

Ecological site DX032X01B146

Sands (Sa)

Big Horn Basin Rim

Last updated: 9/05/2019

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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

Major land resource area (MLRA): 032X – Northern Intermountain Desertic Basins – This MLRA is comprised of two major Basins, the Big Horn and Wind River. These two basins are distinctly different and are split by LRU's to allow individual ESD descriptions. These warm basins are surrounded by uplifts and rimmed by mountains, creating a unique set of plant responses and communities. Unique characteristics of the geology and geomorphology 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

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 & Intermountain Tall Sagebrush Shrubland & Steppe Macrogroup G302 Artemisia Tridentata - Artemisia tripartita - Purshia tridentata Big Sagebrush Steppe Group 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 receives no additional water.
- Slope is 30%
- Soils are:
 - o Textures range from sand to fine sandy loam in top 4" (10 cm) of mineral soil surface
 - o Clay content is 15% in top 4" (10 cm) of mineral soil surface
 - o All subsurface horizons in the particle size control section have a weighted average of 15% clay. (The particle size control section is the segment of the profile from 25-100 cm's).
 - o Moderately deep to very deep (20-80+ in. (50-200+ cm)
 - o Soil profile lacks structure and development.
 - o Not skeletal (35% rock fragments) within 20" (50 cm) of mineral soil surface

Associated sites

R032XY366WY	Shallow Sandy (SwSy) 10-14" East Precipitation Zone Shallow Sandy sites are commonly found inter-mixed with or in association with sands and sandy sites along sandstone outcroppings (escarpments).
R032XY350WY	Sandy (Sy) 10-14" East Precipitation Zone Sandy sites are commonly found inter-mixed with or in association with sands and shallow sandy sits along sandstone outcroppings (escarpments, aprons, or dipslopes).

Similar sites

DX032X01B150	Sandy (Sy) Big Horn Basin Rim Sandy sites are similar in that they are sandy in texture. Sandy has structure and development and is stable where Sands sites are prone to erosion or movement and lack structure and development is minimal.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia cana</i>
Herbaceous	(1) <i>Hesperostipa comata</i> (2) <i>Calamovilfa longifolia</i>

Legacy ID

R032XB146WY

Physiographic features

This site occurs on nearly level to 30% slopes.

Table 2. Representative physiographic features

Landforms	(1) Intermontane basin > Alluvial fan (2) Intermontane basin > Hill (3) Intermontane basin > Plateau
Runoff class	Negligible to high
Elevation	1,130 – 1,830 m
Slope	0 – 30 %

Aspect	Aspect is not a significant factor
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Climatic features

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

Temperatures show a wide range between summer and winter and between daily maximums and minimums, due to the high elevation and dry air, which permits rapid incoming and outgoing radiation. Cold air outbreaks from Canada in winter move rapidly from northwest to southeast and account for extreme minimum temperatures. Chinook winds may occur in winter and bring rapid rises in temperature. Extreme storms may occur during the winter, but most severely affect ranch operations during late winter and spring. High winds are generally blocked from the basin by high mountains but can occur in conjunction with an occasional thunderstorm. Growth of native cool-season plants begins about April 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", "Powell Fld Stn", "Shell 1NE", and "Thermopolis 9NE" are the representative weather stations. 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)	90-90 days
Freeze-free period (characteristic range)	110-120 days
Precipitation total (characteristic range)	180-280 mm
Frost-free period (actual range)	80-110 days
Freeze-free period (actual range)	110-130 days
Precipitation total (actual range)	180-310 mm
Frost-free period (average)	90 days
Freeze-free period (average)	120 days
Precipitation total (average)	230 mm

- (1) THERMOPOLIS 9NE [USC00488884], Thermopolis, WY
- (2) SHELL 1NE [USC00488124], Shell, WY
- (3) CODY 12SE [USC00481850], Meeteetse, WY
- (4) CODY [USC00481840], Cody, WY
- (5) HEART MTN [USC00484411], Powell, WY

- (6) POWELL FLD STN [USC00487388], Powell, WY
- (7) CLARK 3NE [USC00481775], Powell, WY

Influencing water features

The characteristics of these upland soils have no influence from ground water (water table below 60 inches (150 cm)) and have minimal influence from surface water/overland flow. There may be isolated features that are affected by snow pack that persists longer than surrounding areas due to position on the landform (shaded/protected pockets); but overflow is not a suitable fit. No streams are classified within this ecological site.

Soil features

The soils of this site are moderately deep (greater than 20" to bedrock) to very deep, well-drained soils that formed in alluvium, alluvium over residuum, or eolian deposits. These soils have moderate, moderately rapid, or rapid permeability. The surface soil will vary from 3 to 6 inches deep. The coarser topsoils may be included if underlain by finer textured subsoil. The soil characteristic having the most influence on plant community is the light texture which can affect the available moisture.

Table 4. Representative soil features

Parent material	(1) Alluvium – igneous, metamorphic and sedimentary rock (2) Eolian deposits – sandstone (3) Residuum – sandstone
Surface texture	(1) Fine sandy loam (2) Sandy loam (3) Loamy very fine sand (4) Sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Moderately rapid to rapid
Soil depth	50 – 150 cm
Available water capacity (0-101.6cm)	4.57 – 10.67 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4

Ecological dynamics

Ecological Dynamics of the Site:

****Disclaimer**** This PROVISIONAL ecological site was developed for the dryer, basin core, so production values are lower than expected for this site description.

Potential vegetation on this site is dominated by tall and mid perennial grasses. Other significant vegetation includes winterfat, fourwing saltbush, and silver and big sagebrush, and a variety of forbs. The expected potential composition for this site is about 70% grasses, 10% forbs and 20% woody plants. The composition and production will vary naturally due to historical use, fluctuating precipitation and fire frequency.

As this site deteriorates, species such as silver sagebrush, green and rubber rabbitbrush, and big sagebrush will increase. Plains pricklypear and weedy annuals will invade. Mid-grasses such as needleandthread, prairie sandreed and Indian ricegrass will decrease in frequency and production.

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

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

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1				28-56	
	thickspike wheatgrass	ELLA3	<i>Elymus lanceolatus</i>	28-56	–
	thickspike wheatgrass	ELLAL	<i>Elymus lanceolatus ssp. lanceolatus</i>	28-56	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	28-56	–
2				112-224	
	needle and thread	HECO26	<i>Hesperostipa comata</i>	112-224	–
3				112-168	
	prairie sandreed	CALO	<i>Calamovilfa longifolia</i>	112-168	–
4				56-112	
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	56-112	–
5				0-56	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0-28	–
	threeawn	ARIST	<i>Aristida</i>	0-28	–

	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-28	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	0-28	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-28	–
Forb					
6				6-56	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0-28	–
	textile onion	ALTE	<i>Allium textile</i>	0-28	–
	desertparsley	LOMAT	<i>Lomatium</i>	0-28	–
	phlox	PHLOX	<i>Phlox</i>	0-28	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	0-28	–
Shrub/Vine					
7				0-56	
	silver sagebrush	ARCA13	<i>Artemisia cana</i>	0-56	–
8				0-56	
	spiny hopsage	GRSP	<i>Grayia spinosa</i>	0-56	–
9				6-84	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	0-28	–
	big sagebrush	ARTR2	<i>Artemisia tridentata</i>	0-28	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-28	–
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0-28	–
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0-28	–
	rubber rabbitbrush	ERNA10	<i>Ericameria nauseosa</i>	0-28	–
	winterfat	KRLA2	<i>Krascheninnikovia lanata</i>	0-28	–
	yucca	YUCCA	<i>Yucca</i>	0-28	–

Table 6. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 3.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 4.1 plant community composition

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

Animal Community – Wildlife Interpretations Historic Climax Plant Community: The predominance of grasses in this plant community favors grazers and mixed-feeders, such as bison, elk, and antelope. Suitable thermal and escape cover for deer may be limited due to the low quantities of woody plants. However, topographical variations could provide some escape cover. When found adjacent to sagebrush dominated states, this plant community may provide brood rearing/foraging areas for sage grouse, as well as lek sites. Other birds that would frequent this plant community include western meadowlarks, horned larks, and golden eagles. Many grassland obligate small mammals would occur here. Perennial Grass/Mixed Shrub: These communities provide limited grazing for antelope and other herbivores. They may be used as a foraging site by sage grouse if proximal to woody cover. Blowout Dune/Mixed Shrub Plant Community: This community may provide foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Mixed Shrub/Perennial Grass Plant Community is limiting. Generally, these are not target plant communities for wildlife habitat management. Needleandthread/Yucca Plant Community: This community may provide foraging for antelope and other grazers. They may be used as a foraging site by sage grouse if proximal to woody cover and if the Historic Climax Plant Community or the Mixed Shrub/Perennial Grass Plant Community is limited. Animal Community – Grazing Interpretations The following table lists suggested stocking rates for cattle under continuous season-long grazing under normal growing conditions. These are conservative estimates that should be used only as guidelines in the initial stages of the conservation planning process. Often, the current plant composition does not entirely match any particular plant community (as described in this ecological site description). Because of this, a field visit is recommended, in all cases, to document plant composition and

production. More precise carrying capacity estimates should eventually be calculated using this information along with animal preference data, particularly when grazers other than cattle are involved. Under more intensive grazing management, improved harvest efficiencies can result in an increased carrying capacity. If distribution problems occur, stocking rates must be reduced to maintain plant health and vigor. Plant Community Production Carrying Capacity* (lb. /ac) (AUM/ac) Historic Climax Plant Community 350-700 .20 Perennial Grass/Mixed Shrub 200-525 .16 Blowout Dune/Mixed Shrub 75-300 .05 Needleandthread/Yucca 100-325 .10 * - Continuous, season-long grazing by cattle under average growing conditions. Grazing by domestic livestock is one of the major income-producing industries in the area. Rangeland in this area may provide yearlong forage for cattle, sheep, or horses. During the dormant period, the forage for livestock use needs to be supplemented with protein because the quality does not meet minimum livestock requirements.

Hydrological functions

Water is the principal factor limiting forage production on this site. This site is dominated by soils in hydrologic group 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% ground cover have the greatest potential for high infiltration and lower runoff. An example of an exception would be where short-grasses form a strong sod and dominate the site. Areas where ground cover is less than 50% have the greatest potential to have reduced infiltration and higher runoff (refer to Part 630, NRCS National Engineering Handbook for detailed hydrology information). Rills and gullies should not typically be present. Water flow patterns should be barely distinguishable if at all present. Pedestals are only slightly present in association with bunchgrasses. Litter typically falls in place, and signs of movement are not common. Chemical and physical crusts are rare to non-existent. Cryptogamic crusts are present, but only cover 1-2% of the soil surface.

Recreational uses

This site provides hunting opportunities for upland game species. The wide varieties of plants which bloom from spring until fall have an esthetic value that appeals to visitors.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Inventory data references

Information presented here has been derived from NRCS inventory data. Field observations from range trained personnel were also used. Other sources used as references include: USDA NRCS Water and Climate Center, USDA NRCS National Range and Pasture Handbook, and USDA NRCS Soil Surveys from various counties. Inventory Data References Data Source Number of Records Sample Period State County SCS-RANGE-417 19 1965-1986 WY Park & others

Approval

Scott Woodall, 9/05/2019

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)	Ray Gullion
Contact for lead author	ray.gullion@wy.usda.gov
Date	02/19/2008

Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills: Rills should not be present**

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

3. **Number and height of erosional pedestals or terracettes: Essentially non-existent**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**
Bare ground is 25-35% occurring in small areas throughout site

5. **Number of gullies and erosion associated with gullies: Active gullies should not be present**

6. **Extent of wind scoured, blowouts and/or depositional areas: Active blowouts should not be present**

7. **Amount of litter movement (describe size and distance expected to travel): Little to no plant litter movement. Plant litter remains in place and is not moved by erosional forces.**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**
Plant cover and litter is at 60% or greater of soil surface and maintains soil surface integrity. Soil Stability class is anticipated to be 4 or greater.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Use Soil Series description for depth and color of A-horizon

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Grass canopy and basal cover should reduce raindrop impact and slow overland flow providing increased time for infiltration to occur. Healthy deep rooted native grasses enhance infiltration and reduce runoff. Infiltration is Moderately rapid to

Very Rapid.

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 or soil surface crusting should be present.
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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: Tall and Mid stature Grasses

Sub-dominant: Shrubs Forbs

Other: Short stature grasses/grasslikes

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): Very Low
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14. Average percent litter cover (%) and depth (in):
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15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 500 lbs/ac
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16. Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site: Threadleaf sedge, Threawns, Yucca, Skunkbush sumac, Big sagebrush, Annuals, Exotics, Unpalatable forbs, and Species found on Noxious Weed List
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17. Perennial plant reproductive capability: All species are capable of reproducing
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