Ecological site DX032X01A145
Saline Upland Sandy (SUS)
Big Horn Basin
Core

Last updated: 3/05/2025
Accessed: 07/15/2026

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

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

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 single these two basins out. 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

32X01 (WY): This LRU is the core of the Big Horn Basin, comprised of the eroded basin floor. As the LRU shifts toward the 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 to 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 MLRAs and LRUs based on elevation, landform, and biological references. Moisture Regime: Typic Aridic. Prior to 2012, there were map units that cross over to ustic aridic or ustic aridic was correlated into this core area. As progressive mapping continues and when the opportunity arises to do update projects, these overlapping map units will be corrected. Temperature Regime: Mesic Dominant Cover: Rangeland, with saltbush flats as 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 M169 Great Basin Saltbush Scrub Macrogroup G301 Atriplex corrugate – Artemisia pedatifida – Picrothamnus desertorum Dwarf-Scrub Group 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.g Big Horn Salt Desert Shrub Basin

Ecological site concept

• Site does not receive any additional water. • Slope is 30%. • Soils are: o saline or saline-sodic. o Shallow, Moderately deep, deep, or very deep o With 3% stone and boulder cover and 20% cobble and gravel cover. o Not skeletal (35% rock fragments) within 20" (51 cm) of mineral soil surface. o Textures usually range from sand to sandy loam in mineral soil surface 4" (10 cm). Clay content is less than 18%. o Average particle size class is less than 18% clay. The concept of this site is based on soils that are well drained formed in alluvium and residuum of sodic or alkaline sandstone parent materials. Originally,Saline Upland, spanned sandy through clayey soils grouping them based on chemical similarities. After closer review, it appears that as soil texture shifts from a loamy soil profile towards sandy or clayey, the response to management and climate changes, and there is a shift in plant communities. So the original Saline Upland Ecological Site will be divided into: Saline Upland, Loamy; Saline Upland, Sandy, and Saline Upland, Clayey. There may also be a need to separate those saline/sodic soils that are gypsic or calcic once lab samples can be processed to support the need. Until such time, these communities will be documented within the respective textural breaks of the Saline Upland site.

Associated sites

DX032X01A146	**Sands (Sa) Big Horn Basin Core** The Sands ecological site has a distinct grass and forb composition as well as sagebrush rather than Gardner's saltbush. The Sands site occurs in wind blown areas on the landscape or directly associate with sandstone outcrops, but is lacking the salt characteristics.
DX032X01A166	**Shallow Sandy (SwSy) Big Horn Basin Core** The Shallow Sandy ecological site is also found adjacent to sandstone outcrops, and is lacking the salt characteristics catering to sagebrush dominated communities. There will be small pockets of Saline Upland Sandy intermixed with the Shallow Sandy site.
DX032X01A150	**Sandy (Sy) Big Horn Basin Core** The Sandy ecological site will be be similar in composition with Wyoming big sagebrush rather than saltbush. There is a difference in the forb composition as well as production between the Sandy and Saline Upland Sandy sites. Sandy will appear intermixed with small pockets of saline upland along the base of cretaceous sandstone outcrops.
DX032X01A141	**Saline Upland Loamy (SUL) Big Horn Basin Core** See Similar Sites.
DX032X01A122	**Loamy (Ly) Big Horn Basin Core** As move away from the sandstone outcrops, loamy soils tend to increase on the landscape. The loamy textures and lack of salts provides for a more productive sagebrush dominated community.
DX032X01A176	**Very Shallow (VS) Big Horn Basin Core** Very shallow sites will occur with rock outcrop and then as move away from the exposed rock as the soil profile becomes deeper, the Saline Upland Sandy occurs.

Similar sites

DX032X01W140	**Saline Lowland Drained (SLDr) Big Horn Basin Wet** The Saline Lowland, Drained site is responsive to the additional moisture that is received from overland flow, and in areas with sandstone parent material will be very similar to the Saline Upland Sandy, however the drained site has prominent greasewood where the upland site should only have incidental occurrences of greasewood.
DX032X01A143	**Saline Upland Clayey (SUC) Big Horn Basin Core** The Saline Upland Clayey ecological site has the same Gardner's saltbush dominance and similar concept, however, the site has heavier textures and will respond to management slower and with a different community shift than the Saline Upland Sandy ecological site.

DX032X01A141	**Saline Upland Loamy (SUL) Big Horn Basin Core** The Saline Upland Loamy ecological site has overlapping plant communities, however, the site has heavier textures and will respond to management slower and with a different community shift than the Saline Upland Sandy ecological site.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex gardneri* (2) *Atriplex confertifolia*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Elymus elymoides*

Legacy ID

R032XA145WY

Physiographic features

The Saline Upland Sandy ecological site generally occurs on slopes ranging from nearly level to 30 percent. It has been documented that most of these soils are found on toe slopes and terraces below cretaceous sandstone outcrop. The inter-bedded and dissected geology of Big Horn Basin has a mixture of soils creating a wide range of saline-driven communities. Sandy sites are found closer to the originating parent material, Loamy along the central portions of the landforms or following both clayey and sandier parent material sources, and Saline Upland Sandy sites follow the lowest portion of the landscape or at the base of the salt-laden sandstones or inter-bedded sandstone and shale.

Figure 1. Aerial image of a set of landforms where Saline Upland ecological sites are commonly found.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Stream terrace (3) Intermontane basin > Erosion remnant
Runoff class	Negligible to medium
Elevation	1,050 – 1,460 m
Slope	0 – 30 %
Water table depth	150 cm
Aspect	Aspect is not a significant factor

Climatic features

Annual precipitation and modeled relative effective annual precipitation ranges from 5 to 9 inches (127–229 mm). The normal precipitation pattern shows peaks in May and June and a secondary peak in September. The noted peaks account for approximately 50 percent of the mean annual precipitation. Much of the moisture that falls in the latter part of the summer time is lost by evaporation and much of the moisture that falls during the winter months is lost by sublimation.

Average snowfall in the Big Horn Basin Core 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 the summer and winter months 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 time and bring rapid rises in temperature. Extreme storms may occur during the winter months, but most severely affect ranch operations during the late winter and spring months. High winds generally are blocked from the basin by high mountains but can occur in conjunction with an occasional thunderstorm.

Growth of native cool-season plants begins approximately on April 1st and continues through to 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/. Basin, Emblem, Greybull, Lovell, Worland FAA AP and Worland are the representative weather stations for LRU A. 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)	110-120 days
Freeze-free period (characteristic range)	130-140 days
Precipitation total (characteristic range)	180-200 mm
Frost-free period (actual range)	110-120 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) EMBLEM [USC00483031], Burlington, WY
- (2) LOVELL [USC00485770], Lovell, WY
- (3) WORLAND [USW00024062], Worland, WY
- (4) BASIN [USC00480540], Basin, WY
- (5) GREYBULL [USC00484080], Greybull, WY
- (6) WORLAND [USC00489770], Worland, 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 or overland flow. There may be isolated features that are affected by snowpack that persists longer than surrounding areas due to position on the landform (shaded or protected pockets). No streams are classified within this Saline Upland Sandy ecological site.

Soil features

The soils for Saline Upland Sandy are shallow to very deep (greater than 10 inches (25 cm) to bedrock), well-drained soils with slow to moderate permeability. The distinctive characteristic of the soils is their moderately to strongly saline and/or alkaline properties. The surface soil will vary from 1 to 6 inches (2-15 cm) in thickness. These soils often contain more soluble salts deep in the soil profile or immediately on the surface. The soil characteristics that have the most influence on the plant community are the high quantity of soluble salts within the profile compounded by the coarse textures.

Several soils sampled were found to have significant amounts of visible gypsum crystals and masses within the profile, especially lower depths of 20-40 inches (50-100 cm) below the mineral soil surface. Many times the gypsum accumulations were not fully captured in the assigned series.

Major Soil Series correlated to this site include: Enos-like and Wallson

Figure 8. Backhoe pit excavated in a Saline Upland Sandy ecological site.

Table 4. Representative soil features

Parent material	(1) Slope alluvium – interbedded sedimentary rock (2) Residuum – sandstone (3) Colluvium
Surface texture	(1) Gravelly, channery loamy sand (2) Sandy loam (3) Loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to very rapid
Depth to restrictive layer	30 cm
Soil depth	50 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	0 – 20 %

Available water capacity (Depth not specified)	3.05 – 20 cm
Calcium carbonate equivalent (Depth not specified)	0 – 10 %
Electrical conductivity (Depth not specified)	0 – 20 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	10 – 40
Soil reaction (1:1 water) (Depth not specified)	7.8 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 10 %

Ecological dynamics

Salt-tolerant and sand-adapted plant species are dominant on this site; specifically, drought-tolerant low shrub species and mid-stature cool-season perennial bunchgrasses. The potential composition is 45% grasses, 15% forbs, and 40% shrubs (woody species). Bare ground is elevated compared to sites without salt influences, due to the soil capping that occurs with the reaction of the salts and soil moisture. The lowered permeability and infiltration rates reduce the ability for plant persistence. The composition and production will vary naturally due to fluctuation in timing and intensity of precipitation. Historic use has shifted the vigor and plant community, removal of sheep and introduction to cattle has altered the natural selection on this site. Fire frequency is not factor due to the lack of fine fuels necessary to sustain a fire.

As this site deteriorates, the cool season grasses decrease (Indian Ricegrass, Bottlebrush Squirreltail, and needle and thread), in both frequency and production and this allows a slight increase in woody species (Gardner’s saltbush, fourwing saltbush, shadscale, and possibly Greasewood). Finally, weedy annuals will begin to invade, including halogeton and cheatgrass.

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

The following is a State and Transition Model (STM) diagram for this ecological site. An STM has five fundamental components: states, transitions, restoration pathways, community phases and community pathways. The state, designated by the bold box, is 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 the natural disturbance regime of the site. The designation of alternative states (State 2, etc) in STMs denotes changes in ecosystem properties that cross a certain threshold.

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

between states. Restoration pathways are represented by the arrows between states returning back from a lower state to a higher state (State 2 - State 1 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**			28-84	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11-56	5-15
	needle and thread	HECO26	*Hesperostipa comata*	11-56	5-15
2	**Short-stature Cool-season Bunchgrasses**			0-28	
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-22	0-5
	Sandberg bluegrass	POSE	*Poa secunda*	0-22	0-5
	squirreltail	ELEL5	*Elymus elymoides*	0-22	0-5
3	**Tillering Grasses/Grass-likes**			0-56	
	alkali sacaton	SPAI	*Sporobolus airoides*	0-56	0-10
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-22	0-5
	blue grama	BOGR2	*Bouteloua gracilis*	0-22	0-5
	threadleaf sedge	CAFI	*Carex filifolia*	0-22	0-5
4	**Miscellaneous Grasses**			0-28	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-28	0-5
	Grass, perennial	2GP	*Grass, perennial*	0-28	0-5
Forb					
5	**Perennial Forbs**			0-56	
	little larkspur	DEBI	*Delphinium bicolor*	0-22	0-5
	granite prickly phlox	LIPU11	*Linanthus pungens*	0-22	0-5
	scarlet beeblossom	GACO5	*Gaura coccinea*	0-11	0-5
	Forb, perennial	2FP	*Forb, perennial*	0-11	0-5
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-11	0-5
	milkvetch	ASTRA	*Astragalus*	0-11	0-5
	prairie thermopsis	THRH	*Thermopsis rhombifolia*	0-11	0-5
	evening primrose	OENOT	*Oenothera*	0-11	0-5
Shrub/Vine					
6	**Dominant Shrubs**			56-224	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	56-224	20-40
7	**Miscellaneous Shrubs**			0-112	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-22	0-5
	spiny hopsage	GRSP	*Grayia spinosa*	0-22	0-5
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-22	0-5
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-22	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-22	0-5

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Mid-stature Cool-season Bunchgrasses**			0-22	

	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-22	0-5
	needle and thread	HECO26	*Hesperostipa comata*	0-22	0-5
2	**Short-stature Cool-season Bunchgrasses**			22-112	
	Sandberg bluegrass	POSE	*Poa secunda*	22-112	5-20
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-56	0-10
	squirreltail	ELEL5	*Elymus elymoides*	0-22	0-5
3	**Tillering Grasses/Grass-likes**			0-28	
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-22	0-5
	blue grama	BOGR2	*Bouteloua gracilis*	0-22	0-5
	threadleaf sedge	CAFI	*Carex filifolia*	0-22	0-5
4	**Miscellaneous Grasses**			0-56	
	Grass, perennial	2GP	*Grass, perennial*	0-28	0-5
Forb					
5	**Perennial Forbs**			0-56	
	little larkspur	DEBI	*Delphinium bicolor*	0-56	0-5
	evening primrose	OENOT	*Oenothera*	0-22	0-5
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-22	0-5
	granite prickly phlox	LIPU11	*Linanthus pungens*	0-22	0-5
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-22	0-5
	scarlet beeblossom	GACO5	*Gaura coccinea*	0-22	0-5
	Forb, perennial	2FP	*Forb, perennial*	0-22	0-5
6	**Annual Forbs**			0-28	
	flatspine stickseed	LAOC3	*Lappula occidentalis*	0-11	0-5
	woolly plantain	PLPA2	*Plantago patagonica*	0-11	0-5
	tansymustard	DESCU	*Descurainia*	0-11	0-5
	madwort	ALYSS	*Alyssum*	0-11	0-5
	Wilcox's woollystar	ERWI	*Eriastrum wilcoxii*	0-11	0-5
	Forb, annual	2FA	*Forb, annual*	0-11	0-5
Shrub/Vine					
7	**Dominant Shrubs**			56-224	
	Gardner's saltbush	ATGA	*Atriplex gardneri*	56-224	20-40
8	**Miscellaneous Shrubs**			0-84	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0-22	0-5
	spiny hopsage	GRSP	*Grayia spinosa*	0-22	0-5
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-22	0-5
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-22	0-5

Table 7. Community 2.1 plant community composition

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

Table 8. Community 3.1 plant community composition

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

Table 9. Community 3.2 plant community composition

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

Table 10. Community 4.1 plant community composition

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

Animal community

1.1 - Saltbush/Bunchgrasses: The predominance of woody plants in this plant community provides winter grazing for mixed feeders, such as elk, an 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. 1.2 - Saltbush/Sandberg Bluegrass: Decreased diversity and change in phenology of grasses and forbs reduces the value for the large grazers, but still provides forage. Thermal and escape cover suitable for large animals is still very limited due to the low quantities of tall woody plants. Areas with sagebrush-dominated states adjacent to this plant community may provide lek sites for sage grouse, and in productive years provides better cover for birds and some of the grassland obligate small mammals. 2.1 - Saltbush/Sod-formers: Forage value for large grazers has shifted to provide a late spring early summer source of green forage, although less accessible due to low growth stature. Cover is essentially non-existent, but when adjacent to sagebrush-dominated states, this plant community provides lek sites for sage grouse. 3.1 - Saltbush/Nativel Grasses/Invasives: The unpalatable nature of many of the invasive species would reduce the value of this plant community for large grazers; however, there would still be forage available depending on the community composition. Suitable thermal and escape cover is very limited and highly variable. Seeds from invasive species would serve as a forage source for sage grouse and other birds as well as small mammals. 3.2 - Saltbush/Invasives: 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 - Disturbed: Depending on the stage of succession of these sites or the selected seed mixture planted, 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 pant 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. The Carrying capacity is calculated as the production for a normal year X .25 efficiency factor / 912.5 #/AUM to calculate the AUM's/Acre. Plant Community Production Plant Community Description/Title Lbs./Acre AUM/Acre* Acre/AUM* Below Ave. Normal Above Ave. 1.1 Reference: Saltbush / Bunchgrasses 125-350 0.07 14.6 1.2 Saltbush / Sandberg Bluegrass 2.1 Saltbush / Sod-formers 3.1 Saltbush / Native Grasses / Invasives ** ** ** ** 3.2 Saltbush / Invasives ** ** ** ** 4.1 Disturbed ** ** ** ** * - Continuous, Season-long grazing by cattle under average growing conditions. ** - Production and Carrying Capacity is dependent on the species mixture that is present and the stage of succession that each community is at. Site specific investigation is necessary due to the highly variable composition. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide year-long forage for cattle, sheep, or horses. Supplementation of livestock may be necessary during the dormant season (protein/minerals) if the quality does not meet minimum livestock requirements. Distance to water, terrain, slope/slope length, access, shrub density, fencing, and management can affect carrying capacity (grazing capacity) within a management unit as well as kind, class, and breeds of livestock. 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).

Hydrological functions

Water (time and timing of precipitation) is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group B, with localized areas in hydrologic group C. Infiltration potential for this site varies from moderately rapid to rapid depending on soil hydrologic group and ground cover. Runoff varies from low to moderate. 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 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. Cryptogrammic crusts are present, but only cover 1-2 percent of the soil surface.

Recreational uses

This site provides marginal hunting opportunities for upland game species. Because of the raw nature of these sites, cultural artifacts can be found or viewed in the area, especially along the drainages that typically dissect these landforms. The extent of this ecological site is found within three different wild horse ranges: Pryor Mountain, McCullough Peaks, and 15 Mile. Wild Horse/Wildlife Excursions are found as recreational venues for BLM lands and State lands within the Big Horn Basin. This ecological site, however, proves to be limited in association with roadways and trails in relation to erosion potential and functionality. The soils are loose when dry 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 and provides no soft cover for camping or resting.

Wood products

No appreciable wood products are present on the site.

Other products

Herbs: There are a select few forb species that are found on this site, that have medicinal characteristics and have been used by the Native Americans in this area, and currently are in use by the naturopathic profession. Ornamentals Species: The flowering forbs of this site have been found useful in landscaping and xeriscaping. The shrub component has cultivated species that have been used in conservation plantings and in more natural landscaping schemes.

Inventory data references

Information presented in this site description was derived from NRCS inventory data. Field observations from range trained personnel were also used. Those involved in the development of the new concept for Saline Upland Sandy ecological site include: Blaise Allen, Area Range Management Specialist, NRCS; and Marji Patz, Ecological Site Specialist, NRCS. Quality control and quality assurance completed by: Dan Mattke, Area Resource Soil Scientist, NRCS; Daniel Wood, MLRA Soil Survey Leader, NRCS; John Hartung, Wyoming State Rangeland Management Specialist, NRCS; Jeff Goats, Wyoming State Soil Scientist, NRCS; Scott Woodall, Regional Quality Assurance Ecological Site Specialist, NRCS. For specific data inquiries, contact the Powell, Wyoming Soil Survey Office (USDA-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

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

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

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

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

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

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

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

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

Pellant, M., P. Shaver, D. A. Pyke, and J. E. Herrick. 2005. Interpreting indicators of rangeland health. Version 4. Technical Reference 1734-6. USDI-BLM. Ricketts, M. J., R. S. Noggles, and B. Landgraf-Gibbons. 2004. Pryor Mountain Wild Horse Range Survey and Assessment. USDA-Natural Resources Conservation Service.

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

Stringham, T. K. and W. C. Krueger. 2001. States, transitions, and thresholds: Further refinement for rangeland applications. Agricultural

Experiment Station, Oregon State University. Special Report 1024.

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

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

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

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

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

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

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

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

Contributors

Marji Patz

Approval

Kirt Walstad, 3/05/2025

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Marji Patz
Contact for lead author	marji.patz@usda.gov, 307-271-3130
Date	04/16/2020
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

---

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

---

3. **Number and height of erosional pedestals or terracettes:** Not evident on slopes less than 6%, but erosional pedestals will be present with terracettes at debris dams on slopes greater than 6%.

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground will range from 25 to 45%, occurring as small openings between plants.

---

5. **Number of gullies and erosion associated with gullies:** Active gullies should not be present, except in concentrated water flow pattern zones on steeper slopes (>20% slope).

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** Minimal to non-existent.

---

7. **Amount of litter movement (describe size and distance expected to travel):** Herbaceous litter movement expected to move only small amounts (to leeward side of shrubs) due to wind. May see minor litter damming between shrubs on steeper slopes along water flow areas.

---

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 average at 3 in the interspaces, and 5 under plant canopy. 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):** Typically the surface is comprised of an A-Horizon of 1-4 inches (2-10 cm) with medium platy structure parting to granular structure and color hues of 10YR or 5Y, values of 5-7 and chromas of 2-4. Organic matter typically ranges from 0.5-2%.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The evenly distributed, clustered plant community provides 30-60% foliar cover, with minimal basal footprint. The tendency for the surface to seal slows infiltration rates and results in slight to moderate runoff. The lack of basal cover (less than 5%) does little to effect runoff from this site.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No compaction layer exists, but some soil crusting in dry conditions is typical. The soil structure may appear platy in nature due to the dispersion of particles from salts in the soil. The caps of the natric horizon may be platy parting to granular structure, and could be mistaken as a compaction layer.

---

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: Low Growing Perennial Shrubs > Mid-stature Grasses

    Sub-dominant: Perennial Forbs

    Other: Short-stature Grasses

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Minimal or very low incidence of decadence is expected, but minor loss is seen.**

---

14. **Average percent litter cover (%) and depth (in): Litter ranges from 5-15% of total canopy cover with the total litter (including beneath the plant canopy) from 15-35%. Herbaceous litter depth is typically shallow ranging from 2-7 mm. Woody litter depth ranges from from 0.1 to 0.25 of an inch (2-6 mm).**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): The average total above ground production on a normal year is 250 lbs./acre (kg/ha); ranging from 125 to 350 lbs/acre (kg/ha) in poor to above average years.**

---

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: Greasewood, sand dropseed, woolly plantain, low larkspur, native annual mustards and pepperweeds and a variety of other native annual forbs will invade the site as it degrades. Invasive species that are common include but are not limited to: halogeton, cheatgrass, and Russian thistle. For a current and more complete list consult the County and State Weed and Pest Noxious Weed List.**

---

17. **Perennial plant reproductive capability: All species are capable of reproducing, but are limited due to effective soil moisture and seed/soil contact. The lack of perennial canopy with the dispersal tendencies of the soil create a crusting effect from rain drop impact/wetting and drying of the soil. The weak structure of these soils are easily disturbed and provide areas for seeds to catch and germinate. Drought inhibits seed viability as well as reduces the root propagation potential.**
