Ecological site DX032X01A154
Shale (Sh)
Big Horn Basin Core

Last updated: 3/04/2025
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General information

Approved. An approved ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model, enough information to identify the ecological site, and full documentation for all ecosystem states contained in the state and transition model.

MLRA notes

Major Land Resource Area (MLRA): 032X–Northern Intermountain Desertic Basins

Major land resource area (MLRA): 032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology further individualize these two basins. 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): 32X01A (WY): This LRU is the Big Horn Basin within MLRA 32. This LRU is lower in elevation, slightly warmer and receives slightly less overall precipitaiton than the Wind River Basin (LRU 02). This LRU was originally divided into two LRU's - LRU A which was the core and LRU B which was the rim. With the most current standards, this LRU is divided into two Subsets. This subset is Subset A, referred to as the Core, which is warm, dry eroded basin floor. As the LRU shifts outer edges, aspect and relation to the major bodies of water and taller landforms create minor shifts in soil chemistry influencing the variety of ecological sites and plant interactions. 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. Older ESD's will refer to LRU A. LRU A and LRU 01 in MLRA 32X are synonymous. Moisture Regime: Typic Aridic, prior to 2012, there are map units that cross over to ustic aridic or ustic aridic was correlated into this core area. As progressive mapping continues and when the ability to do update projects, these overlapping map units will be corrected. Temperature Regime: Mesic Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this LRU/ESD. Representative Value (RV) Effective Precipitation: 5-9 inches (127 – 229 mm) RV Frost-Free Days: 110-150 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 3.B.1. NE.5 Great Basin Saltbush Scrub Macrogroup 3.B.1. NE.5.a Intermountain Dwarf Saltbush – Sagebrush Scurb A1110 Gardner's Saltbush Low Scrub CEGL001438 Atriplex gardneri Dwarf-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.g Big Horn Salt Desert Shrub Basin

Ecological site concept

• Site receives no additional water. • Slope is 60% • Soils are: - saline, sodic, or saline-sodic, gypsic - Very Shallow (depth to restrictive layer is 10? (25 cm). - With 30% cover of surface fragments (gravels, cobbles, stones) - Textures usually range from silt loam to clay - Clay content is ? 35% in mineral soil profile (0-10"). - With an average particle size class ? 35% but 60% clay The Shale ecoloical site concept is based on soils that are very shallow (depth to a paralithic or lithic (bedrock) contact is 10? (25 cm)). The underlying bedrock or residuum is composed of shale or other salt-laden sedimentary bedrock. The Shale ecological site is very similar and is generally associated with the saline upland clayey ecological site. Shale is less than 10 inches to shale (bedrock) and saline upland is greater than

10 inches. Saline Upland Clayey is generally found over shale bedrock, typically on lower or gentler slopes, and in many cases will have a very similar plant community. The production potential and erosion hazard are the two main distinctive characteristics between these two sites.

Associated sites

DX032X01A158	**Shallow Clayey (SwCy) Big Horn Basin Core** Shallow Clayey ecological site may have simlar soil properties but will be slightly deeper in nature with the lack of salt indications. Sagebrush and bunchgrasses such as bluebunch wheatgrass are prevelent on this site.
R032XY104WY	**Clayey (Cy) 5-9” Big Horn Basin Precipitation Zone** The Clayey ecological site may have responses to disturbance, management and climatic changes similar to a saline upland site, however they lack the chemistry burden, and may not have the strong soil structure or “fluffy” tendencies as the soils dry out. Location on the landscapes are similar, but Clayey tend to occur in flatter or areas with a more concave shape allowing water to infiltrate and move through the profile better, moving salts lower in the profile.
DX032X01W138	**Saline Lowland (SL) Big Horn Basin Wet** The Saline Lowland site is greasewood dominated, and occurs on a terrace or step below saline upland sites (along drainages or in drainage-ways). They have an associated water-table, and will generally have a higher ground cover and productivity.
R032XY144WY	**Saline Upland (SU) 5-9” Big Horn Basin Precipitation Zone** Saline Upland sites are very similar but have a higher potential production and highe species diveristy than is common for a Shale ecological site. Typically, shale sites will be found side by side with saline upland sites as the soils transition from an eroded landform to an apron or depositional landform.

Similar sites

R032XY354WY	**Shale (Sh) 10-14" East Precipitation Zone** Shale 10-14” Foothills and Basins East P.Z., 032XY354WY, has higher production.
DX032X01A143	**Saline Upland Clayey (SUC) Big Horn Basin Core** Saline Upland, Clayey will appear very similar to this site if in a degraded state. Production potential and species diversity overall is higher for the Saline Upland, Clayey Site .
DX032X01A176	**Very Shallow (VS) Big Horn Basin Core** Very Shallow ecological site are found on soils without the salt influence and can be over a mix of sedimentary bedrock. Pincushion forbs and bunchgrasses are dominant on this site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex gardneri*

Herbaceous	(1) *Elymus elymoides*

Legacy ID

R032XA154WY

Physiographic features

These sites generally occur on slopes ranging from nearly level to 60%. These soils occur where marine shales outcrop or along eroded fans formed from interbedded sandstone and shale. They may also occupy erosional features of the foothills and lower mountain ranges with lower precipitations. The inter-bedded and dissected geomorphic features within the Big Horn Basin has a range of saline-driven communities. The dominant landform associated with this site is fan aprons (including alluvial fans and fan remnants).

Many of these landforms are erosional remnants and have soils ranging from shallow to very deep. The variability of soils across the landform is influenced by the geology and its inherent chemistry. This will create pockets of calcareous or saline/sodic soils as well as areas that are not influenced by chemistry. Transitioning across the landform positions, soils shift with the deposition of salt laden materials or with the overflow of chemistry laden runoff. With these transitions, the break between one ecological site and another (and the representative plant community for each) is often a broad and non-descript band between the two sites. This can make it difficult, when on the landscape, to identify clearly which site is dominant for a specific point along that transitional gradient.

Figure 1. Physiographic features for the Shale Big Horn Basin Core ecological site.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Eroded fan remnant sideslope (2) Intermontane basin > Ridge (3) Intermontane basin > Escarpment (4) Intermontane basin > Pediment
Runoff class	Low to very high
Elevation	1,130 – 1,830 m
Slope	0 – 60 %
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation ranges from 5-9 inches per year. 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 1 and continues to about July 1. Cool weather and moisture in September may produce some green up of cool season plants that will continue to late October.

The following information is from the “Emblem” climate station:
Minimum Maximum 5 yrs. out of 10 between
Frost-free period (days): 98 171 May 13 – September 19
Freeze-free period (days): 120 184 May 1 – October 5
Mean Annual Precipitation (inches): 3.22 10.97
Mean annual precipitation: 7.42 inches
Mean annual air temperature: 45.01 F (31.2 F Avg. Min. to 58.7 F Avg. Max.)

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/ website. Other climate station(s) representative of this precipitation zone include: Basin, Deaver, Lovell and Worland.

Table 3 Representative climatic features

Frost-free period (characteristic range)	110-120 days
Freeze-free period (characteristic range)	130-140 days
Precipitation total (characteristic range)	180-200 mm
Frost-free period (actual range)	100-120 days
Freeze-free period (actual range)	130-150 days
Precipitation total (actual range)	150-200 mm
Frost-free period (average)	110 days
Freeze-free period (average)	140 days
Precipitation total (average)	180 mm

- (1) LOVELL [USC00485770], Lovell, WY
- (2) GREYBULL [USC00484080], Greybull, WY
- (3) EMBLEM [USC00483031], Burlington, WY
- (4) DEAVER [USC00482415], Deaver, WY
- (5) WORLAND [USW00024062], Worland, WY
- (6) BASIN [USC00480540], Basin, WY
- (7) WORLAND [USC00489770], Worland, WY
- (8) GREYBULL S BIG HORN AP [USW00024048], Greybull, 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. No streams are classified within this ecological site. The lack of water table above 60 in (150 cm) during any part of the growing season is a key factor for the Saline Upland sites. As the landscape transitions into the bottomlands (lowlands) or drainages, gaining overland flow and ground water influence changes the site to a saline lowland or saline subirrigated

ecological site. In areas where there was historically a water table, but the stream or source has down cut or has been depleted, a site labeled Saline Lowland, Drained was created to cover a mixed or relict plant community.

Soil features

The soils of this site are very shallow (less than 10 inches to bedrock) well-drained soils formed from residuum. These soils have rapid to slow permeability and can be of any texture; however, range generally in the sandy clay loam, silt loam to clay. This site usually occurs on steep slopes with many outcrops of shale bedrock. Can be found on more gentle slopes on eroded landforms. These clay shales are usually saline or alkaline in various degrees, and normally produce sparse stands of halophytes and saline tolerant grasses. The soil characteristics having the most influence on the plant community are the very shallow soils, which drastically reduces the amount of available moisture and potential quantities of soluble salts.

Major soil series correlated to this site include: Birdsley-like, Bributte, Chipeta, Chipeta-like, and Persayo. This list of soil series is subject to change upon completion and correlation of the initial soil surveys: WY629, WY603, and WY617; as well as revisions to completed soil surveys: WY043 and MT611.

Figure 8. Soil Profile of a Shale Site.

Table 4. Representative soil features

Parent material	(1) Residuum – shale
Surface texture	(1) Clay loam (2) Clay (3) Silt loam (4) Sandy clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderate
Depth to restrictive layer	0 – 30 cm
Soil depth	0 – 30 cm
Surface fragment cover <=3"	0 – 10 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	1.52 – 5.08 cm

Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 40
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 10
Subsurface fragment volume <=3" (Depth not specified)	10 – 20 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

Potential vegetation on this site is dominated by salt tolerant plants and drought resistant mid-stature cool-season perennial grasses. The expected potential composition for this site is 30% grasses, 10% forbs and 60% woody plants. The composition and production will vary naturally due to variability of soluble salts and fluctuating precipitation. Historic use has played a subtler role in the variability of these sites.

As this site shifts in chemistry or as the site deteriorates, species such as birdfoot sagebrush and woodyaster will increase. Weedy annuals will invade. Cool-season grasses such as Indian ricegrass, bottlebrush squirreltail, and rhizomatous wheatgrasses will decrease in frequency and production.

Historically, fire frequency has been included as a driving factor for this site. Because of the naturally occurring bare ground, lack of herbaceous cover, and corresponding lack of fine fuels, fire is not a threat. Fires are non-existent to extremely rare and incidental.

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 - State1 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	**Short-stature, Cool-season Bunchgrasses**			17-56	
	squirreltail	ELEL5	*Elymus elymoides*	26-50	5-20
	Sandberg bluegrass	POSE	*Poa secunda*	0-6	0-2
2	**Rhizomatous, Cool-season Grasses**			11-34	
	western wheatgrass	PASM	*Pascopyrum smithii*	0-34	0-10
3	**Mid-stature, Cool-season Bunchgrasses**			0-22	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-22	0-5
	needle and thread	HECO26	*Hesperostipa comata*	0-6	0-2
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	0-6	0-2
4	**Mat-forming (Tillering), Warm-season Grasses**			0-11	
	alkali sacaton	SPAI	*Sporobolus airoides*	0-6	0-2
	blue grama	BOGR2	*Bouteloua gracilis*	0-6	0-2
5	**Miscellaneous Grasses and Grass-likes**			0-6	
	Grass, perennial	2GP	*Grass, perennial*	0-6	0-5
Forb					
6	**Perennial Forbs**			0-28	
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0-11	0-5
	textile onion	ALTE	*Allium textile*	0-6	0-5
	desertparsley	LOMAT	*Lomatium*	0-6	0-5
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-6	0-5
	Forb, perennial	2FP	*Forb, perennial*	0-6	0-5
	milkvetch	ASTRA	*Astragalus*	0-6	0-5
	princesplume	STANL	*Stanleya*	0-6	0-5
Shrub/Vine					
7	**Dominant Shrubs**			56-112	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	56-112	20-50
8	**Miscellaneous Shrubs**			0-28	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-11	0-5
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0-11	0-5
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-11	0-5
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-11	0-5
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-11	0-5

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Forb					
1	**Perennial Forbs**			0-6	
	Forb, perennial	2FP	*Forb, perennial*	0-6	0-5
	milkvetch	ASTRA	*Astragalus*	0-6	0-5
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-6	0-5
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0-6	0-5
	tansyaster	MACHA	*Machaeranthera*	0-6	0-5
	textile onion	ALTE	*Allium textile*	0-6	0-5
	princesplume	STANL	*Stanleya*	0-6	0-5

	desertparsley	LOMAT	*Lomatium*	0-6	0-5
2	**Annual Forbs**			0-6	
	Forb, annual	2FA	*Forb, annual*	0-6	0-2
	flatspine stickseed	LAOC3	*Lappula occidentalis*	0-6	0-2
	Wilcox's woollystar	ERWI	*Eriastrum wilcoxii*	0-6	0-2
Shrub/Vine					
3	**Dominant Shrubs**			28-84	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	28-84	20-45
4	**Miscellaneous Shrubs**			0-28	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-11	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-6	0-5
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	0-6	0-5
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-6	0-5
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-6	0-5

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 (%)

Animal community

Animal Community – Wildlife Interpretations: 1.1 - Saltbush/Bunchgrasses: The predominance of woody plants in this plant community provides winter grazing for mixed feeders, such as elk, and antelope. Suitable thermal and escape cover for these animals are limited due to the low quantities of tall woody plants. When found adjacent to sagebrush-dominated states, this plant community may provide lek sites for sage grouse. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Some grassland obligate small mammals would occur here. 2.1 - Saltbush/Bare Ground: This Plant community exhibits a low level of plant species diversity. It may have forage value for antelope and deer, but in most cases is not a desirable plant community due to the lack of cover and selectivity by the wildlife. It is not, for most cases, a desirable plant community to select for in wildlife habitat management. Due to the open and exposed nature of this community, it may be a location for sage grouse leks, if there is edge effect provided by a sagebrush site surrounding the saltbush community. 3.1 – Invasives/Saltbush: This plant community exhibits a low level of plant species diversity. It is not a desirable plant community to select as a wildlife habitat management objective. However, seeds produced by many of the invasive species serve as a forage source for sage grouse and other birds as well as grassland obligate small mammals. Knapweeds provide good cover for small mammals and birds as well. 4.1 – Altered (Disturbed and Restored/Reclaimed): Depending on the stage of succession, or selected seed mixture, locations may vary widely on value for wildlife habitat management. 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. 1.1 Reference: Saltbush / Bunchgrasses 80 130 265 0.04 25.0 2.1 Saltbush / Bare Ground 25 75 105 0.02 50.0 3.1 Natives / Invasives / Saltbush ** ** ** ** ** 4.1 Disturbed/Degraded ** ** ** ** ** * - 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% of a management unit may have 25% slopes and distances of greater than one mile from water; therefore, the adjustment is only calculated for 30% of the unit (i.e. 50% reduction on 30% 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

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group D. Infiltration ranges from slow to moderate. Runoff potential for this site varies from moderate to very 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 may be present but should be barely distinguishable. Pedestals are only slightly present in association with bunchgrasses such as bluebunch wheatgrass. 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 limited hunting opportunities for upland game species. Because of the raw nature of these sites, cultural artifacts can be viewed in the area of these sites especially along the drainages that dissect the area. And the locations are generally close or include a diverse geology that offers a chance to explore the unique and varied geology of the area. This ecological site, however, proves to be very limited in association with roadways and trails in relation to erosion potential and functionality. The soils will be sticky or slick when wet and are more erosive than other associated ecological sites. Need to take these soils into consideration when crossing the area with trails or roadways. The site is generally rough as well and provides no soft cover for camping or resting.

Wood products

No appreciable wood products are present on the site.

Other products

This site is limited with minimal vegetative cover to provide other products.

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 Saline Upland 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 Saline Upland Ecological site include: Ray Gullion, Area Range Management Specialist, Jim Haverkamp, Area Range Management Specialist, NRCS; Mandi Hirsch, Range Management Specialist, Popo Agie Conservation District; Jim Wolf, Resource Manager, USDI-BLM; John Likins, Range Management Specialist, Retired USDI-BLM; Jeremy Artery, Rangeland Management Specialist, USDI-BLM; Leah Yandow, Wildlife Biologist, USDI-BLM; Daniel Wood, MLRA Soil Survey Leader, NRCS; Jane Karinen, Soil Data Quality Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Quality control and quality assurance completed by: John Hartung, State Rangeland Management Specialist, NRCS; Brian Jensen, State Wildlife Biologist, NRCS; Scott Woodall, Regional Quality Assurance 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. Read 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

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Approval

Kirt Walstad, 3/04/2025

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.

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Date	11/28/2018
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: Rills will be continuous and prominent on this site but are stable and will have more inter-rills with few deep rills on the landscape. Rills should be most prevalent on slopes greater than 15%.**

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2. **Presence of water flow patterns: Water flow paths will be obvious, regular and continuous with debris dams occurring only on lesser slopes.**

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3. **Number and height of erosional pedestals or terracettes:** Erosional pedestals present with terracettes present at debris dams. Infrequent and less than 1 inch in height; most commonly associated with perennial bunchgrasses.

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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 45-65%.

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5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present. Active gullies may be present on steeper slopes (>20%).

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None.

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7. **Amount of litter movement (describe size and distance expected to travel):** Plant litter movement is expected.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil Stability Index ratings range from 1 (interspaces) to 3 (under plant canopy), but average values should be 3.0 or greater. Salts influence the stability of this soil.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Refer to soil series description and map unit for specific information. The soil surface structure is platy to vesicular, with a prismatic subsurface structure. Depth will vary from 1 to 10 inches (2 - 25 cm). The dry surface Colors are generally in the 10YR to 7.5YR range with a Hue of 5 and a Chroma of 2. Organic matter in the surface ranges from 0.5 to 1.0.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The plant community consists of 50-75% shrubs, 5% forbs and 20-45% grasses. Evenly distributed plant canopy (35-55%) and litter help slow runoff. Lack of cover and tendency to crust, runoff is common. Basal cover is typically less than 5% and does very little to effect runoff. Raindrop impact and runoff are common on this site.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer would be expected but soil surface is typically crusted and hard to very hard when dry.

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: perennial shrubs

    Sub-dominant: Cool season, mid-stature grasses

Other: Short stature grasses/grasslikes = Forbs

Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **Some plant mortality and decadence (10 to 15%) is expected on this site. Perennial bunchgrass shows higher mortality with drought stress, dwarf shrubs (saltbush) will show minimal mortality.**

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14. **Average percent litter cover (%) and depth (in):** **Litter ranges from 5-10% of total canopy measurement with total litter (including beneath the plant canopy) from 5-20% expected. Herbaceous litter depth typically ranges from 1 - 3 mm. Woody litter can be 2-5 mm. Litter cover is in contact with soil surface with little evidence of biological activity.**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **English: 85 - 250 lbs/ac (150 lbs/ac average); Metric: 95 - 280 kg/ha (168 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:** **Seepweed, birdfoot sagebrush, flatspine stickseed, and woodyaster are native species that increase with stress; invasive species such as, but not limited to: halogeton, cheatgrass (downy brome), and Russian thistle are also found on this site. Other common noxious weeds can be found on the Noxious Weed List for Wyoming and specific counties.**

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17. **Perennial plant reproductive capability:** **All species have a limited capability of reproducing.**
