Ecological site DX032X01B154
Shale (Sh)
Big Horn Basin Rim

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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 land resource units (LRUs) to allow individual ecological site descriptions (ESD s). 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): 32X01B (WY): This LRU is the Big Horn Basin within MLRA 032X. This LRU is lower in elevation, slightly warmer and receives slightly less overall precipitation 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 B, referred to as the Rim, is a transitional band between the basin floor and the lower foothills. The subset encircles Subset A which was originally LRU A. As the LRU shifts towards the south and tracks east, changes in geology and relation to the mountain position, creates a minor shift 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. Moisture Regime: Ustic Aridic – Prior to 2012, many of the soils within this group were correlated as Frigid Ustic Aridic or as Mesic Typic Aridic, with few mapped within this cross over zone. As progressive soil survey mapping continues, these “crossover” or transitional areas are being identified and corrected. Temperature Regime: Mesic Dominant Cover: Rangeland, with Saltbush flats the dominant vegetative cover for this LRU/ESD. Representative Value (RV) Effective Precipitation: 10-14 inches (254 – 355 mm) RV Frost-Free Days: 105-125 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 Scrub 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 10.1.18.d Foothill Shrublands and Low Mountains 10.1.18.g Big Horn Salt Desert Shrub Basin

Ecological site concept

• This site receives no additional water. • The slope is less than 65 percent. • Soils in the Shale ecological site: - are saline, sodic, saline-sodic, or gypsic - are very shallow (depth to restrictive layer is less than 10 inches or 25 cm) - have less than 30 percent cover of surface fragments (gravels, cobbles, and stones) - have textures that usually range from silt loam to clay - have less than 35 percent clay content in the mineral soil profile (0-10 inches) - have an average particle size class of more than 25 percent but less than 65 percent clay The Shale ecological site concept is based on soils that are very shallow: depth to a paralithic or lithic (bedrock) contact is 10 inches (25 cm).

The underlying bedrock or residuum is of shale or other salt-laden sedimentary bedrock. This Shale ecological site is very similar to and is generally associated with the Saline Upland Clayey ecological site. Cody Shale and bentonite escarpments are common geology associated with this site. Shale is less than 10 inches to shale parent material (bedrock) and saline upland is greater than 10 inches. The Saline Upland Clayey ecological site typically is found over shale or interbedded sedimentary bedrock, typically on lower and gentler slopes, and in many cases will have a very similar plant community. The production potential and erosion hazard are the two interpretive characteristics that differ between these two sites.

Associated sites

R032XY340WY	**Saline Lowland Drained (SLDr) 10-14" East Precipitation Zone** The Saline Lowland, Drained site will have similar plants, with the presence or stronger accent of greasewood. Many times the salts will not be visible in the profile, but SAR and EC are present. Generally located on terraces or benches above a downcut or severely incised stream channel.
R032XY338WY	**Saline Lowland (SL) 10-14" East Precipitation Zone** The Saline Lowland site is greasewood-dominated, and occurs on a terrace or step below Saline Upland sites (along draws or in drainageways). They have an associated wat er table, and will generally have a higher percentage of ground cover and productivity.
R032XY304WY	**Clayey (Cy) 10-14" East 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 sites tend to occur in flatter places or in areas with a more concave shape allowing water to infiltrate and move through the profile better, moving salts lower in the profile.

Similar sites

DX032X01B141	**Saline Upland Loamy (SUL) Big Horn Basin Rim** The Saline Upland Loamy site is within the Big Horn Basin and is the loamy fraction of the general Saline Upland site. This site contains 18 to 35 percent clay within the particle-size control section and classifies typically as a fine-loamy textural class. The site has a similar composition to the original Saline Upla nd site, with a narrower concept and corrected range of production.
DX032X01B143	**Saline Upland Clayey (SUC) Big Horn Basin Rim** The Saline Upland Clayey site is within the Big Horn Basin and is the clayey fraction of the general Saline Upland site. This site contains greater than 35 percent clays within the particle-size control section and is greater than 10 inches deep to a restrictive layer. The site can look identical to the shale site, especially in a degraded state; however, the site does have the potential for greater herbaceous cover. May occur in association with a Shale site.
R032XY344WY	**Saline Upland (SU) 10-14" East Precipitation Zone** The Saline Upland site was all-encompassing for the Big Horn Basin Saline Upland sites, within the 10-14" east precipitation zone in Wyoming. This site can be very similar is characteristics and appearance but tends to have higher potential production and stability. May occur in association with a Shale ecological site.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Atriplex gardneri* (2) *Artemisia pedatifida*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus elymoides*

Legacy ID

R032XB154WY

Physiographic features

The Shale ecological site generally occurs on slopes ranging from nearly level to 60 percent. These soils occur where marine shales (e.g. Cody Shale and Gypsum Springs) 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 precipitation. The interbedded and dissected geomorphic features within the Big Horn Basin has a range of saline-driven communities. The dominant landforms associated with this site are escarpments and erosional remnants.

Many of these landforms are complex soils, with intermixed chemistry and ranging from shallow to very deep. This will create pockets of calcareous or saline or 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 chemical-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 nondescript 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 Image - Aerial View of landforms and associated sites for Shale.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Erosion remnant (2) Intermontane basin > Escarpment (3) Intermontane basin > Pediment (4) Intermontane basin > Hillslope
Runoff class	Low to very high
Elevation	1,460 – 1,970 m
Slope	0 – 60 %
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 percent of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer months is lost by evaporation and much of the moisture that falls during the winter time 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 the late winter and spring months. 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 1st and continues to about July 1st. Cool weather and moisture in September may produce some green-up of cool season plants that will continue to late October. For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Clark 3NE, Cody, Cody 12SE, Heart Mtn, and Powell Fld Stn 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)	90-100 days
Freeze-free period (characteristic range)	110-120 days
Precipitation total (characteristic range)	200-280 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	110-130 days
Precipitation total (actual range)	180-280 mm
Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	230 mm

- (1) HEART MTN [USC00484411], Powell, WY
- (2) POWELL FLD STN [USC00487388], Powell, WY
- (3) CODY [USC00481840], Cody, WY
- (4) CODY 12SE [USC00481850], Meeteetse, WY
- (5) SHELL 1NE [USC00488124], Shell, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches or 150 cm) and have minimal influence from surface water and overland flow. No streams are classified within this ecological site. The lack of water table above 60 inches (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 drainageways, 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 dow ncut 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 Shale ecological site

usually occurs on steep slopes with many outcrops of shale bedrock but 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 with 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 Hilight, Midway, Shingle, and Rallod. 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. Soils Profile Image - Shale Soil that is very shallow to paralithic contact.

Table 4. Representative soil features

Parent material	(1) Residuum – shale (2) Slope alluvium – sedimentary rock
Surface texture	(1) Clay loam (2) Clay (3) Silty clay loam (4) Sandy clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Slow to moderate
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 percent grasses, 10 percent forbs and 60 percent 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 that occur 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	**Mid-stature, Cool-season Bunchgrasses**			22-56	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	22-56	5-20
	needle and thread	HECO26	*Hesperostipa comata*	0-11	0-5
2	**Short-stature, Cool-season Bunchgrasses**			11-34	
	squirreltail	ELEL5	*Elymus elymoides*	11-34	5-15
	Sandberg bluegrass	POSE	*Poa secunda*	0-11	0-5

3	**Rhizomatous, Cool-season Grasses**			0-22	
	western wheatgrass	PASM	*Pascopyrum smithii*	0-11	0-5
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0-11	0-5
4	**Miscellaneous Grasses and Grass-likes**			22-45	
	Grass, perennial	2GP	*Grass, perennial*	0-11	0-5
	threadleaf sedge	CAFI	*Carex filifolia*	0-11	0-5
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0-11	0-5
8	**Mat-forming (Tillering), Warm-season Grasses**			0-11	
	alkali sacaton	SPAI	*Sporobolus airoides*	0-11	0-5
	blue grama	BOGR2	*Bouteloua gracilis*	0-6	0-5
Forb					
5	**Perennial Forbs**			6-28	
Shrub/Vine					
6	**Dominant Shrubs**			56-168	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	56-168	20-40
7	**Miscellaneous Shrubs**			0-22	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-11	0-5
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-11	0-5
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-11	0-5
	fourwing saltbush	ATCA2	*Atriplex canescens*	0-11	0-5
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-11	0-5

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Short-stature, Cool-season Bunchgrasses**			11-56	
	squirreltail	ELEL5	*Elymus elymoides*	6-56	5-25
	Sandberg bluegrass	POSE	*Poa secunda*	0-11	0-5
2	**Rhizomatous, Cool-season Grasses**			6-22	
	western wheatgrass	PASM	*Pascopyrum smithii*	6-22	0-10
	thickspike wheatgrass	ELLAL	*Elymus lanceolatus ssp. lanceolatus*	0-11	0-10
3	**Mid-stature, Cool-season Bunchgrasses**			0-11	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-11	0-5
	needle and thread	HECO26	*Hesperostipa comata*	0-11	0-5
4	**Mat-forming (Tillering), Warm-season Grasses**			0-11	
	alkali sacaton	SPAI	*Sporobolus airoides*	0-11	0-5
	blue grama	BOGR2	*Bouteloua gracilis*	0-6	0-5
5	**Miscellaneous Grasses and Grass-likes**			0-11	
	Grass, perennial	2GP	*Grass, perennial*	0-11	0-5
	threadleaf sedge	CAFI	*Carex filifolia*	0-6	0-5
	Grass-like (not a true grass)	2GL	*Grass-like (not a true grass)*	0-6	0-5
	Grass, annual	2GA	*Grass, annual*	0-6	0-5
	annual wheatgrass	ERTR13	*Eremopyrum triticeum*	0-6	0-5
Forb					
6	**Perennial Forbs**			0-28	
	Forb, perennial	2FP	*Forb, perennial*	0-6	0-5

	textile onion	ALTE	*Allium textile*	0-6	0-5
	milkvetch	ASTRA	*Astragalus*	0-6	0-5
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0-6	0-5
	tansyaster	MACHA	*Machaeranthera*	0-6	0-5
	desertparsley	LOMAT	*Lomatium*	0-6	0-5
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-6	0-5
	princesplume	STANL	*Stanleya*	0-6	0-5
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0-6	0-5
7	**Annual Forbs**			0-6	
	madwort	ALYSS	*Alyssum*	0-6	0-5
	Wilcox's woollystar	ERWI	*Eriastrum wilcoxii*	0-6	0-5
	Forb, annual	2FA	*Forb, annual*	0-6	0-5
Shrub/Vine					
8	**Dominant Shrubs**			56-168	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	34-168	20-50
9	**Miscellaneous Shrubs**			0-34	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-22	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-11	0-5
	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-11	0-5
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-11	0-5
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-11	0-5

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Forb					
1	**Perennial Forbs**			0-28	
	princesplume	STANL	*Stanleya*	0-11	0-5
	smooth woodyaster	XYGL	*Xylorhiza glabriuscula*	0-11	0-5
	milkvetch	ASTRA	*Astragalus*	0-11	0-5
	desertparsley	LOMAT	*Lomatium*	0-6	0-5
	tansyaster	MACHA	*Machaeranthera*	0-6	0-5
	leafy wildparsley	MUDI	*Musineon divaricatum*	0-6	0-5
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0-6	0-5
	textile onion	ALTE	*Allium textile*	0-6	0-5
	Forb, perennial	2FP	*Forb, perennial*	0-6	0-5
2	**Annual Forbs**			0-6	
	madwort	ALYSS	*Alyssum*	0-6	0-5
	Wilcox's woollystar	ERWI	*Eriastrum wilcoxii*	0-6	0-5
	Forb, annual	2FA	*Forb, annual*	0-6	0-5
Shrub/Vine					
3	**Dominant Shrubs**			34-168	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	34-168	20-50
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0-22	0-20
4	**Miscellaneous Shrubs**			0-34	
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-22	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-11	0-5

	birdfoot sagebrush	ARPE6	*Artemisia pedatifida*	0-11	0-5
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-11	0-5
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-11	0-5

Table 8. Community 3.1 plant community composition

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

Table 9. Community 4.1 plant community composition

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

Animal community

Animal Community – Wildlife Interpretations: 1.1 – Indian Ricegrass/Gardner's Saltbush: Perennial Bunchgrasses/Gardner's Saltbush: 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. 1.2 – Perennial Bunchgrasses/Gardner's Saltbush: 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. 2.1 – Gardner's 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 – Invaded/Gardner's 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. 4.1 – Altered (Disturbed and Restored/Reclaimed): This is not a desirable plant community to select as a wildlife habitat management objective. After establishment, this community exhibits a low level of plant species diversity. However, seeds produced by seeded species may serve as a forage source for sage grouse and other birds as well as grassland obligate small mammals. Depending upon 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 lbs. /AUM (Animal Unit Month, the amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month) to calculate the AUMs/Acre. Plant Community Description/Title Lbs./Acre AUM/Acre* Acres/AUM* Below Ave. Normal Above Ave. 1.1 Reference: Indian Ricegrass/Gardner's Saltbush 80 175 300 0.05 20.0 1.2 Perennial Bunchgrasses / Gardner's Saltbush 75 150 250 0.04 25.0 2.1 Gardner's Saltbush / Bare Ground 35 100 175 0.03 33.0 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 yet been collected or evaluated, 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 must be supplemented with protein because the forage 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 grazeable 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 upon soil hydrologic group and ground cover. In many cases, areas with greater than 75 percent 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 percent 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 typically should not 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 percent 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 drainageways that dissect the area. The locations generally are 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. These soils must be taken into consideration when crossing the area with trails or roadways. The site generally is 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 also were 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. 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; and 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-feet 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 two of these estimated points, with two 21 ft. X 21 ft. square extended shrub plots) • Line Point Intercept (overstory 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 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. 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.)

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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	11/30/2018
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 20% .**

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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 40-65%.**

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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:** **Minimal to nonexistent.**

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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 generally are 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 affect 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: Forbs = Short-stature grasses/grass-likes

    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: 80 - 300 lbs/ac (175 lbs/ac average); Metric: 90 - 336 kg/ha (196 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:** Pursh 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.
