Ecological site R078CY107TX
Sand Hills
23-31" PZ

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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): 078C–Central Rolling Red Plains, Eastern Part

MLRA 78C is characterized by moderately dissected, rolling plains with prominent ridges and valleys and numerous terraces adjacent to dissecting streams. Loamy and clayey soils are generally deep, well drained, and developed in calcareous and gypsiferous sediments of Permian age.

LRU notes

NA

Classification relationships

This ecological site is correlated to soil components at the Major Land Resource Area (MLRA) level which is further described in USDA Ag Handbook 296.

Ecological site concept

These sites are on coarse textured sand dunes. The reference vegetation consists of native tallgrasses and forbs with some shrub species. Woody plant cover is kept below 25% under reference conditions. Without periodic fires to limit brush canopy, it may exceed 25%. A carefully designed grazing management plan should be implemented on these site to ensure ground cover and prevent reactivating the dunes.

Associated sites

R078CY025OK	**Depressional Upland** Adjacent sites. Episaturated.

Similar sites

R078CY105TX	**Loamy Sand 23-31" PZ** Both sites have a fine sandy texture.
R078CY098TX	**Deep Sand 23-30" PZ** Both sites have a fine sandy texture. Higher oak canopy.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia filifolia*
Herbaceous	(1) *Calamovilfa gigantea*

Physiographic features

The Sand Hills 23-31” PZ ecological site was formed in sandy calcareous eolian Holocene sediments. These very gently sloping to undulating to steep soils are on undulating to steep sand dunes adjacent to stream terraces and flood plains of major streams and drainage ways in the Central Rolling Red Plains – Eastern Part (MLRA 78C). These soils are on long narrow undulating to hummocky dunes adjacent to present or past stream channels. Most areas of this soil are surrounded by, or are adjacent to occasionally flooded soils. Low areas of this soil are subject to rare flooding. Water runs off the surface very slowly. Slopes are complex and are 3 to 13 percent. Elevation ranges from 1000 to 2250 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Dune (2) Alluvial plain > Stream terrace (3) Alluvial plain > Sand sheet
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	210 – 790 m
Slope	0 – 30 %
Water table depth	180 cm
Aspect	Aspect is not a significant factor

Climatic features

MLRA 78C lies within the subtropical sub-humid climate regime, which typically has dry winters with hot and not as humid summers. MLRA 78C extends north and south from Coldwater, Kansas to just northeast of San Angelo, Texas (Ballinger, Texas), and east to west from Weatherford, Oklahoma to west of Shamrock, Texas. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall. The weather is alternately influenced by cold dry air from the Arctic Circle, and warm moist air from the Gulf of Mexico.

Seasonal changes are gradual. Spring is a season of variable weather and relatively high precipitation with prevailing winds from the southwest. Summers are generally hot with low humidity. Fall has long periods of pleasant weather interspersed with moderate to heavy rains. Winter is open and moderate to cold with winds from the north and infrequent snows.

Wind speeds average more than eleven miles an hour with prevailing southern winds. Rather strong winds can occur in all months of the year. While strong gusty winds occur, severe dust storms are rare.

Approximately 75 percent of the rainfall occurs during the warm season, and much of it comes in storms of high intensity and short duration in May and June. These rains can be particularly erosive on sites where vegetation is sparse. Occasional droughts are to be expected. Lack of rainfall and hot, dry winds often curtail forage production during July and August.

Table 3 Representative climatic features

Frost-free period (characteristic range)	150-190 days
Freeze-free period (characteristic range)	180-200 days
Precipitation total (characteristic range)	660-710 mm
Frost-free period (actual range)	140-190 days
Freeze-free period (actual range)	170-210 days
Precipitation total (actual range)	610-760 mm
Frost-free period (average)	170 days
Freeze-free period (average)	190 days
Precipitation total (average)	690 mm

- (1) CHATTANOOGA [USC00341706], Chattanooga, OK
- (2) WILMORE 16SE [USC00148914], Coldwater, KS
- (3) ASHLAND [USC00140365], Ashland, KS
- (4) ALTUS IRIG RSCH STN [USC00340179], Elmer, OK
- (5) ARNETT 3NE [USC00340332], Arnett, OK
- (6) WAYNOKA [USC00349404], Waynoka, OK
- (7) VERNON [USC00419346], Vernon, TX
- (8) FORT SUPPLY 3SE [USC00343304], Fort Supply, OK

Influencing water features

None.

Wetland description

NA

Soil features

Soils are mapped for each county within the MLRA. Mapunits are representations of the major soil series component(s) and named accordingly. Each Mapunit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these Mapunits, there are often minor soil series components included. These minor components are soils that occur within a Mapunit polygon

but are of small extent (15% or less of the Mapunit area). However, it is difficult to separate these minor soils spatially due to the scale of soil mapping.

Ecological sites are correlated at the component level of the soil survey. Therefore, a single Mapunit may contain multiple Ecological Sites just as it may contain multiple soil components. This is important to understand when investigating soils and Ecological Sites. A soil survey Mapunit may be correlated to a single Ecological Site based on the major component; however, there may be inclusional areas of additional Ecological Sites which are correlated to the minor components of that particular soil Mapunit.

Representative soil components for this site include:
Jester, Southside and Tivoli.

The soils found in the Sand Hills ecological site are very deep and excessively drained. Permeability is rapid. Runoff is negligible to low on slopes less than 5 percent, very low on 5 to 20 percent slopes and low to medium on 20 to 45 percent slopes. Depth to bedrock is greater than 80 inches. The textural control section is loamy fine sand or coarser. No gravel or secondary carbonate accumulations are present within the profile. Depth to an apparent water table is 6 to 20 feet, from January to December.

Table 4. Representative soil features

Parent material	(1) Eolian sands – quartzite
Surface texture	(1) Sand (2) Fine sand (3) Loamy fine sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Moderately rapid 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)	2.03 – 11.94 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)	6.1 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological Site Description was developed using archeological and historical data, professional experience, and scientific studies. The information presented is representative of a very complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals and ecological processes are described to inform land management decisions.

This site is found on undulating to hummocky sandy soils on uplands and in narrow dunned areas adjacent to flood plains. The soils are typically loose, fine sands highly susceptible to wind erosion and low in fertility. Considerable variation in vegetation structure can be expected because of the undulating topography and because some dunes are recent with poor soil development while others are older with more developed soils.

The reference vegetation of the Sand Hills Ecological Site is assumed to have been a Tallgrass Prairie Community (1.1) . Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, re-occurring droughts and infrequent fires. Wildfires are thought to have occurred at return intervals of 7 to 12 years (Frost 1998) in this region. The openness of the plant community and the considerable bare ground may have reduced the frequency of fires on this site, but fire was a factor in the development of the plant communities in the region (Brown and Smith, 2006). The fires and the semi-arid climate kept woody species suppressed. Since European settlement in the late 1800s, grazing and possibly climate change (Milchunas 2006) have interacted with reduced fire frequency and intensity to give the competitive advantage to woody plant species. The interaction of these disturbances has changed the composition and structure of the HCPC dramatically where brush control has not been practiced.

Historically, the vegetation on the site consisted of tallgrasses such as sand bluestem , Indiangrass, switchgrass and giant dropseed, a five to ten percent canopy of woody species such as sand sagebrush, plum (Chickasaw or Oklahoma) and yucca and an abundance of forbs. Other characteristic grasses found in historic climax include little bluestem, giant sandreed, sand dropseed, fringed signalgrass and sand lovegrass. See the Plant Composition and Annual Production Table below for estimated composition and production of the species assumed to have been present under reference conditions.

The Tallgrass Prairie Community (1.1) developed under the prevailing climate and pre-historic fire regime until settlement by Europeans. Even before livestock grazing, the site was probably unstable because of its proximity to rivers and streams. The water source along the stream would have concentrated native wildlife use, as it did early livestock husbandry by the Europeans. Not understanding the limits of rangeland productivity most settlers, and the ranchers that followed, overstocked the area with domesticated livestock almost universally. As overgrazing occurred, there was a reduction of more palatable species, such as Indiangrass and sand bluestem, a decline in litter and soil organic matter and concurrently a reduction in frequency and intensity of fires.

Woody plant encroachment was favored by the shift in plant structure to generally shorter grasses and the decline in soil properties. The woody and herbaceous invaders were generally endemic species, released from competition and fire suppression, although human activities supplied exotic species. Yucca, sand sagebrush and plum are quick increasers on the site. Continuous heavy grazing magnifies the increase. Some studies have shown that sand sage canopy fluctuates with rainfall (Gillen, 2004). Years of above average rainfall increase canopy while die-backs of sand sage occur in extremely dry years. Mesquite infrequently invades where clayey soil horizons occur. In the resulting Mixed-grass Community (1.2), sand bluestem, Indiangrass and switchgrass give way to more grazing resistant little bluestem, dropseeds and shortgrasses. Little bluestem increases initially, but decreases under continuous heavy grazing by cattle. A good mix of tall, mid and shortgrasses dominates annual herbage production, but the encroaching woody species increase in the

proportion of production compared to the Tallgrass Prairie Community (1.1).

Abusive grazing of the Mixed-grass Community (1.2) and reduction of the frequency and intensity of fires transitions the plant community into one that is increasingly occupied by woody plants. Droughts, which occur at approximately 20-year intervals in this region, magnify this situation. During the transition the less palatable or more grazing resistant plants such as silver bluestem, perennial three-awns, dropseeds, sand lovegrass and less palatable forbs begin replacing the tall grasses. As the grass cover declines, litter, mulch and soil organic matter declines while bare ground, erosion and other desertification processes increase. In this stage the site can be relatively unstable and subject to wind erosion. The occurrence of annual forbs is common because of the sparse ground cover and sandy soil. Rest from grazing and prescribed burning will generally not restore the grassland community once the woody plant community exceeds 25 percent canopy and/or the plants reach maturity or fire resistant age. When this occurs the Mixed-grass Community has transitioned into a Midgrass/Mixed-brush Community (2.1) is identifiable by an abundance of midgrasses, shortgrasses, annual forbs and more than 25 percent canopy of woody species. This threshold also marks the beginning of a new steady state, the Shrubland State (2.0).

Sand sagebrush, plums and yucca, are generally the most common shrubby species on the Midgrass/Mixed-brush Community (2.1). The characteristic grasses in this community are sand lovegrass, sand paspalum, plains bristlegrass, meadow dropseed, sand dropseed and three-awns. Common forbs include camphorweed, stickleaf mentzelia, western ragweed, mentzelia and gaura. In early stages (25-35% shrub cover) of the Shrubland state, the encroachment of invasive species can be reversed with relatively inexpensive brush control practices such as individual plant treatments (IPT) and good grazing management that allows the application of prescribed burning. If these practices are not applied and overgrazing continues, the woody species will continue to increase in dominance and ground cover until the plant community transitions into a Mixed-brush/Shortgrass/Annuals Community (2.2). Once the brush canopy exceeds 50 to 60 percent, annual production for the herbaceous species is limited to scattered tall and midgrasses plus shortgrasses, weedy forbs and annuals. Cool-season annuals, such as wild buckwheat, may be abundant following wet winters and springs. The Mixed-brush/Shortgrass/Annuals Community (2.2) produces only small and often variable amounts of useable livestock forage. Useable livestock forage production is considerably less than the reference community due to the presence of unpalatable brush and the erosion of soil fertility during the desertification process that often occurs during the transition from grassland to shrubland. Generally, high cost brush management practices along with other restoration practices such as range planting, prescribed grazing and prescribed burning are necessary to return the Shrubland State (2) back to a Grassland State (1). The site is so fragile that extreme care must be taken to avoid this stage and in the process of renovation. The use of prescribed fire is often unsuccessful because of the lack of fine fuel for fire and the sparseness of ground cover which disrupts fire continuity. The possibility of wind erosion following fire also makes it risky. Burning should be done under good moisture conditions so that recovery happens quickly to decrease the chance of wind erosion. The site should not be cultivated.

State and Transition Diagram:
A State and Transition Diagram for the Sand Hills (R078CY107TX) site is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.
Plant communities will differ across the MLRA because of the natural variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category.

The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every situation or the full range of conditions, species, and responses for the site.

Composition by dry weight and percent canopy cover are provided to describing the functional groups. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs).

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances. It does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

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					
0	**Tallgrass**			168	
1	**Tallgrasses**			925-2466	
	sand bluestem	ANHA	*Andropogon hallii*	252-673	–
	switchgrass	PAVI2	*Panicum virgatum*	252-673	–

	Indiangrass	SONU2	*Sorghastrum nutans*	252-673	–
	giant dropseed	SPGI	*Sporobolus giganteus*	112-247	–
	giant sandreed	CAGI3	*Calamovilfa gigantea*	112-247	–
2	**Midgrasses**			252-673	
	sideoats grama	BOCU	*Bouteloua curtipendula*	17-45	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	17-45	–
	Arizona cottontop	DICA8	*Digitaria californica*	17-45	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	17-45	–
	vine mesquite	PAOB	*Panicum obtusum*	17-45	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	17-45	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	17-45	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	17-45	–
	white tridens	TRAL2	*Tridens albescens*	17-45	–
	purpletop tridens	TRFL2	*Tridens flavus*	17-45	–
3	**Shortgrasses**			84-224	
	purple threeawn	ARPU9	*Aristida purpurea*	11-19	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	11-19	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	11-19	–
	fall witchgrass	DICO6	*Digitaria cognata*	11-19	–
	Hall's panicgrass	PAHAH	*Panicum hallii var. hallii*	11-19	–
	thin paspalum	PASE5	*Paspalum setaceum*	11-19	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	11-19	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11-19	–
	fringed signalgrass	URCI	*Urochloa ciliatissima*	11-19	–
4	**Cool-season grasses**			17-45	
	Canada wildrye	ELCA4	*Elymus canadensis*	17-45	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	17-45	–
	Texas bluegrass	POAR	*Poa arachnifera*	17-45	–
Forb					
5	**Forbs**			84-224	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	6-17	–
	bluestem pricklypoppy	ARALT	*Argemone albiflora ssp. texana*	6-17	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	6-17	–
	whitemouth dayflower	COER	*Commelina erecta*	6-17	–
	prairie clover	DALEA	*Dalea*	6-17	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	6-17	–
	buckwheat	ERIOG	*Eriogonum*	6-17	–
	beeblossom	GAURA	*Gaura*	6-17	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	6-17	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	6-17	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	6-17	–
	blazingstar	MENTZ	*Mentzelia*	6-17	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	6-17	–
	evening primrose	OENOT	*Oenothera*	6-17	–
	queen's-delight	STSY	*Stillingia sylvatica*	6-17	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	6-17	–

Shrub/Vine					
6	**Shrubs**			168-448	
	sand sagebrush	ARFI2	*Artemisia filifolia*	17-45	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	17-45	–
	Chickasaw plum	PRAN3	*Prunus angustifolia*	17-45	–
	Oklahoma plum	PRGR	*Prunus gracilis*	17-45	–
	fragrant sumac	RHAR4	*Rhus aromatica*	17-45	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	17-45	–
	bully	SIDER2	*Sideroxylon*	17-45	–
	yucca	YUCCA	*Yucca*	17-45	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	17-45	–

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 2.2 plant community composition

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

Animal community

Many types of grassland reptiles, birds and mammals use the Sand Hills Ecological Site along with adjacent sites. It was perhaps a concentration area because of its proximity to water. Small mammals include many kinds of rodents, black-tailed jackrabbit, eastern and desert cottontail, ground squirrel, badger and skunk. Predators include coyote, kit fox and bobcat. Prairie chicken, quail, doves, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison made infrequent migratory use and pronghorn antelope and deer were indigenous. Free roaming bison are no longer present, but deer still utilize the Sand Hills site in its various states. The site is suitable for production of many kinds of wildlife and livestock. In the grassland state it is suited to primary grass eaters such as cattle. As livestock caused retrogression occurs and woody plants invade it becomes better habitat for deer and other wildlife because of the browse and forbs. Livestock should be stocked according to the available grass, forb and browse forage, keeping competition for forbs and browse with deer in mind.

Hydrological functions

The Sand Hills Ecological Site consists of undulating topography with steep slopes, but deep sandy soils with moderate to rapid permeability. There is a high water intake rate, thus only slight water erosion susceptibility. Almost no water moves off the site. Wind erosion is a hazard where the site is not protected by vegetation, however. Natural fertility and organic matter is low. Water infiltration is rapid but water holding capacity is low. The rooting zone is deeper than 60 inches on all soils of the site and most incoming water moves through the profile and into underground aquifers. Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall. Hydrologic functions were representative of a tallgrass prairie. Litter and soil movement was slight except on steep slopes. However, standing plant cover, duff and soil organic matter decrease as the Tallgrass Prairie Community (1.1) transitions to the Mixed-grass Community (1.2) and continue to decline in the spaces between the shrubs of the Midgrass/Mixed-brush Community (2.1). During the transition, evaporation and interception losses are higher, resulting in less moisture reaching the soil. Fertility erosion takes place between shrubs. The deeper-rooted woody invaders are able to extract water from greater depths than the short grasses and may accumulate some windblown soil and litter. The woody plants compete for moisture with the remaining grasses and forbs further reducing production and ground cover in openings. Once the Mixed-brush/Shortgrass/Annuals Community (2.2) canopy surpasses 50 percent the hydrological and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy and shrubland type ecological processes dominate (Thurow 1991).

Recreational uses

The site has value from an aesthetic standpoint. The undulating topography and proximity to water make it an interesting site. Hunting, camping, hiking, bird watching, photography and horseback riding are possibilities. Good spring rainfall brings scattered stands of colorful forbs.

Wood products

None.

Other products

Honeybees may be used to make honey from flowering plants.

Other information

None.

Inventory data references

Information presented has been derived from the Sand Hills Range Sites PE 32-38 and 38-42, and an undated NRCS draft Sandhills PE 31-44 Ecological Site Description for 78C, literature, personal experience, field observations and personal contacts with range-trained personnel. Discussions were also made with Jennie Buchanan. Photos by: J.L. Schuster. Photos 1 and 2 were taken August 15 2007 in northern Wilbarger County, Texas. Photos 3 and 4 were taken July 30, 2007 in southern Jackson County, OK Special thanks to the following NRCS personnel for assistance and guidance with development of this ESD: Reggie Quiett and Cody Bauman NRCS, Vernon, Texas, Melissa Teague NRCS Hollis, Oklahoma, Mark Moseley NRCS, San Antonio, Texas and Justin Clary NRCS Temple, Texas. This site has been correlated with the following states: Texas and Oklahoma. This site was formerly known in Oklahoma as Dune R078XY022OK and Deep Sand R078XY014OK.

Other references

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Approval

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Acknowledgments

Site Development and Testing Plan Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review,

quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

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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Contact for lead author	817-596-2865
Date	01/01/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** **None to slight.**

3. **Number and height of erosional pedestals or terracettes:** **None to slight.**

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **Expect no more than 20 to 30% bare ground.**

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

6. **Extent of wind scoured, blowouts and/or depositional areas:** Slight to moderate extent of wind scoured areas randomly distributed.

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7. **Amount of litter movement (describe size and distance expected to travel):** Under normal rainfall, little litter movement would take place due to high water intake of soil.

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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 surface not resistant to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Fine sand single grained surface with low SOM.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Basal cover and density with moderate interspaces should make rainfall impact minimal. This site has rapid permeability, runoff is slow, and available water holding capacity is low.

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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 evidence of compaction under HCPC.

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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: Warm-season tallgrasses >>

    Sub-dominant:

    Other: Warm-season midgrasses > Shrubs/Vines/Trees > Warm-season shortgrasses = Forbs > Cool-season grasses

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** There should be little mortality or decadence for any functional group.

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14. **Average percent litter cover (%) and depth (in):** Dominant litter is herbaceous.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1500 - 4000 lbs/acre

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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: Sand sagebrush, Yucca, Plums, Skunkbush sumac, Mesquite, Juniper, Camphorweed, Annual wild buckwheat.**

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17. **Perennial plant reproductive capability: All perennial plants should be capable of reproducing except during periods of prolonged drought conditions, heavy natural herbivory or wildfires.**
