

# Ecological site DX032X01B145

## Saline Upland Sandy (SUS)

### Big Horn Basin

### Rim

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## General information

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

## MLRA notes

Major Land Resource Area (MLRA): 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](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 32. 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 M169 Great Basin Saltbush Scrub Macrogroup G301 Atriplex corrugate – Artemisia pedatifida – Picrothamnus desertorum Dwarf-Scrub Group CEG001438 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.
- 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.
- Slope is 30%. The concept of this site is based on soils that are well-drained; formed in alluvium or residuum from sodic or alkaline sandstone parent materials. Originally, the Saline Upland ecological site spanned textural classes, grouping them based on chemical and vegetative similarities. Closer review shows a correlation between the soil textural shifts

(sandy to loamy to clayey) and the response to management and shift in plant communities. So the original Saline Upland Ecological Site will be divided into the Saline Upland Loamy; Saline Upland Sandy, and Saline Upland Clayey ecological sites. 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

|                     |                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DX032X01B150</b> | <p><b>Sandy (Sy) Big Horn Basin Rim</b></p> <p>The Sandy ecological site will 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.</p> |
| <b>DX032X01B146</b> | <p><b>Sands (Sa) Big Horn Basin Rim</b></p> <p>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.</p>                                                                      |
| <b>DX032X01B176</b> | <p><b>Very Shallow (VS) Big Horn Basin Rim</b></p> <p>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.</p>                                                                                                                                                                           |
| <b>DX032X01B166</b> | <p><b>Shallow Sandy (SwSy) Big Horn Basin Rim</b></p> <p>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.</p>                                                                        |
| <b>DX032X01B122</b> | <p><b>Loamy (Ly) Big Horn Basin Rim</b></p> <p>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.</p>                                                                                                                                                      |
| <b>DX032X02B144</b> | <p><b>Saline Upland (SU) Wind River Basin Rim</b></p>                                                                                                                                                                                                                                                                                                                                               |

### Similar sites

|                     |                                                                                                                                                                                                                                                                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DX032X01B143</b> | <p><b>Saline Upland Clayey (SUC) Big Horn Basin Rim</b></p> <p>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.</p> |
| <b>DX032X01B141</b> | <p><b>Saline Upland Loamy (SUL) Big Horn Basin Rim</b></p> <p>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.</p>                               |

|                     |                                                                                                                                                                                                                                  |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DX032X02B144</b> | <b>Saline Upland (SU) Wind River Basin Rim</b><br><br>This site is located in the Wind River Basin, has similar characteristics but due to varied climatic conditions, historically has been written as its own ecological site. |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Table 1. Dominant plant species**

|            |                                                                   |
|------------|-------------------------------------------------------------------|
| Tree       | Not specified                                                     |
| Shrub      | (1) <i>Atriplex gardneri</i><br>(2) <i>Atriplex confertifolia</i> |
| Herbaceous | (1) <i>Achnatherum hymenoides</i><br>(2) <i>Elymus elymoides</i>  |

## Legacy ID

R032XB145WY

## 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 Big Horn Basin has a mixture of these 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<br>(2) Intermontane basin > Fan apron<br>(3) Intermontane basin > Erosion remnant |
| Runoff class      | Negligible to medium                                                                                                    |
| Elevation         | 1,100 – 1,980 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 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) | 180-230 mm   |
| Frost-free period (actual range)           | 90-110 days  |
| Freeze-free period (actual range)          | 110-130 days |
| Precipitation total (actual range)         | 180-250 mm   |
| Frost-free period (average)                | 100 days     |
| Freeze-free period (average)               | 120 days     |
| Precipitation total (average)              | 230 mm       |

- (1) CLARK 3NE [USC00481775], Powell, WY
- (2) POWELL FLD STN [USC00487388], Powell, WY
- (3) HEART MTN [USC00484411], Powell, WY
- (4) CODY [USC00481840], Cody, WY
- (5) CODY 12SE [USC00481850], Meeteetse, 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 down cut or has been depleted, a site labeled Saline Lowland, Drained was created to cover a mixed or relict plant community.

## Wetland description

No wetlands are associated with these sites.

## 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. 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: Begay and Turnback-like.

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

Table 4. Representative soil features

|                             |                                                                                                               |
|-----------------------------|---------------------------------------------------------------------------------------------------------------|
| Parent material             | (1) Colluvium – conglomerate<br>(2) Slope alluvium – interbedded sedimentary rock<br>(3) Residuum – sandstone |
| Surface texture             | (1) Loamy sand<br>(2) Sandy loam<br>(3) Loam                                                                  |
| Family particle size        | (1) Coarse-loamy                                                                                              |
| Drainage class              | Well drained                                                                                                  |
| Permeability class          | Moderate to very rapid                                                                                        |
| Depth to restrictive layer  | 30 cm                                                                                                         |
| Soil depth                  | 30 – 150 cm                                                                                                   |
| Surface fragment cover <=3" | 0 – 20 %                                                                                                      |

|                                                          |                 |
|----------------------------------------------------------|-----------------|
| Surface fragment cover >3"                               | 0 – 20 %        |
| Available water capacity<br>(Depth not specified)        | 3.05 – 20 cm    |
| Calcium carbonate equivalent<br>(Depth not specified)    | 0 – 10 %        |
| Electrical conductivity<br>(Depth not specified)         | 0 – 20 mmhos/cm |
| Sodium adsorption ratio<br>(Depth not specified)         | 10 – 40         |
| Soil reaction (1:1 water)<br>(Depth not specified)       | 7.8 – 9.8       |
| Subsurface fragment volume <=3"<br>(Depth not specified) | 0 – 30 %        |
| Subsurface fragment volume >3"<br>(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 (%) |
|------------------------|-----------------------------------------------|--------|---------------------------------|----------------------|------------------|
| <b>Grass/Grasslike</b> |                                               |        |                                 |                      |                  |
| 1                      | <b>Mid-stature Cool-season Bunchgrasses</b>   |        |                                 | 28-112               |                  |
|                        | Indian ricegrass                              | ACHY   | <i>Achnatherum hymenoides</i>   | 17-84                | 5-20             |
|                        | needle and thread                             | HECO26 | <i>Hesperostipa comata</i>      | 11-56                | 5-15             |
| 2                      | <b>Short-stature Cool-season Bunchgrasses</b> |        |                                 | 0-56                 |                  |
|                        | prairie Junegrass                             | KOMA   | <i>Koeleria macrantha</i>       | 0-28                 | 0-5              |
|                        | Sandberg bluegrass                            | POSE   | <i>Poa secunda</i>              | 0-28                 | 0-5              |
|                        | squirreltail                                  | ELEL5  | <i>Elymus elymoides</i>         | 0-28                 | 0-5              |
| 3                      | <b>Tillering Grasses/Grass-likes</b>          |        |                                 | 0-28                 |                  |
|                        | blue grama                                    | BOGR2  | <i>Bouteloua gracilis</i>       | 0-28                 | 0-5              |
|                        | threadleaf sedge                              | CAFI   | <i>Carex filifolia</i>          | 0-28                 | 0-5              |
| 4                      | <b>Miscellaneous Grasses</b>                  |        |                                 | 0-28                 |                  |
|                        | sand dropseed                                 | SPCR   | <i>Sporobolus cryptandrus</i>   | 0-28                 | 0-5              |
|                        | Grass, perennial                              | 2GP    | <i>Grass, perennial</i>         | 0-28                 | 0-5              |
| <b>Forb</b>            |                                               |        |                                 |                      |                  |
| 5                      | <b>Perennial Forbs</b>                        |        |                                 | 0-56                 |                  |
|                        | little larkspur                               | DEBI   | <i>Delphinium bicolor</i>       | 0-56                 | 0-5              |
|                        | Forb, perennial                               | 2FP    | <i>Forb, perennial</i>          | 0-28                 | 0-5              |
|                        | scarlet globemallow                           | SPCO   | <i>Sphaeralcea coccinea</i>     | 0-11                 | 0-5              |
|                        | milkvetch                                     | ASTRA  | <i>Astragalus</i>               | 0-11                 | 0-5              |
|                        | prairie thermopsis                            | THRH   | <i>Thermopsis rhombifolia</i>   | 0-11                 | 0-5              |
|                        | evening primrose                              | OENOT  | <i>Oenothera</i>                | 0-11                 | 0-5              |
| <b>Shrub/Vine</b>      |                                               |        |                                 |                      |                  |
| 6                      | <b>Dominant Shrubs</b>                        |        |                                 | 112-280              |                  |
|                        | Gardner's saltbush                            | ATGA   | <i>Atriplex gardneri</i>        | 112-280              | 20-40            |
| 7                      | <b>Miscellaneous Shrubs</b>                   |        |                                 | 0-168                |                  |
|                        | shadscale saltbush                            | ATCO   | <i>Atriplex confertifolia</i>   | 0-28                 | 0-5              |
|                        | fourwing saltbush                             | ATCA2  | <i>Atriplex canescens</i>       | 0-28                 | 0-5              |
|                        | Shrub (>.5m)                                  | 2SHRUB | <i>Shrub (&gt;.5m)</i>          | 0-28                 | 0-5              |
|                        | winterfat                                     | KRLA2  | <i>Krascheninnikovia lanata</i> | 0-28                 | 0-5              |
|                        | spiny hopsage                                 | GRSP   | <i>Grayia spinosa</i>           | 0-28                 | 0-5              |
|                        | greasewood                                    | SAVE4  | <i>Sarcobatus vermiculatus</i>  | 0-28                 | 0-5              |

Table 6. Community 1.2 plant community composition

| Group                  | Common Name                                 | Symbol | Scientific Name | Annual Production () | Foliar Cover (%) |
|------------------------|---------------------------------------------|--------|-----------------|----------------------|------------------|
| <b>Grass/Grasslike</b> |                                             |        |                 |                      |                  |
| 1                      | <b>Mid-stature Cool-season Bunchgrasses</b> |        |                 | 0-28                 |                  |

|                   |                                               |        |                                |        |       |
|-------------------|-----------------------------------------------|--------|--------------------------------|--------|-------|
|                   | needle and thread                             | HECO26 | <i>Hesperostipa comata</i>     | 0-28   | 0-5   |
|                   | Indian ricegrass                              | ACHY   | <i>Achnatherum hymenoides</i>  | 0-11   | 0-2   |
| 2                 | <b>Short-stature Cool-season Bunchgrasses</b> |        |                                | 56-168 |       |
|                   | Sandberg bluegrass                            | POSE   | <i>Poa secunda</i>             | 28-112 | 5-20  |
|                   | prairie Junegrass                             | KOMA   | <i>Koeleria macrantha</i>      | 0-56   | 0-10  |
|                   | squirreltail                                  | ELEL5  | <i>Elymus elymoides</i>        | 0-28   | 0-5   |
| 3                 | <b>Tillering Grasses/Grass-like</b> s         |        |                                | 0-28   |       |
|                   | blue grama                                    | BOGR2  | <i>Bouteloua gracilis</i>      | 0-28   | 0-5   |
|                   | threadleaf sedge                              | CAFI   | <i>Carex filifolia</i>         | 0-28   | 0-5   |
| 4                 | <b>Miscellaneous Grasses</b>                  |        |                                | 0-56   |       |
|                   | sand dropseed                                 | SPCR   | <i>Sporobolus cryptandrus</i>  | 0-28   | 0-5   |
|                   | Grass, perennial                              | 2GP    | <i>Grass, perennial</i>        | 0-28   | 0-5   |
| <b>Forb</b>       |                                               |        |                                |        |       |
| 5                 | <b>Perennial Forbs</b>                        |        |                                | 0-56   |       |
|                   | little larkspur                               | DEBI   | <i>Delphinium bicolor</i>      | 0-56   | 0-5   |
|                   | evening primrose                              | OENOT  | <i>Oenothera</i>               | 0-28   | 0-5   |
|                   | plains pricklypear                            | OPPO   | <i>Opuntia polyacantha</i>     | 0-28   | 0-5   |
|                   | Forb, perennial                               | 2FP    | <i>Forb, perennial</i>         | 0-28   | 0-5   |
|                   | scarlet globemallow                           | SPCO   | <i>Sphaeralcea coccinea</i>    | 0-28   | 0-5   |
| 6                 | <b>Annual Forbs</b>                           |        |                                | 0-28   |       |
|                   | flatspine stickseed                           | LAOC3  | <i>Lappula occidentalis</i>    | 0-11   | 0-5   |
|                   | woolly plantain                               | PLPA2  | <i>Plantago patagonica</i>     | 0-11   | 0-5   |
|                   | tansymustard                                  | DESCU  | <i>Descurainia</i>             | 0-11   | 0-5   |
|                   | madwort                                       | ALYSS  | <i>Alyssum</i>                 | 0-11   | 0-5   |
|                   | Wilcox's woollystar                           | ERWI   | <i>Eriastrum wilcoxii</i>      | 0-11   | 0-5   |
|                   | Forb, annual                                  | 2FA    | <i>Forb, annual</i>            | 0-11   | 0-5   |
| <b>Shrub/Vine</b> |                                               |        |                                |        |       |
| 7                 | <b>Dominant Shrubs</b>                        |        |                                | 84-280 |       |
|                   | Gardner's saltbush                            | ATGA   | <i>Atriplex gardneri</i>       | 84-280 | 20-40 |
| 8                 | <b>Miscellaneous Shrubs</b>                   |        |                                | 0-168  |       |
|                   | spiny hopsage                                 | GRSP   | <i>Grayia spinosa</i>          | 0-56   | 0-5   |
|                   | greasewood                                    | SAVE4  | <i>Sarcobatus vermiculatus</i> | 0-56   | 0-5   |
|                   | Shrub (>.5m)                                  | 2SHRUB | <i>Shrub (&gt;.5m)</i>         | 0-56   | 0-5   |
|                   | shadscale saltbush                            | ATCO   | <i>Atriplex confertifolia</i>  | 0-28   | 0-5   |
|                   | fourwing saltbush                             | ATCA2  | <i>Atriplex canescens</i>      | 0-28   | 0-5   |

Table 7. Community 2.1 plant community composition

| Group                  | Common Name                              | Symbol | Scientific Name           | Annual Production () | Foliar Cover (%) |
|------------------------|------------------------------------------|--------|---------------------------|----------------------|------------------|
| <b>Grass/Grasslike</b> |                                          |        |                           |                      |                  |
| 1                      | <b>Tillering Grasses/Grass-like</b> s    |        |                           | 22-112               |                  |
|                        | blue grama                               | BOGR2  | <i>Bouteloua gracilis</i> | 22-112               | 10-25            |
|                        | threadleaf sedge                         | CAFI   | <i>Carex filifolia</i>    | 0-56                 | 0-10             |
| 2                      | <b>Short-stature Cool-season Grasses</b> |        |                           | 0-28                 |                  |
|                        | Sandberg bluegrass                       | POSE   | <i>Poa secunda</i>        | 0-28                 | 0-5              |
|                        | prairie Junegrass                        | KOMA   | <i>Koeleria macrantha</i> | 0-11                 | 0-2              |
|                        | squirreltail                             | ELEL5  | <i>Elymus elymoides</i>   | 0-11                 | 0-2              |

|            |                       |        |                                |        |       |
|------------|-----------------------|--------|--------------------------------|--------|-------|
| 3          | Miscellaneous Grasses |        |                                | 0-28   |       |
|            | sand dropseed         | SPCR   | <i>Sporobolus cryptandrus</i>  | 0-28   | 0-5   |
|            | needle and thread     | HECO26 | <i>Hesperostipa comata</i>     | 0-28   | 0-5   |
|            | Grass, perennial      | 2GP    | <i>Grass, perennial</i>        | 0-28   | 0-5   |
| Forb       |                       |        |                                |        |       |
| 4          | Perennial Forbs       |        |                                | 0-56   |       |
|            | plains pricklypear    | OPPO   | <i>Opuntia polyacantha</i>     | 0-56   | 0-5   |
|            | Forb, perennial       | 2FP    | <i>Forb, perennial</i>         | 0-28   | 0-5   |
|            | little larkspur       | DEBI   | <i>Delphinium bicolor</i>      | 0-28   | 0-5   |
|            | evening primrose      | OENOT  | <i>Oenothera</i>               | 0-28   | 0-5   |
|            | scarlet globemallow   | SPCO   | <i>Sphaeralcea coccinea</i>    | 0-11   | 0-5   |
| 5          | Annual Forbs          |        |                                | 0-28   |       |
|            | Forb, annual          | 2FA    | <i>Forb, annual</i>            | 0-28   | 0-5   |
|            | tansymustard          | DESCU  | <i>Descurainia</i>             | 0-11   | 0-5   |
|            | flatspine stickseed   | LAOC3  | <i>Lappula occidentalis</i>    | 0-11   | 0-5   |
|            | woolly plantain       | PLPA2  | <i>Plantago patagonica</i>     | 0-11   | 0-5   |
| Shrub/Vine |                       |        |                                |        |       |
| 6          | Dominant Shrubs       |        |                                | 84-280 |       |
|            | Gardner's saltbush    | ATGA   | <i>Atriplex gardneri</i>       | 84-280 | 20-40 |
| 7          | Miscellaneous Shrubs  |        |                                | 0-112  |       |
|            | greasewood            | SAVE4  | <i>Sarcobatus vermiculatus</i> | 0-56   | 0-5   |
|            | Shrub (>.5m)          | 2SHRUB | <i>Shrub (&gt;.5m)</i>         | 0-28   | 0-5   |
|            | shadscale saltbush    | ATCO   | <i>Atriplex confertifolia</i>  | 0-28   | 0-5   |

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/Native 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 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. 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 200 - 375 - 650 0.10 9.73 1.2 Saltbush / Sandberg Bluegrass 100 - 300 - 650 0.08 12.17 2.1 Saltbush / Sod-formers 100 - 250 - 450 0.07 14.60 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. Cryptogammic 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 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 Everett 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 Sandy range site include: Chris Krassin, Range Management Specialist, NRCS and Everett Bainter, Range Management Specialist. Those involved in the development of

the new concept for sandy ecological site include: Jim Haverkamp, Area Range Management Specialist, NRCS; Mandi Hirsche, Range Management Specialist/Sage Grouse Coordinator, Popo Agie Conservation District; John Likins, Range Management Specialist (Retired), USDI-BLM; 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; James Bauchert, 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.)

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## 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                                        | 03/17/2020                        |
| 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.

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

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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%.

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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 will range from 25 to 45%, occurring as small openings between plants.

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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).

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

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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.

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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 average at 3 in the interspaces, and 5 under plant canopy. Average values should be 3.0 or greater.

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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%.

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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.

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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 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.

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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: Low Growing Perennial Shrubs >> Mid-stature Grasses

Sub-dominant: Mid-stature Grasses >> Perennial Forbs

Other: Forbs = Short-stature Grasses

Additional:

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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 5-25% 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 0.5 of an inch (0.25-1.25 cm).
- 
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 400 lbs./acre ( kg/ha); ranging from 175 to 500 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.
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