological site concept

• Site influence by a water table below soil surface through the entire growing season (within 40 inches), and water may move over the surface from run-in but only for short periods. • Slope is 6% • Soils are: - saline, sodic, or saline-sodic, gypsic - Moderately deep, deep, or very deep (depth to restrictive layer is greater than 10” (25 cm). - Poorly to moderately well drained - Textures usually range from loamy sand to clay loam - Clay content is 60% in mineral soil surface 4”. - With an average particle size class 40% clay

Associated sites

EX043B23B138	**Saline Lowland (SL) Absaroka Upper Foothills** Saline Lowland ecological site is drier with a water table that is lower (100 cm) in the profile for most of the growing season. The productivity is less and the plant community is a mixture of upland (dry) and moist or water loving plants.
EX043B23B140	**Saline Lowland Drained (SLDr) Absaroka Upper Foothills** Saline Lowland Drained ecological sites occur on terraces or relict floodplains that have lost their connection to the water table due to down cutting of the original stream channel. Saline Subirrigated is associated with the current stream channel or water table.
EX043B23B178	**Wetland (WL) Absaroka Upper Foothills** Wetland ecological sites are connected to or a transition from Saline Subirrigated and Subirrigated sites. Wetlands hold water year round and have water over the surface for part of the growing season, where Saline Subirrigated has a receding of the water table during the growing season and rarely has water standing on the surface for long periods of time.

Similar sites

EX043B23A142	**Saline Subirrigated (SS) Absaroka Lower Foothills** The lower foothills Saline Subirrigated ecological site is lower in production, with a few minor plant shifts, but are very similar in overall composition.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Sporobolus airoides* (2) *Puccinellia nuttalliana*

Legacy ID

R043BX642WY

Physiographic features

This site occurs on relatively level lands adjacent to perennial streams, lakes, ponds and springs.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Alluvial fan (2) Foothills > Drainageway (3) Foothills > Flood plain

Runoff class	Negligible to low
Flooding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Flooding frequency	Rare to occasional
Ponding duration	Very brief (4 to 48 hours) to brief (2 to 7 days)
Ponding frequency	None to frequent
Elevation	1,830 – 2,740 m
Slope	0 – 10 %
Ponding depth	0 – 10 cm
Water table depth	30 – 100 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 15 to 19 inches (381 – 483 mm). The normal precipitation pattern shows peaks in June tapering into September. This amounts to about 50 percent of the mean annual precipitation. Average snowfall is about 150 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

Because of the varied topography, the wind will vary considerably for different parts of the area. The wind is usually much lighter at the lower elevations and in the valleys as compared with the higher terrain. The average winter wind velocity is 8.5 mph while the summer wind velocity averages 7.5 mph. Winds during storms and on ridges may exceed 45 mph.

Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. High winds are generally blocked by high mountains but occur in conjunction with thunderstorms, which are common in late summer. Growth of native cool-season plants begins about May 1 to May 15 and continues until about October 15.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Historically, Crandall Creek was the representative weather stations within this subset. However, Sunshine 3NE, Tower Falls, and Yellowstone Pk Mammoth are the available weather stations within a close proximity in location and characteristics for this subset. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to 2010.

Table 3 Representative climatic features

Frost-free period (characteristic range)	20-60 days

Freeze-free period (characteristic range)	40-100 days
Precipitation total (characteristic range)	360-410 mm
Frost-free period (actual range)	10-70 days
Freeze-free period (actual range)	20-110 days
Precipitation total (actual range)	360-410 mm
Frost-free period (average)	40 days
Freeze-free period (average)	70 days
Precipitation total (average)	380 mm

- (1) SUNSHINE 3NE [USC00488758], Meeteetse, WY
- (2) TOWER FALLS [USC00489025], Yellowstone National Park, WY
- (3) YELLOWSTONE PK MAMMOTH [USC00489905], Yellowstone National Park, WY

Influencing water features

The characteristics of these soils have influence from ground water that is within 40 inches of the soil surface and will be just below the surface for all of the growing season. Water over the surface from run-in may occur but only for short periods of time.

Wetland description

No wetland classification was established for this site.
Stream type: C (Rosgen)

Soil features

The soils of the Saline Subirrigated site are moderately deep to very deep (greater than 20 inches (50 cm) to bedrock) poorly drained to moderately well drained soils formed in alluvium. A water table persists below the soil surface for all of the growing season, and is within 40 inches throughout most of the year. The soil surface may have water flow over (flooding) from run-in but only for short periods of time. The soil characteristics having the most influence on the plant community are depth to a water table during the growing season and the amount of soluble salts.

Figure 7. Soils with a fluctuating water table and soluble salts are the key characteristics for the Saline Subirrigated ecological site.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock

Surface texture	(1) Cobbly, extremely cobbly, gravelly loam (2) Clay loam (3) Silt loam (4) Sandy clay loam (5) Sandy loam
Family particle size	(1) Fine-loamy (2) Fine (3) Loamy-skeletal (4) Fine-loamy over sandy or sandy-skeletal
Drainage class	Somewhat poorly drained to poorly drained
Permeability class	Slow to moderate
Soil depth	50 – 150 cm
Available water capacity (Depth not specified)	7.11 – 15.75 cm
Calcium carbonate equivalent (Depth not specified)	0 – 20 %
Electrical conductivity (Depth not specified)	0 – 10 mmhos/cm
Sodium adsorption ratio (Depth not specified)	10 – 40
Soil reaction (1:1 water) (Depth not specified)	7.4 – 10

Ecological dynamics

Potential vegetation on this site is dominated by plants that can tolerate soils that are saline and/or alkaline and have a water table near the surface for most of the growing season. The expected potential composition for this site is about 80 percent grasses, 5 percent forbs and 15 percent woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates from improper grazing management, species such as inland saltgrass, alkali bluegrass, and inland saltgrass increase. Grasses such as alkali sacaton, basin wildrye, and Nuttall's alkaligrass will decrease in frequency and production.

The ecological states and community phases as well as the dynamic processes driving the transitions between these communities have been determined by studying this ecological site under all management scenarios, including those that do not include cattle grazing. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have been used.

The following State and Transition Model (STM) Diagram has five fundamental components: states, transitions, restoration pathways, community phases and community pathways. The state, designated by the bold box, is considered to be a set of parameters with thresholds defined by ecological processes. A State can be a single community phase or suite of community phases. The reference state is recognized as State 1. It describes the ecological potential and natural range of variability resulting from dynamic ecological processes occurring on the site. The designation of alternative states (State 2, etc.) in STMs denotes changes in ecosystem properties that cross a certain threshold.

Transitions are represented by the arrows between states moving from a higher state to a lower state (State 1 - State 2) and are denoted in the legend as a "T" (T1-2). They describe the variables or events that contribute directly to loss of state resilience and result in shifts between states. Restoration pathways are represented by the arrows between states returning back from a lower state to a higher state (State 2 - State) or better illustrated by State 1.

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Warm Season Grasses**			841-1961	
	alkali sacaton	SPAI	*Sporobolus airoides*	1121-1513	–
	alkali cordgrass	SPGR	*Spartina gracilis*	56-392	–
	saltgrass	DISP	*Distichlis spicata*	112-336	–
2	**Cool Season Grasses**			841-1961	
	Nuttall's alkaligrass	PUNU2	*Puccinellia nuttalliana*	560-1121	10-20
	Canada wildrye	ELCA4	*Elymus canadensis*	0-560	0-10
	Sandberg bluegrass	POSE	*Poa secunda*	0-560	0-10
3	**Grasses/Grass-likes**			280-1121	
	slender wheatgrass	ELTR7	*Elymus trachycaulus*	0-224	0-10
	chairmaker's bulrush	SCAM6	*Schoenoplectus americanus*	0-224	0-10
	common spikerush	ELPA3	*Eleocharis palustris*	0-224	0-10
	Nebraska sedge	CANE2	*Carex nebrascensis*	0-224	0-10
	rush	JUNCU	*Juncus*	0-224	0-10
	arctic rush	JUAR2	*Juncus arcticus*	0-224	0-10
	beaked sedge	CARO6	*Carex rostrata*	0-224	0-10
	Grass, perennial	2GP	*Grass, perennial*	0-224	0-10
	Grass-like, perennial	2GLP	*Grass-like, perennial*	0-224	0-10
	little barley	HOPU	*Hordeum pusillum*	0-224	0-10
Forb					
4	**Perennial Forbs**			0-280	
	common plantain	PLMA2	*Plantago major*	0-112	0-5
	American licorice	GLLE3	*Glycyrrhiza lepidota*	0-112	0-5
	Forb, perennial	2FP	*Forb, perennial*	0-112	0-5
	silverweed cinquefoil	ARAN7	*Argentina anserina*	0-112	0-5
	aster	EUCEP2	*Eucephalus*	0-112	0-5

	arrowgrass	TRIGL	*Triglochin*	0-112	0-5
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0-112	0-5
	milkvetch	ASTRA	*Astragalus*	0-112	0-5
Shrub/Vine					
5	**Shrubs**			168-560	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-336	0-15
	Woods' rose	ROWOW	*Rosa woodsii var. woodsii*	0-112	0-5
	shrubby cinquefoil	DAFR6	*Dasiphora fruticosa*	0-112	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-112	0-5

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 10. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

Reference Community Phase (1.1): The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. This plant community may provide brood rearing/foraging areas for sage grouse. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here. 1.2 - Alkali Sacaton/Inland Saltgrass/Mixed Shrub: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to woody cover. Good grasshopper habitat equals good foraging for birds. 1.3 - Inland Saltgrass Sod/Mixed Shrub: This plant community may be useful for the same large grazers that would use the Historic Climax Plant Community. However, the plant community composition is less diverse, and thus, less apt to meet the seasonal needs of these animals. It may provide some foraging opportunities for sage grouse when it occurs proximal to woody cover. Good grasshopper habitat equals good foraging for birds. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing with normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Plant Community Production Carrying Capacity* The Carrying capacity is calculated as the production (normal year) X .25 efficiency factor / 912.5 # /AUM to calculate the AUM's/Acre. Plant Community Description Title Lbs./Acre AUM/Acre* Acres/AUM* Below Ave. Normal Above Ave. Historic Climax Plant Community 3200-4400 2.1 0.48 Alkali Sacaton/Inland Saltgrass/Mixed Shrub 2800-3600 1.8 0.56 Inland Saltgrass Sod/Greasewood 1400-2200 1.3 0.77 * - Carrying Capacity is figured for continuous, season-long grazing by cattle under average growing conditions. ** - Sufficient data for invaded and reclaimed communities has not be collected or evaluated, at this time, so no projection of a stocking rate recommendation or production range will be established at this time. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements. Distance to water, shrub density, and slope can affect carrying capacity (grazing capacity) within a management unit. Adjustments should be made for the area that is considered necessary for reduction of animal numbers. For example, 30 percent of a management unit may have 25 percent slopes and distances of greater than one mile from water; therefore, the adjustment is only calculated for 30 percent of the unit (i.e. 50 percent reduction on 30 percent of the management unit).

Fencing, slope length, management, access, terrain, kind and class of livestock, and breeds are all factors that can increase or decrease the percent of graze-able acres within a management unit. Adjustments should be made that incorporate these factors when calculating stocking rates.

Hydrological functions

Climate is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B and C, with localized areas in hydrologic group D. Infiltration ranges from moderately slow to moderately rapid. Runoff potential for this site varies from moderate to high depending on soil hydrologic group and ground cover. In many cases, areas with greater than 75% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information). Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for wetland and upland game species. The wide varieties of plants which bloom from spring until fall have an aesthetic value that appeals to visitors.

Wood products

Limited wood products are present on the site. Poplars and willows provide some firewood, and do provide materials for crafters. But no commercial harvest is known.

Other products

none noted

Inventory data references

Information presented in this description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in the development of the new concept for the Saline Subirrigated ecological site include: Blaise Allen, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Other sources used as references include USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, USDI and USDA Interpreting Indicators of Rangeland Health Version IV, and USDA NRCS Soil Surveys from various counties. Inventory Data References: Ocular field estimations observed by trained personnel were completed at each site. Then sites were selected where a 100 foot tape was stretched and the following sample procedures were completed by inventory staff. For full sampling protocol and guidelines with forms please refer to the Wyoming ESI Operating Procedures, compiled in 2012 for the Powell and Rock Springs Soil Survey Office, USDA-NRCS. • Double Sampling Production Data (9.6 hoop used to estimate ten points, clipped a minimum of three of the estimated points, with two 21-foot X 21-foot square extended shrub plots). • Line Point Intercept (over story and understory captured with soil cover). Height of herbaceous and woody cover is collected every three feet along established transect.) • Continuous Line Intercept (Woody Canopy Cover, with minimum gap of 0.2 of a foot for all woody species and succulents. Intercept height collected at each measurement.), • Gap Intercept (Basal Gap measured with a minimum gap requirement of 0.7 foot.), • Sample Point (ten – 1 meter square point photographs taken at set distances on transect. Red using the sample point computer program established by the High Plains Agricultural Research Center, WY). • Soil Stability (Slake Test – surface and subsurface samples collected and processed according to the soil stability guidelines provided by the Jornada Research Center, NM.)

Other references

Baker, William L. 2006. Fire and Restoration of Sagebrush Ecosystems. Wildlife Society Bulletin 34(1): 177-185.

Bestelmeyer, B., and J. R. Brown. 2005. State-and-transition models 101: a fresh look at vegetation change. The Quivira Coalition Newsletter, Vol. 7, No. 3.

Bestelmeyer, B., J. R. Brown, K. M. Havstad, B. Alexander, G. Chavez, J. E. Herrick. 2003. Development and use of state and transition models for rangelands. Journal of Range Management 56(2):114-126.

Bestelmeyer, B., J. E. Herrick, J. R. Brown, D. A. Trujillo, and K. M. Havstad. 2004. Land management in the American Southwest: a state-and-transition approach to ecosystem complexity. Environmental Management 34(1):38-51.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume I Quick Start. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

Herrick, J. E., J. W. Van Zee, K. M. Havstad, L. M. Burkett, and W. G. Whitford. 2005. Monitoring manual for grassland, shrubland and savanna Ecosystems. Volume II: Design, supplementary methods and interpretation. USDA - ARS Jornada Experimental Range, Las Cruces, New Mexico.

NRCS. 2014. (electronic) National Water and Climate Center. Available online at http://www.wcc.nrcs.usda.gov/

NRCS. 2014. (electronic) Field Office Technical Guide. Available online at http://efotg.nrcs.usda.gov/efotg_locator.aspx?map=WY NRCS. 2009. Plant Guide: Cheatgrass. Prepared by Skinner et al., National Plant Data Center.

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health. Version 4. Technical Reference 1734-6. USDI-BLM.

Ricketts, M. J., R. S. Noggles, and B. Landgraf-Gibbons. 2004. Pryor Mountain Wild Horse Range Survey and Assessment. USDA-Natural Resources Conservation Service.

Schoeneberger, P. J., D. A. Wysocki, E. C. Benham, and Soil Survey Staff. 2012. Field book for describing and sampling soils, Version 3.0. Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE. (http://soils.usda.gov/technical/fieldbook/)

Stringham, T. K. and W. C. Krueger. 2001. States, transitions, and thresholds: Further refinement for rangeland applications. Agricultural Experiment Station, Oregon State University. Special Report 1024.

Stringham, T. K., W. C. Kreuger, and P. L Shaver. 2003. State and transition modeling: an ecological process approach. Journal of Range Management 56(2):106-113.

United States Department of Agriculture. Soil Survey Division Staff. 1993. Soil Survey Manual, United States Department of Agriculture Handbook No. 18, Chapter 3: Examination and Description of Soils. Pg.192-196.

USDA, NRCS. 1997. National Range and Pasture Handbook. (http://www.glti.nrcs.usda.gov/technical/publications/nrph.html)

Trlica, M. J. 1999. Grass growth and response to grazing. Colorado State University. Cooperative Extension. Range. Natural Resource Series. No. 6.108.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS). 2007. The PLANTS Database (http://plants.usda.gov). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

U.S. Department of Agriculture, Natural Resources Conservation Service (USDA/NRCS), Soil Survey Staff. 2010. Keys to Soil Taxonomy, Eleventh Edition, 2010.

USDA/NRCS Soil survey manuals for appropriate counties within MLRA 32X.

Western Regional Climate Center. (2014) (electronic) Station Metadata. Available online at: http://www.wrcc.dri.edu/summary/climsmwy.html.

Contributors

Dan Mattke, Resource Soil Scientist, NRCS Riverton Office

Approval

Kirt Walstad, 3/06/2025

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)	Marji Patz, Blaise Allen
Contact for lead author	blaise.allen@usda.gov
Date	03/31/2020
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **Rare to nonexistent. A very slight amount of rill development may be observed following large storm events or spring runoff periods, but they should heal within the following growing season. Slight rill development may also be observed where the site is adjacent to ecological sites that produce large amounts of runoff (i.e. steeper sites)**

---

2. **Presence of water flow patterns:** **Barely observable. Any flow patterns present should be sinuous and wind around perennial plant bases. They should be short (5 to 10 feet), one foot wide, and spaced from 20 to 30 feet apart. They should be stable with only minor evidence of deposition. This site is periodically inundated with runoff water from adjacent sites. It also acts as a filter and trap sediment.**

---

3. **Number and height of erosional pedestals or terracettes:** **Rare to nonexistent. A few plants may show very minor pedestalling where they are adjacent to any water flow patterns present, but there will be no exposed roots. Terracettes are not present.**

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Bare ground can range from 0-5%. Any bare ground openings present should be <1 foot in size and should not be connected.**

---

5. **Number of gullies and erosion associated with gullies:** **Active gullies should not be present.**

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** **No evidence of wind generated soil movement. Wind scoured (blowouts) and depositional areas are not present.**

---

7. **Amount of litter movement (describe size and distance expected to travel):** **Herbaceous and woody litter is not expected to move.**

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings range from 3 (interspaces) to 6 (under plant canopy), but average values should be 4.0 or greater.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Typically an A-horizon of greater than 2 inches (5 cm) with massive structure and color hues of 10YR or 2.5Y, values of 5-6, and chromas of 2-3. Organic matter typically is 1-2%.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Plant community consists of 75-90% grasses, 10% forbs, and 0-15% shrubs. Dense plant canopy (80-100%) and litter plus moderate infiltration rates result in minimal to nonexistent runoff. Basal cover is typically greater than 5% for this site and effectively reduces runoff on this site. With the physiographic location of this site being in low lying areas, it often acts as a terminal accumulation site for runoff. The amount of sodium in the soil can affect infiltration and facilitate puddling on the surface.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer exists. This site will normally have textural changes within its' profile and should not be mistaken for compaction layers.

---

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: warm-season bunchgrasses (3 species)

    Sub-dominant: cool-season bunchgrasses (3 species)

    Other: Community 1.1 = warm-season bunchgrasses > cool-season bunchgrasses > Perennial Forbs = Shrubs 12b. F/S Groups not expected for the site: Annual Grasses 12c. Number of F/S Groups: 3 groups 12d. Species number in Dominate and Sub-dominate F/S Groups: 6 species

    Additional: Biological soil crust is variable in its' expression where present on this site and is measured as a component of ground cover. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions. Disturbance regimes include insects, infrequent fire, and flooding. Temporal variability can be caused by fires, droughts, insects, etc. Spatial variability can be caused by runoff, soil pH, and topography.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above average precipitation, there should be no mortality or decadence in either perennial grasses or grasslikes. During severe (multi-year) droughts that affect groundwater levels, up to 10% of the perennial plants may die. There may be partial mortality of individual grasses and grasslikes during less severe droughts.

---

14. **Average percent litter cover (%) and depth (in):** Litter ranges from 0-20% of total canopy measurement with total litter (including beneath the plant canopy) from 80-100% expected. Herbaceous litter depth typically ranges from 10-25 mm.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **Total annual production ranges from 3200-4400 lb/ac (3586-4931 kg/ha); with an average annual production of 3800 lb/ac (4259 kg/ha).**

---

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:** **Bare ground greater than 20% is the most common indicator of a threshold being crossed. Greasewood and inland saltgrass are common increasers. Redtop bentgrass and foxtail barley may degrade the site.**

---

17. **Perennial plant reproductive capability:** **All species are capable of reproducing, except in drought years.**
