

Ecological site R078BY091TX Very Shallow 19-26" PZ

Last updated: 9/15/2023
Accessed: 05/03/2024

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.

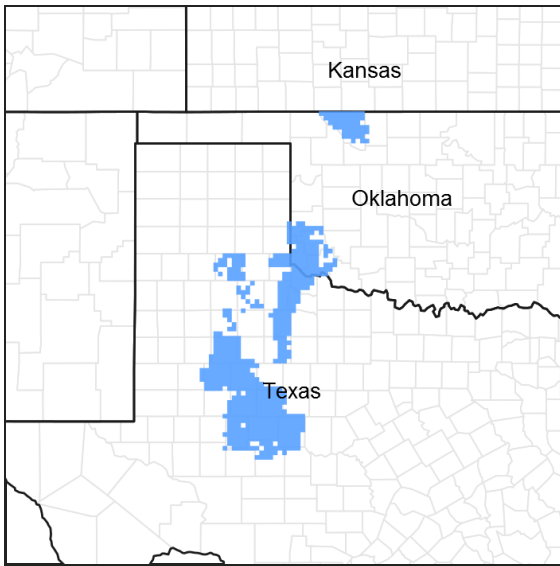


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 078B–Central Rolling Red Plains, Western Part

MLRA 78B is characterized by strongly dissected, rolling plains with prominent ridges and valleys and rolling to steep irregular topography. Loamy soils are generally well drained, range from shallow to deep, and developed in sediments of Triassic and 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 occur on very shallow loams on uplands. Reference vegetation includes midgrasses and shortgrasses with forbs and scattered shrubs. Abusive grazing practices can lead to a shift in the plant community and an

increase in bare ground. Without periodic fire or alternative brush management, woody species may increase on the site.

Associated sites

R078BY072TX	Clay Loam 19-26" PZ Deep clay loam soils on uplands
R078BY076TX	Gyp 19-26" PZ Very shallow soils over gypsum

Similar sites

R078BY089TX	Shallow 19-26" PZ Shallow site for MLRA 78B.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Dalea formosa</i>
Herbaceous	(1) <i>Schizachyrium scoparium</i> (2) <i>Tetraneuris scaposa</i>

Physiographic features

This is an upland site with very shallow soil over caliche or limestone. It occurs on ridges, hills, erosional slopes and along escarpments. Slopes are moderate to steep. There are often pebbles or rock fragments on the soil surface and occasionally bedrock will be showing. The parent material may be very hard such as limestone or indurated caliche or it may be softer caliche of the upper Ogallala. The parent material is harder where it is exposed such as on escarpments.

The aspect can be at any position of the landscape.

Table 2. Representative physiographic features

Landforms	(1) Plains > Ridge (2) Plains > Escarpment (3) Plains > Hill
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	305–945 m
Slope	1–30%
Water table depth	152–203 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of the western rolling plains is dry, sub-humid with hot summers and mild winters. Temperatures often reach 100 degrees F for several consecutive days during summer. Cold spells with temperatures less than 20 degrees F only last short periods of time. The soil is not frozen below the 3-inch depth for more than 2 to 3 days. Humidity is low during the winter and early spring months. Sometimes relative humidity is high enough to make summer days seem uncomfortable. Most of the precipitation comes in the form of rain and that in the spring and early summer principally. May is the wettest month followed by June. July and August are dryer and much hotter. Rainfall often comes as intense showers of relatively short duration. Rainfall rate per hour is often high and runoff is

significant. Infiltration is diminished due to lack of opportunity time. The growing season begins in April and ends with the first killing frost in November. There is little snowfall with the average being about 10 inches. Rainfall averages about 22 inches.

There is a 70% chance that yearly precipitation will fall between 16 and 24 inches. About 55% of the time, the yearly rainfall is below the mean. Dry spells during the growing season are common and long-term droughts occur in cycles of about 20 years. Native vegetation is principally warm season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	189-194 days
Freeze-free period (characteristic range)	204-222 days
Precipitation total (characteristic range)	584-610 mm
Frost-free period (actual range)	184-201 days
Freeze-free period (actual range)	202-223 days
Precipitation total (actual range)	559-635 mm
Frost-free period (average)	192 days
Freeze-free period (average)	213 days
Precipitation total (average)	584 mm

Climate stations used

- (1) WELLINGTON [USC00419565], Wellington, TX
- (2) PADUCAH [USC00416740], Paducah, TX
- (3) JAYTON [USC00414570], Jayton, TX
- (4) SNYDER [USC00418433], Snyder, TX
- (5) ROBERT LEE [USC00417669], Robert Lee, TX

Influencing water features

Overland flow from intense rains moves across the site to streams lower on the landscape.

Wetland description

NA

Soil features

Soils are very shallow, well drained and calcareous. Geologic erosion has stripped away soil material along these erosional surfaces. Some very shallow site have leached carbonates which form petrocalcic horizons. The soil may be loam, clay loam or sandy loam in texture and is usually rocky or gravelly in nature. Petrocalcic horizons are impermeable while the softer caliche horizons are moderately permeable. Available water holding capacity is low and fertility is low. Plant growth and production is limited due to shallow depth. Cracks in underlying bedrock can allow water to penetrate. Shrubs and grasses with deep root systems may be able to access some of this moisture.

Major Soil Taxonomic Units correlated to this site include: Harmon soils, Ector soils (Ector-LaCasa association), Latom soils and Potter soils.

Table 4. Representative soil features

Parent material	(1) Residuum–limestone and dolomite
Surface texture	(1) Stony fine sandy loam (2) Very gravelly loam (3) Gravelly silty clay

Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Very slow to moderate
Soil depth	10–51 cm
Surface fragment cover <=3"	0–18%
Surface fragment cover >3"	0–20%
Available water capacity (0-101.6cm)	1.52–5.08 cm
Calcium carbonate equivalent (0-101.6cm)	5–60%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–20%

Ecological dynamics

The reference plant community is mixed grasses, forbs and low growing shrubs. Vegetation is somewhat sparse compared to sites with deeper soils. Bare soil with exposed rock is usually evident. The soils are limy in nature which, along with shallow depth, affects both quantity of vegetation and species composition. Production is limited and the limy nature of the soils has some influence on the palatability of some of the plant species. Usually, livestock will not graze this site as heavily as sites with more developed soils. Tall, mid and short grass species can be found on the site, with mid grasses being dominant. A good variety of perennial forbs is usually present. Scattered low growing shrubs may make up 10% of the total vegetation.

The major grass species include: little bluestem (*Schizachyrium scoparium*), sideoats grama (*Bouteloua curtipendula*), hairy grama (*Bouteloua hirsuta*), black grama (*Bouteloua eriopoda*), blue grama (*Bouteloua gracilis*), wright threeawn (*Aristida wrightii*), New Mexico feathergrass (*Stipa neomexicana*), and smaller amounts of big bluestem (*Andropogon gerardii*), and Indiangrass (*Sorghastrum nutans*). Major forbs include: plains actinea (*Tetaneuris scaposa*), longleaf buckwheat (*Eriogonum longifolium*), blackfoot daisy (*Melampodium leucantham*), dotted gayfeather (*Liatrix punctata*), trailing ratany (*Krameria lanceolata*), broom nailwort (*Paronychia jamesii*), baby white aster (*Chaetappa ericoides*), halfshrub sundrop (*Calylophus serrulata*), skullcap (*Scutellaria drummondii*), and purple coneflower (*Echinacea angustifolia*). The most common low shrubs are: feather dalea (*Dalea formosa*) and catclaw mimosa (*Mimosa aculeaticarpa* var. *biuncifera*). Occasional redberry juniper (*Juniperus pinchotii*) and shrubby hackberry (*Celtis reticulata*) are also present.

Along with depth of soil, there are other factors affecting vegetation on the site. Natural fires very likely helped promote a grassland aspect and kept woody shrubs from dominating. Grazing of large herbivores who visited the site then moved on kept grazing pressure limited. Dryness of the site probably played the greatest part in shaping the historic vegetation. This site may have changed less than many sites due to less inherent fertility, thus less grazing pressure from livestock. However, grazing abuse can occur and sites that have been protected usually have more of the tall grass species present. If this site is abused, it will quickly give way to perennial threeawn, broom snakeweed, and various annual forbs. When the site is extremely degraded, it is unlikely that the historic community can ever be approached again. While this is generally a resistant site, severe abuse can lead to advanced surface erosion due to lack of protective cover.

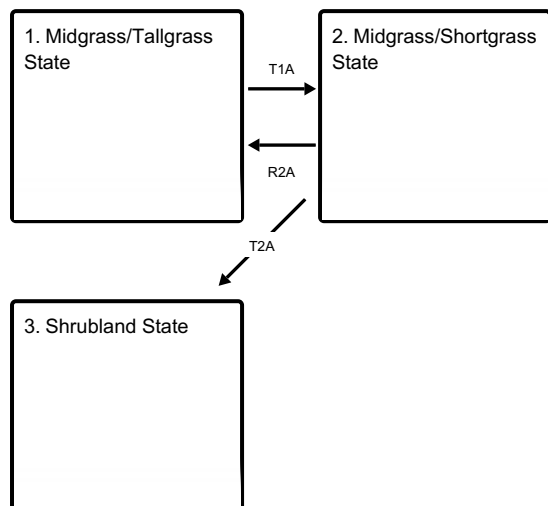
Plant Communities and Transitional Pathways (diagram):

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. When this site passes the threshold going to a community dominated by short grasses, threeawns, and annuals, it is not likely that the site can be restored to a community approaching the historic climax.

State and transition model

Ecosystem states

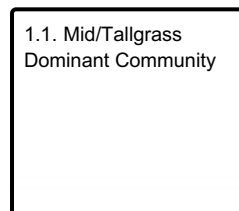


T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Adequate rest from defoliation, followed by reintroduction of historic disturbance regimes

T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

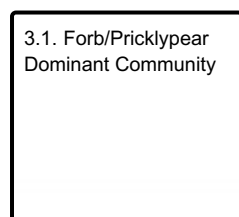
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1 Midgrass/Tallgrass State

The Mid/Tallgrass Dominant Community is a balanced mixture of tall, mid and a few short grasses, a variety of perennial forbs, and scattered low growing short woody shrubs. Little bluestem and sideoats grama are the

dominant species. There are short shrubs such as feather dalea and catclaw mimosa. Common forbs are dotted gayfeather, plains actinea, plains zinnia and baby white aster.

Dominant plant species

- featherplume (*Dalea formosa*), shrub
- little bluestem (*Schizachyrium scoparium*), grass
- stemmy four-nerve daisy (*Tetaneuris scaposa*), grass

Community 1.1 Mid/Tallgrass Dominant Community



Figure 8. 1.1 Mid/Tallgrass Dominant Community

The interpretive or "reference" plant community for this site is a balanced mixture of tall, mid and a few short grasses, a variety of perennial forbs, and scattered low growing short woody shrubs. Little bluestem and sideoats grama are the dominant species. There are short shrubs such as feather dalea and catclaw mimosa. Common forbs are dotted gayfeather, plains actinea, plains zinnia and baby white aster.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	841	953
Forb	56	112	101
Shrub/Vine	56	67	101
Microbiotic Crusts	11	22	28
Tree	–	–	1
Total	683	1042	1184

Figure 10. Plant community growth curve (percent production by month). TX2019, Tall/Midgrass prairie with trees, shrubs and forbs. Tall and midgrasses with trees, small shrubs and forbs in near historic climax..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	5	10	25	25	10	5	8	5	2	1

State 2 Midgrass/Shortgrass State

Midgrasses dominate the site along with some low growing shrubs. Some increase in perennial threeawn. Sideoats grama and blue grama are still the major grasses. Some increase in perennial forbs.

Dominant plant species

- pricklypear (*Opuntia*), shrub
- sideoats grama (*Bouteloua curtipendula*), grass
- blue grama (*Bouteloua gracilis*), grass

Community 2.1 Midgrass/Shortgrass Dominant Community



Figure 11. 2.1 Midgrass/Shortgrass Dominant Community

Midgrasses dominate the site along with some low growing shrubs. Some increase in perennial threeawn. Sideoats grama and blue grama are still the major grasses. Some increase in perennial forbs. This community is not as productive as the reference community.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	560	673	785
Forb	34	84	112
Shrub/Vine	56	78	95
Tree	–	–	1
Microbiotic Crusts	–	–	1
Total	650	835	994

Figure 13. Plant community growth curve (percent production by month). TX2020, Midgrass/Shortgrass with few shrubs. Site comprising of mid and shortgrasses with few shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	15	25	20	5	5	15	8	1	0

State 3 Shrubland State

The Forb/Pricklypear Dominant Community is composed of shortgrasses, annual forbs, short shrubs, and pricklypear. There is also an increase in bare ground. The annual production potential is lower too.

Dominant plant species

- pricklypear (*Opuntia*), shrub
- soapweed yucca (*Yucca glauca*), shrub
- blue grama (*Bouteloua gracilis*), grass

Community 3.1 Forb/Pricklypear Dominant Community



Figure 14. 3.1 Forb/Pricklypear Dominant Community

The Forb/Pricklypear Dominant Community is composed of shortgrasses, annual forbs, short shrubs, and pricklypear. There is also an increase in bare ground. The annual production potential is lower too.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	280	392	616
Shrub/Vine	420	448	504
Forb	34	45	56
Tree	–	6	6
Microbiotic Crusts	–	–	–
Total	734	891	1182

Figure 16. Plant community growth curve (percent production by month). TX2022, Shortgrasses/Annual grasses/Shrubs . Shortgrasses, shrubs, and annuals having low production and being degraded..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	16	27	25	7	4	10	5	1	0

Transition T1A State 1 to 2

With heavy continuous grazing and no fires, the Midgrass/Tallgrass State will transition into the Midgrass/Shortgrass State.

Restoration pathway R2A State 2 to 1

With Prescribed Grazing and Prescribed Burning conservation practices, the Midgrass/Shortgrass State can revert back to the Midgrass/Tallgrass State.

Conservation practices

Prescribed Burning
Prescribed Grazing

Transition T2A State 2 to 3

With heavy continuous grazing, brush invasion, no brush management, and no pest management, the Midgrass/Shortgrass State will transition to the Shrubland State.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	Midgrasses			420–644	
	little bluestem	SCSC	<i>Schizachyrium scoparium</i>	230–353	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	191–291	–
2	Midgrasses			135–224	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	56–90	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	17–34	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	17–34	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	13–28	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	11–22	–
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	11–22	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	7–17	–
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	7–17	–
3	Tallgrasses			56–84	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	28–45	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	28–45	–
Forb					
4	Forbs			56–112	
	Forb, annual	2FA	<i>Forb, annual</i>	0–28	–
	white sagebrush	ARLUM2	<i>Artemisia ludoviciana</i> ssp. <i>mexicana</i>	0–28	–
	yellow sundrops	CASE12	<i>Calylophus serrulatus</i>	0–28	–
	rose heath	CHER2	<i>Chaetopappa ericoides</i>	0–28	–
	Texas croton	CRTE4	<i>Croton texensis</i>	0–28	–
	blacksamson echinacea	ECAN2	<i>Echinacea angustifolia</i>	0–28	–
	spurge	EUPHO	<i>Euphorbia</i>	0–28	–
	collegeflower	HYFL	<i>Hymenopappus flavescens</i>	0–28	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–28	–
	Gordon's bladderpod	LEGO	<i>Lesquerella gordonii</i>	0–28	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–28	–
	hoary blackfoot	MECI	<i>Melampodium cinereum</i>	0–28	–
	plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	0–28	–
	grassland blazingstar	MEST3	<i>Mentzelia strictissima</i>	0–28	–
	evening primrose	OENOT	<i>Oenothera</i>	0–28	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0–28	–

	yellow nailwort	PAVI4	<i>Paronychia virginica</i>	0–28	–
	Fendler's penstemon	PEFE	<i>Penstemon fendleri</i>	0–28	–
	James' holdback	POJA5	<i>Pomaria jamesii</i>	0–28	–
	curlytop knotweed	POLA4	<i>Polygonum lapathifolium</i>	0–28	–
	slimflower scurfpea	PSTE5	<i>Psoraleidium tenuiflorum</i>	0–28	–
	stemmy four-nerve daisy	TESC2	<i>Tetraneuris scaposa</i>	0–28	–
	branched noseburn	TRRA5	<i>Tragia ramosa</i>	0–28	–
	Rocky Mountain zinnia	ZIGR	<i>Zinnia grandiflora</i>	0–28	–
Shrub/Vine					
5	Shrubs			56–101	
	featherplume	DAFO	<i>Dalea formosa</i>	0–28	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	0–28	–
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0–28	–
	soapweed yucca	YUGL	<i>Yucca glauca</i>	0–28	–
Tree					
6	Tree			0–11	
	netleaf hackberry	CELAR	<i>Celtis laevigata</i> var. <i>reticulata</i>	0–11	–
	Pinchot's juniper	JUPI	<i>Juniperus pinchotii</i>	0–11	–

Animal community

Pronghorn antelope, white tail deer and mule deer utilize the site for browsing. The site has little cover for bobwhite quail but scaled quail frequent the site during feeding. The Texas horned lizard is often present along with several species of lizards and snakes. A few species of small mammals often find dens in rock crevices.

Hydrological functions

Runoff water from the site will enter streams lower on the landscape. The site yields considerable runoff if the slope is more than 3% and if cover is poor.

Recreational uses

Hunting, Camping, Hiking, Birdwatching, Photography, and Horseback Riding.

Wood products

None.

Other products

On occasion, this site has been mined for calcium carbonate (caliche) for road construction material.

Other information

None.

Inventory data references

NRCS FOTG – Section II of the FOTG Range Site Descriptions and numerous historical accounts of vegetative conditions at the time of early settlement in the area were used in the development of this site

description. Vegetative inventories were made at several site locations for support documentation. Several years of clipping data were surveyed.

Inventory Data References (documents):

NRCS FOTG – Section II - Range Site Descriptions
NRCS Clipping Data summaries over a 20 year period

Other references

Natural Resources Conservation Service - Range Site Descriptions
USDA-Natural Resources Conservation Service - Soil Surveys & Website soil database
Rathjen, Frederick W., The Texas Panhandle Frontier, Rev. 1998, Univ. of Texas Press
Hatch, Brown and Ghandi, Vascular Plants of Texas (An Ecological Checklist)
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Approval

Bryan Christensen, 9/15/2023

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.

Author(s)/participant(s)	Stan Bradbury, Zone RMS, NRCS, Lubbock, Texas
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Contact for lead author	806-791-0581
Date	09/04/2007
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Due to the percent slopes, rills will be common.

2. **Presence of water flow patterns:** Due to the percent slopes, water flow patterns will be common.

3. **Number and height of erosional pedestals or terracettes:** Due to the percent slopes, pedestals/terraces will be common.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 to 30% bare ground, low percentage due to rock fragments scattered throughout the soil profile.

5. **Number of gullies and erosion associated with gullies:** Slight to moderate.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight.

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** If the soil surface is left unprotected by vegetation, the sloping soil is highly susceptible to water erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Gravelly silt loam, moderate SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Low vegetative cover and percent slopes make this site susceptible to erosion. This site is a slowly permeable soil, well drained, and available water holding capacity is moderate. High lime content provides a favorable plant-soil moisture relationship.

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: Warm-season midgrasses > Warm-season tallgrasses >

Sub-dominant: Warm-season shortgrasses >

Other: Forbs > Shrubs/Vines > Trees

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant community will have minimal mortality and decadence.
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14. **Average percent litter cover (%) and depth (in):** Litter is dominantly herbaceous.
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 600 to 1,000 pounds per 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:** Yucca, juniper and broom snakeweed can be invasive.
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17. **Perennial plant reproductive capability:** All plant species should be capable of reproduction except during periods of prolonged drought conditions, heavy natural herbivory or intense wildfires.
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