Ecological site EX043B23A104
Clayey (Cy)
Absaroka Lower Foothills

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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): 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) 043B23A: Absaroka Lower 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 (east face versus west face). Subset A is set for the lower elevations within the foothills with 10 to 14 inches of precipitation. To verify or identify the LRU A (the referenced LRU for this ecological site), refer to the Wyoming LRU matrix key contained within the Ecological Site Key. This particular LRU occurs along the eastern lower 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 tracks east with the intersection of the Absaroka and Owl Creek Ranges, 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: Aridic Ustic or Ustic Aridic – Progressive Initial mapping has shown that soil correlations completed prior to 2014 were identified as ustic aridic, after further evaluation of climatic and soil taxonomy information the proper moisture regime is aridic ustic. Both are recorded here until an update project is completed to correct the previous correlations. Temperature Regime: Frigid Dominant Cover: Rangeland – Sagebrush Steppe (major species is Wyoming Big Sagebrush) Representative Value (RV) Effective Precipitation: 10-14 inches (254 – 355 mm) RV Frost-Free Days: 80-110 days

Classification relationships

Relationship to Other Established Classification Systems: National Vegetation Classification System (NVC): 3 Xeromorphic Woodland, Scrub & Herb Vegetation Class 3.B Cool Semi-Desert Scrub & Grassland Subclass 3.B.1 Cool Semi-Desert Scrub & Grassland formation 3.B.1.NE Western North American Cool Semi-Desert Scrub & Grassland Division M169 Great Basin & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup G302 Artemisia Tridentata - Artemisia tripartita - Purshia tridentata Big Sagebrush Steppe Group CEGL001535 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Herbaceous Vegetation or CEGL001009 - Artemisia tridentata ssp. wyomingensis/Pseudoroegneria spicata Shrubland 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.b Big Horn Basin and 10.1.18.d Foothills and Low Mountains

Ecological site concept

• Site receives no additional water. • Slope is 20% • Soils are: o Textures range from loamy sand to very fine sandy loam in top 4” (10 cm) of mineral soil surface o Clay content is ?35% in top 4” (10 cm) of mineral soil surface o All subsurface horizons in the particle size control section have a weighted average of ? 35% clay. (The particle size control section is the segment of the profile from either the start of an

argillic horizon for 50 cm’s or from 25-100 cm’s). o Moderately deep to very deep (20-80+ in. (50-200+ cm) o 3% stone and boulder cover and 20% or less cobble and gravel cover o Not skeletal (35% rock fragments) within 20” (50 cm) of mineral soil surface o None to Slightly effervescent throughout top 20” (50 cm) of mineral soil surface o Non-saline, sodic, or saline-sodic The Clayey ecological site concept is based on minimal (none to slight) influence from salts, carbonates, gypsum or other chemistry within the top 20 inches (50 cm) of the mineral soil surface. The main soil characteristic is a moderately deep to very deep soil that is fine textured with greater than or equal to 35% clay throughout the soil profile; the dominant soil textural classes are loamy sand to sandy loam in the subsurface. The clayey site can be found occurring in a complex mosaic pattern where the geology is controlled by inter-bedded sandstone and shale. Locations controlled by primarily shale bedrock have pockets of saline upland, dense clay, and loamy sites intermixed with the clayey ecological site.

Associated sites

EX043B23A138	**Saline Lowland (SL) Absaroka Lower Foothills** Saline Lowlands are found as you move off of the upland clayey ecological site down along the riparian corridors and floodplains of the drainages/streams cutting through the foothills.
EX043B23A144	**Saline Upland (SU) Absaroka Lower Foothills** Saline Upland sites may be very similar in texture, but have a significant content of salt that affects the plant community.
EX043B23A106	**Clayey Overflow (CyO) Absaroka Lower Foothills** Clayey Overflow sites are found in concave positions along slopes and will be similar to clayey sites, but receive additional extra moisture (with no water table) from upland runoff or overflow from intermittent streams. These sites are higher in productivity and have basin wildrye, slender wheatgrass, and snowberry.
EX043B23A109	**Cobbly Upland (CoU) Absaroka Lower Foothills** Dense Clay is similar in characteristics, however dense clay starts with a coarser textured soil surface texture and then has an abrupt increase in clay. This site is characterized by a birdfoot sagebrush dominated community.
EX043B23A122	**Loamy (Ly) Absaroka Lower Foothills** Loamy sites are noted by slightly coarser in texture (>18% but < 35% clays), and have a mixture of needleandthread with rhizomatous wheatgrasses. Runoff is less of an issue on Loamy soils and plants tend to maintain a higher vigor with the increased ease of infiltration.
EX043B23A150	**Sandy (Sy) Absaroka Lower Foothills** Sandy sites are found along the sandstone outcrops and in the same inter-bedded sedimentary uplifts. Sandy soils are dominated by Indian ricegrass and needleandthread. They tend to show drought stress quicker than clayey sites, but have similar production as the clayey site.
EX043B23A158	**Shallow Clayey (SwCy) Absaroka Lower Foothills** Shallow Clayey soils are found along the outcrops and eroded slopes of shale (claystone) parent materials. These sites are lower in productivity with increased bare ground, but otherwise are very similar in characteristics.

Similar sites

R032XY104WY	**Clayey (Cy) 5-9” Big Horn Basin Precipitation Zone** Clayey 5-9
R032XY304WY	**Clayey (Cy) 10-14" East Precipitation Zone** Clayey 10-14
R032XY204WY	**Clayey (Cy) 5-9” Wind River Basin Precipitation Zone** Clayey 5-9

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia tridentata ssp. wyomingensis*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus albicans*

Legacy ID

R043BX504WY

Physiographic features

This site occurs on nearly level to 20% slopes. The primary parent material is shale (claystone), but is found in the inter-bedded shale and sandstone, as well as along the dolomite and volcanic uplifts.

Table 2. Representative physiographic features

Landforms	(1) Foothills > Hillslope (2) Foothills > Fan apron (3) Foothills > Eroded fan remnant
Runoff class	Very low to very high
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Rare
Elevation	1,650 – 2,290 m
Slope	0 – 20 %

Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 10 to 14 inches (254 – 355 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. This amounts to about 50% of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer is lost by evaporation and much of the moisture that falls during the winter is lost by sublimation. Average snowfall is about 20 inches annually. Wide fluctuations may occur in yearly precipitation and result in more dry years than those with more than normal precipitation.

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. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. High winds are generally blocked from the basin by high mountains, but can occur in conjunction with an occasional thunderstorm. Growth of native cool-season plants begins about April 15th and continues until about July 1st. Cool weather and moisture in September may produce some green up of cool season plants that will continue through late October.

Review of a 30 year trend of data for Average Temperature as well as Average Precipitation, there has been a warming trend, but as the last 12 years graphed, the temperatures have swayed high and low, but overall it has maintained a steady trajectory, neither increasing nor decreasing. Where on the moisture side, the trajectory in trend has been a slow decline. The swings of when spring warm up and first frost hit with the decline in average precipitation have produced a drought effect where the moisture is not being received when the plants and ground is able to utilize the moisture. And in some cases, the late precipitation has encouraged the warm season or mat forming species over the cool season bunchgrasses that are the drivers of the natural system. Early frosts, with dry open winters has created a more arid or desert effect on plants resulting in high rates of winter kill, loss of vigor or overall damage to the plant.

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. “Buffalo Bill Dam", "Cody 21SW", "Thermopolis", "Thermopolis 9NE", "Thermopolis 25WNW" and "Wapiti 1NE" are the representative weather stations within LRU D. 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)	60-110 days
Freeze-free period (characteristic range)	100-140 days
Precipitation total (characteristic range)	280-310 mm
Frost-free period (actual range)	50-120 days
Freeze-free period (actual range)	90-150 days
Precipitation total (actual range)	250-330 mm
Frost-free period (average)	80 days
Freeze-free period (average)	120 days
Precipitation total (average)	310 mm

- (1) THERMOPOLIS 25WNW [USC00488888], Thermopolis, WY
- (2) WAPITI 1NE [USC00489467], Cody, WY
- (3) CODY 21 SW [USC00481855], Cody, WY
- (4) SUNSHINE 3NE [USC00488758], Meeteetse, WY
- (5) THERMOPOLIS [USC00488875], Thermopolis, WY
- (6) BUFFALO BILL DAM [USC00481175], Cody, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. Depressional areas may pond runoff and precipitation for a short period of time, but is not significant enough to alter the reference vegetation for this site. There may also be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets).

Soil features

The soils of this site are moderately deep (greater than 20” to bedrock) to very deep, moderately well to well-drained soils that formed in alluvium or alluvium over residuum. These soils have slow to moderate permeability. The surface soil will vary from 2 to 5 inches deep. These soils may develop severe cracks. The soil characteristics having the most influence on plants are the heavy texture, available moisture, and potential for elevated quantities of soluble salts.

Major Soil Series correlated to this site include: Abston, Absher, Havre, Poposhia

Table 4. Representative soil features

Parent material	(1) Slope alluvium – sedimentary rock (2) Residuum – sedimentary rock (3) Colluvium – sedimentary rock
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Slow to moderate
Soil depth	50 – 150 cm
Available water capacity (0-101.6cm)	7.62 – 15.24 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	6.4 – 8.2

Ecological dynamics

Potential vegetation on this site is dominated by mid cool-season perennial grasses. Other significant vegetation includes big sagebrush, winterfat, Gardner's saltbush, birdfoot sagebrush, and a variety of forbs. The expected potential composition for this site is about 75% grasses, 10% forbs and 15% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates species such as blue grama, birdfoot sagebrush, and big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Cool-season grasses such as Griffiths and bluebunch wheatgrass, western wheatgrass, bottlebrush squirreltail, and Indian ricegrass will decrease in frequency and overall production.

Big sagebrush may become dominant on some areas with an absence of fire. Wildfires are actively controlled in recent times so chemical control using herbicides has replaced the historic role of fire on this site. Recently, prescribed burning has regained some popularity.

Due to the amount and pattern of the precipitation, the big sagebrush component typically is not resilient once it has been removed if a healthy and vigorous stand of grass exists and is maintained. The exception to this is where the herbaceous component is severely degraded at the time of treatment, growing conditions are unfavorable after treatment, and/or recovery periods are inadequate due to poor grazing management.

The Historic Climax Plant Community (description follows the plant community diagram) has been determined by study of rangeland relic areas, or areas protected from excessive disturbance. Trends in plant communities going from heavily grazed areas to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

The following is a State and Transition Model Diagram that illustrates the common plant communities (states) that can occur on the site and the transitions between these communities. The ecological processes will be discussed in more detail in the plant community narratives following the diagram.

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				90-224	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90-224	–
2				90-179	

	Montana wheatgrass	ELAL7	*Elymus albicans*	90-179	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	90-179	–
3				90-224	
	western wheatgrass	PASM	*Pascopyrum smithii*	90-224	–
4				45-90	
	muttongrass	POFE	*Poa fendleriana*	45-90	–
5				0-90	
	squirreltail	ELEL5	*Elymus elymoides*	0-90	–
6				0-90	
	green needlegrass	NAVI4	*Nassella viridula*	0-90	–
7				45-90	
	Grass, perennial	2GP	*Grass, perennial*	0-45	–
	blue grama	BOGR2	*Bouteloua gracilis*	0-45	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-45	–
	spike fescue	LEKI2	*Leucopoa kingii*	0-45	–
	Sandberg bluegrass	POSE	*Poa secunda*	0-45	–
Forb					
8				0-90	
	Forb, perennial	2FP	*Forb, perennial*	0-45	–
	Indian paintbrush	CASTI2	*Castilleja*	0-45	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	0-45	–
	larkspur	DELPH	*Delphinium*	0-45	–
	threadleaf fleabane	ERFI2	*Erigeron filifolius*	0-45	–
	parsnipflower buckwheat	ERHE2	*Eriogonum heracleoides*	0-45	–
	fleabane	ERIGE2	*Erigeron*	0-45	–
	cous biscuitroot	LOCO4	*Lomatium cous*	0-45	–
	desertparsley	LOMAT	*Lomatium*	0-45	–
	lupine	LUPIN	*Lupinus*	0-45	–
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-45	–
	phlox	PHLOX	*Phlox*	0-45	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-45	–
	American vetch	VIAM	*Vicia americana*	0-45	–
Shrub/Vine					
9				90-179	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-45	–
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-45	–
	big sagebrush	ARTR2	*Artemisia tridentata*	0-45	–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	0-45	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0-45	–
	winterfat	KRASC	*Krascheninnikovia*	0-45	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0-45	–
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-45	–

Table 6. Community 2.1 plant community composition

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

Table 7. Community 3.1 plant community composition

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

Table 8. Community 4.1 plant community composition

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

Table 9. Community 5.1 plant community composition

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

Table 10. Community 6.1 plant community composition

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

Animal community

Animal Community – Wildlife Interpretations Indian Ricegrass/Rhizomatous Wheatgrasses (HCPC): 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. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include Western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here. Perennial Grass/Mixed Shrub Plant Community: The combination of an overstory of sagebrush and an understory of grasses and forbs provides a very diverse plant community for wildlife. The crowns of sagebrush tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows nest in big sagebrush plants, and a host of other nesting birds utilize stands in the 20-30% cover range. Mixed Shrub/Bare Ground Plant Community: This plant community can provide important winter foraging for elk, mule deer and antelope, as sagebrush can approach 15% protein and 40-60% digestibility during that time. This community provides excellent escape and thermal cover for large ungulates, as well as nesting habitat for sage grouse. Blue Grama Sod Plant Community: These communities provide limited foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Perennial Grass/Mixed Shrub Plant Community is limited. Generally, these are not target plant communities for wildlife habitat management. Salt Tolerant Shrub/Bare Ground Plant Community: This plant community exhibits a low level of plant species diversity due to the accumulation of salts near the soil surface. It may provide some thermal and escape cover for deer and antelope if no other woody community is nearby, but in most cases, it is not a desirable plant community to select as a wildlife habitat management objective. Salt Tolerant Shrub/Rhizomatous Wheatgrass Plant Community: The combination of an overstory of shrubs and an understory of grasses and forbs provide a very diverse plant community for wildlife. The crowns of the shrubs tend to break up hard crusted snow on winter ranges, so mule deer and antelope may use this state for foraging and cover year-round, as would cottontail and jack rabbits. It provides important winter, nesting, brood-rearing, and foraging habitat for sage grouse. Brewer's sparrows' nest in big sagebrush plants and hosts of other nesting birds utilize stands in the 20-30% cover range. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing under 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* (lb./ac) (AUM/ac) Historic Climax Plant Community 500-1100 .40 Perennial Grass/Mixed Shrub 400-900 .30 Mixed Shrub/Bare ground 300-700 .20 Blue Grama Sod 100-300 .10 Salt Tolerant Shrub/Bare Ground 250-550 .13 Salt Tolerant Shrub/Rhizomatous Wheatgrasses 400-800 .22 * - Continuous, season-long grazing by cattle under average growing conditions. 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.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group C, with localized areas in hydrologic group D. Infiltration ranges from slow to moderately slow. 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 hydrologic 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 upland game species. The wide variety of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

none noted

Inventory data references

Information presented in the original site description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in developing the original site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist. 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 3, and USDA NRCS Soil Surveys from various counties. Information presented here has been derived from NRCS inventory data, Field observations from range trained personnel, and the existing range site descriptions. Those involved in developing the Loamy range site include: Chris Krassin, Range Management Specialist, NRCS and Everet Bainter, Range Management Specialist. Those involved in the development of the new concept for Loamy and Loamy Calcareous Ecological site include: Ray Gullion, Area Range Management Specialist, NRCS; Jim Wolf, Resource Manager, USDI-BLM; Jack Mononi, Range Management Specialist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. 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 10 points, clipped a minimum of 3 of these 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 (10 – 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.)

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Contributors

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Approval

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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.

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Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **Rare to nonexistent. Where present, short and widely spaced.**

2. **Presence of water flow patterns:** **Barely observable.**

3. **Number and height of erosional pedestals or terracettes:** **Rare to nonexistent.**

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 10-30%.**

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:** **Rare to nonexistent.**

7. **Amount of litter movement (describe size and distance expected to travel):** **Herbaceous litter expected to move only in small amounts (to leeward side of shrubs). Large woody debris from sagebrush will show no movement.**

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 1 (interspaces) to 6 (under plant canopy), but average values should be 3.0 or greater.**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **Soil data is limited for this site. Described A-horizons vary from 1-12 inches (3-30 cm) with OM of 1 to 2%.**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** **The plant community consists of 60-75% grasses, 10% forbs and 15-30% shrubs. Evenly distributed plant canopy (35-55%) and litter plus moderate to moderately rapid infiltration rates result in minimal runoff. Basal cover is typically less than 8% for this site and does very little to effect runoff on this site.**

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** **None**

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: Mid-stature, cool-season bunchgrasses

    Sub-dominant: perennial shrubs = cool-season rhizomatous grasses

    Other: perennial forbs short-stature cool-season bunchgrasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **Minimal decadence, typically associated with shrub component of the canopy cover.**

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14. **Average percent litter cover (%) and depth (in):** **Litter ranges from 20-45% of total canopy measurement with total litter (including beneath the plant canopy) from 35-85% expected. Herbaceous litter depth typicall**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **English: 350 - 1125 lbs/ac (650 lbs/ac average); Metric: 392 - 1262 kg/ha (729 kg/ha average).**

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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:** **The increase of bare ground above 35% is an indicator that a threshold is being crossed. Corresponding increase will be noted in one or more of the following species is common: Blue grama, Sandberg bluegrass, Wyoming big sagebrush, buckwheats, and Spiny phlox. Annual weeds such as kochia, mustards, Lambsquarter, Russian thistle, and pepperweeds are common invasive species in disturbed sites. Common noxious weeds that invade are: Cheatgrass (Downy brome), knapweeds, thistles (Bull, Canada), Houndstongue, Black henbane and Whitetop.**

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