Ecological site R072XY109KS
Rolling Sands

Last updated: 6/06/2025
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General information

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

MLRA notes

Major Land Resource Area (MLRA): 072X–Central High Tableland

Major Land Resource Area (MLRA) 72--Central High Tableland. This area is in Kansas (54 percent), Nebraska (25 percent), and Colorado (21 percent). A very small part of the area is in Wyoming. The area covers about 34,550 square miles (89,535 square kilometers). It includes the towns of Garden City, Goodland, and Colby, Kansas; Imperial, North Platte, Ogallala, and Sidney, Nebraska; and Holyoke and Wray, Colorado. Interstate 70 bisects the area, and Interstates 76 and 80 follow the south side of the South and North Platte Rivers, respectively. The Cimarron National Grasslands occur in the southwest corner of the MLRA.

Classification relationships

MLRA 72 is in the Central Great Plains Winter Wheat and Range Land Resource Region. It is in the High Plains Section, of the Great Plains Province, of the Interior Plains (USDA, 2006). MLRAs can be defined by climate, landscapes, geology, and annual precipitation zones (PZ). Other features such as landforms, soil properties, and key vegetation further refine these concepts, and are described at the Ecological Site Description (ESD) level. Relationship to Other Classifications: Natural Resource Conservation Service (NRCS) Classification Hierarchy: Physiographic Division Physiographic Province Physiographic Section Land Resource Region Major Land Resource Area Land Resource Unit (Fenneman, 1946) United States Forest Service (USFS) Classification Hierarchy: Domain Division Province Section Subsection Landtype Association Landtype Landtype Phase (Cleland et al, 1997) Revision Notes: The Rolling Sands site was developed by an earlier version of the Sands (2001). The earlier version of the Sands ESD was based upon input from NRCS (formerly Soil Conservation Service) and historical information obtained from the Sands (Sa) Range Site Description (1967, updated 1983).

Ecological site concept

This site is characterized by sandy soils, generally with greater than 52 percent sand. Sandy eolian sediments make up the parent material of this ecological site. This site occurs mostly on rolling hills. The surface textures for the components that make up this site are loamy fine sand, sand, find sand, and loamy sand.

Associated sites

R072XY110KS	**Choppy Sands** This site can be found adjacent to Rolling Sands site and is characterized by sandy soils, generally with greater than 52 percent sand. This site occurs on hummocky upland dunes and stream terraces. Slopes are generally greater than 24 percent, giving a short, steep, hummocky appearance.
R072XY111KS	**Sandy Plains** This site can be found adjacent to the Rolling Sands ecological site and is characterized by sandy soils, generally with greater than 52 percent sand. This site occurs on plains and tablelands. The textures for the surface of the components of this group are fine sandy loam, loamy sand, sandy loam, and loamy fine sand.

Similar sites

R072XY110KS	**Choppy Sands** This site can be found adjacent to Rolling Sands site and is characterized by sandy soils, generally with greater than 52 percent sand. This site occurs on hummocky upland dunes and stream terraces. Slopes are generally greater than 24 percent, giving a short, steep, hummocky appearance.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon hallii* (2) *Calamovilfa longifolia*

Physiographic features

This site occurs on mostly rolling topography associated with sand dunes. This site generates very low to medium runoff. Inclusions of steep topography showing the characteristic “catsteps” on slopes (a type of soil surface slippage caused by a combination of weak soil structure, hoof traffic of heavy herbivores, and gravity) should be very minimal on this site.

Figure 1. Sandy soils block diagram MLRA72 ESD

Table 2. Representative physiographic features

Landforms	(1) Dune (2) Hill
Flooding frequency	None
Ponding frequency	None
Elevation	1,100 – 1,520 m
Slope	10 – 20 %
Water table depth	150 – 200 cm

Climatic features

The average annual precipitation in this area is 14 to 25 inches (35 to 63 centimeters). It fluctuates widely from year to year. Most of the rainfall occurs as high-intensity, convective thunderstorms during the growing season. The maximum precipitation occurs from late spring through early autumn. Precipitation in winter occurs as snow. The annual snowfall ranges from about 16 inches (40 centimeters) in the southern part of the area to 35 inches (88 centimeters) in the northern part. The average annual temperature is 46 to 57 degrees F (8 to 14 degrees C). The freeze-free period averages 161 days and ranges from 135 to 210 days, increasing in length from northwest to southeast. Climate data comes from the Natural Resources Conservation Service (NRCS) National Water and Climate Center. The data set is from 1981-2010.

Table 3 Representative climatic features

Frost-free period (characteristic range)	120-140 days
Freeze-free period (characteristic range)	150-170 days
Precipitation total (characteristic range)	480-510 mm
Frost-free period (actual range)	120-150 days
Freeze-free period (actual range)	140-170 days
Precipitation total (actual range)	460-530 mm
Frost-free period (average)	130 days
Freeze-free period (average)	160 days
Precipitation total (average)	480 mm

- (1) IDALIA [USC00054242], Idalia, CO
- (2) GARDEN CITY EXP STN [USC00142980], Garden City, KS
- (3) HAIGLER [USC00253515], Haigler, NE
- (4) CROOK [USC00051996], Crook, CO
- (5) LAKIN [USC00144464], Lakin, KS
- (6) HERSHEY 5 SSE [USC00253810], Hershey, NE
- (7) IMPERIAL [USC00254110], Imperial, NE
- (8) WALLACE 2W [USC00258920], Wallace, NE

Influencing water features

This ecological site is characterized by very deep sandy soils that are excessively drained.

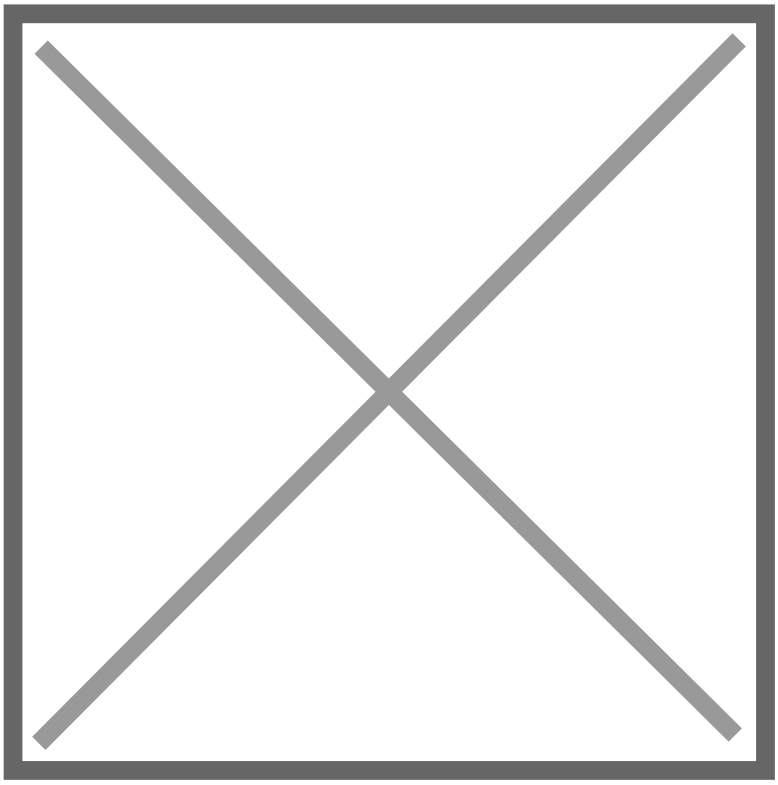

Figure 8. Fig. 7-1 from National Rangeland and Pasture Handb

Soil features

The soils of this site are deep to very deep, very sandy and have thin, generally light colored surface layers. Organic matter content is generally low to moderately low in the surface layer. Sod formation is very weak or non-existent in these soils. These soils often have loose, single-grained to subangular blocky structure soil structure in all layers beneath the surface layer. These soils are highly susceptible to wind erosion when the vegetative cover is opened. Roads, trails, pipeline, overgrazing, fire and all other disturbances can be the cause of severe wind erosion on this site.

The Reference Plant Community should display slight to no evidence of rills. Water flow paths, if present, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers. Minor wind scoured areas may exist. Pedestaled plants caused by wind erosion would be minor. The soil surface is stable and intact. Subsurface soil layers are non-restrictive to water movement and root penetration. These soils can be susceptible to erosion hazards where vegetative cover is inadequate.

Major soil series correlated to this ecological site include: Ashollow, Dwyer, Manter, Otero, Pratt, Sarben, Valent, and Vona.

These attributes represent 0-40 inches in depth or to the first restrictive layer.

Figure 9. Valent soils profile from Lincoln, Nebraska

Table 4. Representative soil features

Surface texture	(1) Loamy fine sand (2) Sand (3) Fine sand (4) Loamy sand
Family particle size	(1) Sandy

Drainage class	Well drained to excessively drained
Permeability class	Moderately slow to rapid
Soil depth	100 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 15.24 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 10 %
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 7.8
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The plant community for this site is dynamic due to the complex interaction of many ecological processes. The interpretive plant community for this site is the Reference Plant Community. The Reference Plant Community has been determined by the study of rangeland relic areas, areas protected from excessive disturbance, and areas under long-term rotational grazing strategies. Trends in plant community dynamics ranging from heavily grazed to lightly grazed areas, seasonal use pastures, and historical accounts have also been used.

This ecological site is made up of a Grassland State, Shrub State, and Tillage State. The grassland state is characterized by non-broken

land (no tillage), both warm and cool-season, tall, mid and short bunchgrasses, sod-forming grasses, forbs, and shrubs. The Shrub State is dominated by sand sagebrush with a minor component of understory species. The Tillage State has been mechanically disturbed (broken) by equipment and includes either a variety of reseeded warm-season bunch and sod-forming grasses or early successional plants, as well as annual grasses and forbs.

Vegetation changes are expected within this ecological site and depends upon the sites geographical location inside Major Land Resource Area (MLRA) 72 the Central High Tablelands. The northern part of MLRA 72 is characterized by cooler temperatures and shorter growing season in respect to the southern end. As a result, cool-season bunchgrasses and sod formers proliferate. Growth of native cool-season plants begins about April 15, and continues to about June 15. Native warm-season plants begin growth about May 15, and continue to about August 15. Regrowth of cool-season plants may occur in September and October if adequate moisture is available (weather data from National Climate Data Center 1980-2010).

Fires are a part of the natural disturbance regime of this site. This site developed with occasional fires as part of the ecological processes. Historically, it is believed that the fires were infrequent, randomly distributed, and started by lightning at various times throughout the season when thunderstorms were likely to occur. It is also believed that pre-European inhabitants may have used fire as a management tool for attracting herds of large migratory herbivores (bison, elk, deer, and pronghorn). The impact of fire over the past 100 years has been relatively insignificant due to the human control of wildfires and the lack of acceptance of prescribed fire as a management tool in the semi-arid, High Plains area.

The degree of herbivory (feeding on herbaceous plants) has a significant impact on the dynamics of the site. Historically, periodic grazing by herds of large migratory herbivores was a primary influence. Secondary influences of herbivory by species such as prairie dogs, grasshoppers, gophers, and root-feeding organisms impacted the vegetation historically, and continue to this day.

The management of herbivory by humans through grazing of domestic livestock and/or manipulation of wildlife populations has been a major influence on the ecological dynamics of the site. This management, coupled with the High Plains climate, largely dictates the plant communities for the site.

Drought cycles historically had a major impact upon the vegetation of this site. The species composition changes according to the duration and severity of the drought cycle. Initially, the shorter rooted species die out and the deeper-rooted species persist.

This ecological site occurs on undulating topography or rolling hills landscape. This site is found adjacent to the Sandy Plains and Choppy Sands ecological sites. The flatter areas are preferred by livestock, which can lead to grazing distribution problems. Water locations, salt placement, and other aids help to distribute grazing on this site. Other management techniques such as concentrated grazing and/or rotational grazing systems can also help distribute grazing more evenly.

The general response of this site to heavy long-term continuous grazing is to gradually lose the vigor and reproductive potential of the tall and mid-grass species and shift the plant community toward short-grass, shrubs, and unpalatable species. The use of grazing management that includes needed distribution tools, a forage and animal balance, and adequate recovery periods during the growing season, helps to maintain and restore the reference plant community.

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	**Warm-season Mid/Tallgrass, Dominant 75%**			964-1681	
	sand bluestem	ANHA	*Andropogon hallii*	381-471	–
	prairie sandreed	CALO	*Calamovilfa longifolia*	202-269	–
	little bluestem	SCSC	*Schizachyrium scoparium*	67-269	–
	switchgrass	PAVI2	*Panicum virgatum*	202-247	–
	Indiangrass	SONU2	*Sorghastrum nutans*	90-202	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	0-179	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	8-112	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0-45	–
	composite dropseed	SPCO16	*Sporobolus compositus*	0-22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	8-22	–
2	**Cool-season Midgrass, Subdominant 10%**			90-224	

	needle and thread	HECO26	*Hesperostipa comata*	67-202	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0-22	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	8-22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-22	–
3	**Miscellaneous Grasses/Grass-likes, Minor 2%**			8-45	
	purple threeawn	ARPU9	*Aristida purpurea*	8-22	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	8-22	–
	blue grama	BOGR2	*Bouteloua gracilis*	8-22	–
	thin paspalum	PASE5	*Paspalum setaceum*	0-8	–
	prairie Junegrass	KOMA	*Koeleria macrantha*	0-8	–
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0-8	–
	sun sedge	CAINH2	*Carex inops ssp. heliophila*	0-8	–
	sedge	CAREX	*Carex*	0-8	–
	Great Plains flatsedge	CYLU2	*Cyperus lupulinus*	0-8	–
Forb					
4	**Forbs/ Legumes, Minor 9%**			22-202	
	lemon scurfpea	PSLA3	*Psoralidium lanceolatum*	8-22	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	8-22	–
	white sagebrush	ARLU	*Artemisia ludoviciana*	8-22	–
	annual buckwheat	ERAN4	*Eriogonum annuum*	8-22	–
	Texas croton	CRTE4	*Croton texensis*	0-8	–
	tenpetal blazingstar	MEDE2	*Mentzelia decapetala*	0-8	–
	chickenthief	MEOL	*Mentzelia oligosperma*	0-8	–
	common evening primrose	OEBI	*Oenothera biennis*	0-8	–
	othake	PASP	*Palafoxia sphacelata*	0-8	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0-8	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-8	–
	golden prairie clover	DAAU	*Dalea aurea*	0-8	–
	silky prairie clover	DAVI	*Dalea villosa*	0-8	–
	Carolina larkspur	DECAV2	*Delphinium carolinianum ssp. virescens*	0-8	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	0-8	–
	manystem pea	LAPO2	*Lathyrus polymorphus*	0-8	–
	common starlily	LEMO4	*Leucocrinum montanum*	0-8	–
	longbract spiderwort	TRBR	*Tradescantia bracteata*	0-8	–
	snowball sand verbena	ABFR2	*Abronia fragrans*	0-8	–
	dotted blazing star	LIPU	*Liatris punctata*	0-8	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0-8	–
	plains snakecotton	FRFL	*Froelichia floridana*	0-8	–
	bluebowls	GIAC4	*Giliastrum acerosum*	0-8	–
	common sunflower	HEAN3	*Helianthus annuus*	0-8	–
	stiff sunflower	HEPA19	*Helianthus pauciflorus*	0-8	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	0-8	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0-8	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0-8	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0-8	–
	painted milkvetch	ASCEF	*Astragalus ceramicus var. filifolius*	0-8	–

	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0-8	–
	beardtongue	PENST	*Penstemon*	0-8	–
Shrub/Vine					
5	**Shrubs, Minor 5%**			22-112	
	sand sagebrush	ARFI2	*Artemisia filifolia*	45-112	–
	soapweed yucca	YUGL	*Yucca glauca*	0-67	–
	western sandcherry	PRPUB	*Prunus pumila var. besseyi*	0-67	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	8-22	–
	leadplant	AMCA6	*Amorpha canescens*	0-22	–
	prairie rose	ROAR3	*Rosa arkansana*	0-22	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	0-8	–
	skunkbush sumac	RHTR	*Rhus trilobata*	0-8	–
	brittle pricklypear	OPFR	*Opuntia fragilis*	0-8	–

Table 6. Community 1.2 plant community composition

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

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 (%)

Animal community

Grazing Interpretations Grazing by domestic livestock is one of the major income-producing industries in the area. Rangelands in this area provide yearlong forage under prescribed grazing for cattle, sheep, horses and other herbivores. During the dormant period, livestock may need supplementation based on reliable forage analysis. Calculating Safe Stocking Rates: Proper stocking rates should be incorporated into a grazing management strategy that protects the resource, maintains or improves rangeland health, and is consistent with management objectives. In addition to usable forage, safe stocking rates should consider ecological condition, trend of the site, past grazing use history, season of use, stock density, kind and class of livestock, forage digestibility, forage nutritional value, variation of harvest efficiency based on desirability preference of plant species and/or grazing system and site graze ability factors (such as steep slopes, site inaccessibility, or distance to drinking water). Often the current plant community does not entirely match any given plant community phase as described in this Ecological Site Description. Because of this, a resource inventory is necessary to document plant composition and production. Proper interpretation of inventory data will permit the establishment of a safe initial stocking rate. No two years have the same weather conditions. For this reason, year-to-year and season-to season fluctuations in forage production are to be expected on grazing lands. Livestock producers must make timely adjustments in the numbers of animals or in the length of grazing periods to avoid overuse of forage plants when production is unfavorable and to make advantageous adjustments when forage supplies are above average. Initial stocking rates should be improved using vegetation monitoring and actual use records that include number and type of livestock, the timing and duration of grazing, and utilization levels. Records of actual use over time will assist in making stocking rate adjustments based on the variability factors. Average annual production must be measured or estimated to properly assess useable forage production and stocking rates.

Hydrological functions

Water is the principal factor limiting forage production on this site. Infiltration is high and runoff potential for this site varies from moderate to low depending on ground cover. Areas where ground cover is less than 50 percent have the greatest potential to have reduced infiltration and higher runoff. (Refer to NRCS Section 4, National Engineering Handbook (NEH-4) for runoff quantities and hydrologic curves).

Recreational uses

None noted.

Wood products

No appreciable wood products are present on the site.

Other products

None noted.

Other information

Site Development and Testing Plan. Future work (for approved ESD) includes field visits to verify ES site concepts with field staff. Field staff include but not limited to project office leader, area soil scientist, state soil scientist, ecological site specialist, state rangeland conservationist, area rangeland management specialist, and local field personnel. Field visits are to be determined by the spatial extent of the site as well as personal knowledge of the site. Activity during field visits will include but not limited to: identifying the soil, landform, plant community, and verifying existing site concepts.

Inventory data references

The information presented here has been derived from NRCS clipping data, numerous ocular estimates and other inventory data. Field observations from experienced range-trained personnel were used extensively to develop this ecological site description. NRCS individuals involved in developing the Sands (South) ESD in 2001 include: Tim Watson (KS), Amanda Shaw (KS), Susan Francis (KS), Jon Deege (KS), Harvey Sprock (CO), Robert Schiffner (KS) and Josh Saunders (CO). NRCS individuals involved in developing the Sands (North) ESD in 2001 include: Harvey Sprock (CO), Carol Eakins (NE), Chuck Markley (NE), Jeff Nichols (NE), Mary Schrader (NE), Joan Gienger (KS) and Ted Houser (KS). Range Condition Guides and Technical Range Site Descriptions for Kansas, Sands, USDA, Soil Conservation Service, August 1967 Range Site Description for Kansas, Sands, USDA-Soil Conservation Service, September1983 Range Site Description for Colorado, Deep Sands, USDA-Soil Conservation Service, December 1975 Guide for determining range condition and suggestive initial stocking rates for Nebraska, Sands, Vegetative Zone 1 and II, USDA-Soil Conservation Service, April 1983 Range Site Description for Nebraska, Sands, USDA-Soil Conservation Service, August, 1981 Schacht, Walter H., Larsen, Dana. Section III Range Sites, Sands Range Site, The Board of Regents of the University of Nebraska, publication Ecological Site Description for Kansas, Sands North (R072XA021KS) and South (R072XB021KS), located in Ecological Site Information System (ESIS), 2007 Ecological Site Description for Colorado, Deep Sands (R072XY016CO), located in Ecological Site Information System (ESIS)

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Contributors

Chris Tecklenburg

Approval

Suzanne Mayne-Kinney, 6/06/2025

Acknowledgments

The ecological site development process is a collaborative effort, conceptual in nature, dynamic and is never considered complete. I thank all those who set the foundational work in the early 2000's in regards to this ESD. I thank all those who contributed to the development of this site. In advance, I thank those who would provide insight, comments and questions about this ESD in the future.

Rangeland health reference sheet

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

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Date	07/14/2016
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **None**

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2. **Presence of water flow patterns:** **Typically none. If present, are broken, irregular in appearance or discontinuous with numerous debris dams or vegetative barriers.**

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3. **Number and height of erosional pedestals or terracettes:** **There is no evidence of pedestaled plants or terracettes on the site.**

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5% or less bare ground, with bare patches ranging from 3-5 inches in diameter. Prolonged drought or wildfire events will cause bare ground to increase upwards to 5-10% with bare patches ranging from 8-12 inches in diameter.

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5. **Number of gullies and erosion associated with gullies:** None

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6. **Extent of wind scoured, blowouts and/or depositional areas:** Minor wind scouring may occur on knolls. Wind erosion can occur with disturbances such as wildfire or extended drought.

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7. **Amount of litter movement (describe size and distance expected to travel):** Litter should be uniformly distributed with little movement. On steep slopes or knolls, litter may move from a few inches to 1-2 feet depending on intensity of wind/rainfall event.

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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):** Stability class rating anticipated to be 2-3 in interspaces at soil surface.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** SOM ranges from 2-4%. A-horizon ranges from 0-7 inches. Soils are very deep, very dark brown (10YR 2/2) moist; loamy sand; weak fine granular structure;

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Diverse grass, forb, shrub canopy and root structure reduces raindrop impact and slows overland flow providing increased time for infiltration to occur. Extended drought and/or wildfire may reduce canopy cover and litter amounts resulting in decreased infiltration and increased runoff on slopes of 15-25%.

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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):** None

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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 warm season grasses 65%--sand bluestem >> prairie or giant sandreed = swithgrass > Indiangrass = little bluestem

    Sub-dominant: Group2 grasses 10% needleandthread = blue grama = sand lovegrass > sidoats grama > sand dropseed > composite dropseed = western wheatgrass

    Other: Group3 grasses Minor 5%. Forbs and legumes Sub-dominant 10% and Shrubs Sub-dominant at 10%.

    Additional: See functional and structural group sheet for specific forbs and shrubs.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** The majority of plants are alive and vigorous. Some mortality and decadence is expected for the site. This in part is due to drought, unexpected wildfire or a combination of the two events. This would be expected for both dominant and sub-dominant groups.

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14. **Average percent litter cover (%) and depth (in):** 40-65% litter cover at 0.25-0.50 inch depth. Litter cover during and following drought can range from 25-35% and 5-15% following wildfire.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1000 lbs./ac. low precip years, 2000 lbs./ac. average precip years, 3000 lbs./ac. high precip years. After extended drought or the first growing season following wildfire, production may be significantly reduced by 400 – 750 lbs./ac. or more.

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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:** Invasive plants should not occur in reference plant community. Following wildfire or extended drought, cheatgrass, Russian thistle, kochia, Rocky Mountain beeplant will invade assuming a seed source is available. Blue grama and sand sagebrush are the major native (non-invasive) increasers on this site.

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17. **Perennial plant reproductive capability:** The only limitations are weather-related, wildfire, natural disease, and insects that may temporarily reduce reproductive capability.
