

Ecological site R077EY053TX

Gravelly 16-24" 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): 077E–Southern High Plains, Breaks

MLRA 77E occurs along moderately sloping breaks and steep escarpments associated with dissecting river systems and erosional margins of the Southern High Plains. Soil temperature regime is thermic and soil moisture regime is ustic bordering on aridic. Loamy and sandy soils are generally well drained, range from shallow to deep, and developed in lower Ogallala Formation sediments.

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

This site occurs on very deep gravelly loams and gravelly sandy loam soils on uplands. Up to 35% of the soil surface may be covered with gravels. Additionally, the soil profile may contain up to 40% gravels. The reference vegetation consists of intermixed midgrasses and shortgrasses and forbs with occasional tallgrasses and few shrubs. Grazing activities and fire frequency may affect the plant community composition. However, on these sites, the slope percent and slope aspect may also play a large role in determining the plant community.

Associated sites

R077EY055TX	Hardland Slopes 16-24" PZ Nearly level to moderately steep fine-loamy calcareous soils on higher side slope positions. Dominantly shortgrass community with some midgrasses, forbs, and few woody species.
R077EY061TX	Mixedland Slopes 16-24" PZ Very gently to moderately steeply sloping, very deep coarse-loamy soils on adjacent hillslopes. Tallgrasses and midgrasses dominate with forbs, and few shrub species.
R077EY063TX	Sand Hills 16-24" PZ Very sandy soils on adjacent undulating to steep dune topography with a mixture of tall and midgrasses, forbs, and few shrub species and bare ground.
R077EY064TX	Sandy 16-24" PZ Undulating to rolling loamy sand soils on adjacent positions. Dominantly tallgrasses, forbs, and few shrubs.

R077EY057TX	Limy Upland 16-24" PZ Gently sloping to moderately sloping loamy soils with highly calcareous subsoils on higher side slopes. Short and mid-grass dominate and with few tall grasses, perennial and annual forbs, and few woody species present.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Schizachyrium scoparium</i>

Physiographic features

The site occurs on gently sloping to steep hillslopes of gravelly lower Ogallala parent materials along the Canadian and Cimarron Rivers. It also occurs as chains of low hills and steep knobs. This site is classified as upland and occurs where major river systems have incised into the Ogallala formation. These are the Dissected High Plains, where the sloping back cutting erosional surfaces are slowly carving away into the flat High Plains landscapes above.

Table 2. Representative physiographic features

Hillslope profile	(1) Backslope
Landforms	(1) Plains > Hillslope (2) Plains > Knob (3) Plains > Low hill
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	610 – 1,370 m
Slope	0 – 30 %
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Low to high
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Flooding frequency	None
Ponding frequency	None
Elevation	610 – 1,370 m
Slope	0 – 30 %

Climatic features

Climate is a cold semi-arid steppe (Koppen-Geiger classification BSk). Summers are hot and winters are cold. Temperature extremes are common. Humidity is generally low, evaporation is high, and short-term droughts are common. Average annual wind speed is 12 mph with highest winds in early spring. The prevailing wind direction is south. Summertime brings strong high pressure systems that build into heat domes with highs in the upper 90 to mid-100 degree F range. Evaporation in summer is high and open pan evaporation exceeds 6 feet per year. Early autumn temperatures are mild, with Canadian and Pacific cold fronts bringing cold air in mid-autumn throughout winter. Arctic air can settle in and dominate for several weeks during winter with very cold air in place for 2 to 3 weeks at a time.

Most of the precipitation comes in the form of rain from May through September. Rainfall events often occur as intense showers of relatively short duration. Snowfall average is about 17 inches but is also variable from 8 to 36 inches annually. Long term droughts are likely to occur every 15 to 20 years and may last 4 to 5 years. Mean precipitation is around 21 inches but varies significantly from year to year. Rainfall amounts over the last 100 years have varied from as little as 9 inches to as much as 37 inches. The probability is about 70% that precipitation will fall between 14 to 24 inches. Growing season averages 190 days. Average first frost is around October 22, and the last freeze of the season occurs around April 15.

Table 4 Representative climatic features

Frost-free period (characteristic range)	150-160 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	510-610 mm
Frost-free period (actual range)	140-180 days
Freeze-free period (actual range)	180-200 days
Precipitation total (actual range)	480-660 mm
Frost-free period (average)	160 days
Freeze-free period (average)	190 days
Precipitation total (average)	560 mm

- (1) MIAMI [USC00415875], Miami, TX
- (2) BOYS RANCH [USC00411000], Vega, TX
- (3) CHANNING 2 [USC00411649], Channing, TX
- (4) SANFORD DAM [USC00418040], Fritch, TX
- (5) GATE [USC00343489], Gate, OK
- (6) FOLLETT [USC00413225], Follett, TX
- (7) CANADIAN [USC00411412], Canadian, TX
- (8) GUYMON MUNI AP [USW00003030], Guymon, OK
- (9) BEAVER [USC00340593], Beaver, OK
- (10) MEADE [USC00145171], Meade, KS
- (11) CLARENDON [USW00023072], Clarendon, TX
- (12) LIPSCOMB [USC00415247], Booker, TX
- (13) COLDWATER [USC00141704], Coldwater, KS
- (14) REYDON 2SSE [USC00347579], Reydon, OK

Influencing water features

Moderately steep to steep slopes with rapid runoff. Overland flow from the flatter landscape positions move throughout this site to the major streams below. The site exists as a result of the formation of drainage patterns of major streams. The streams are generally located some distance below this site on the landscape.

Wetland description

Soils in this ecological site are not part of wetland ecosystems.

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 inclusions of areas of additional Ecological Sites which are correlated to the minor components of that particular soil Mapunit.

These soils are loams to fine sandy loams that have quartzite gravel or cobbles through the profile. Soil formation is limited due to slope and geologic erosion. The exposed sediments are of lower Ogallala geology. Approximately 50% of the soil surface is covered with quartzite gravel. Soils are deep and underlain by gravelly and/or sandy material. This site occurs as series of hills or ridges and occasionally as alluvial fans in the Ogallala formation. Slopes range from 3 to 30% but most commonly have 5 to 15 % slope. The gravel ranges from pea size to 3 inches in diameter and some cobble size fragments are also present. This site is low in fertility, moderate in permeability and low in water holding capacity. Productive capacity is generally low, but diversity is good due to the variations in slope and exposure.

Representative soil components for this site include: Tascosa. Some older surveys include the Schamber series.

Table 5. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Gravelly, very gravelly loam (2) Gravelly, very gravelly sandy loam (3) Gravelly, very gravelly fine sandy loam

Family particle size	(1) Loamy-skeletal (2) Sandy-skeletal
Drainage class	Well drained to excessively drained
Permeability class	Moderate
Soil depth	100 – 200 cm
Surface fragment cover <=3"	40 – 50 %
Surface fragment cover >3"	0 – 10 %
Available water capacity (0-101.6cm)	2.29 – 10.92 cm
Calcium carbonate equivalent (0-101.6cm)	10 – 60 %
Electrical conductivity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	6.1 – 8.4
Subsurface fragment volume <=3" (0-101.6cm)	40 – 50 %
Subsurface fragment volume >3" (0-101.6cm)	0 – 20 %

Ecological dynamics

The reference plant community is a mixture of short, mid and tallgrasses with forbs and a few shrubs. The most significant grasses are sideoats grama (*Bouteloua curtipendula*), little bluestem (*Schizachyrium scoparium*), hairy grama (*Bouteloua hirsuta*), and sand dropseed (*Sporobolus cryptandrus*). Other species include black grama (*Bouteloua eriopoda*), fall witchgrass (*Digitaria cognata*), slim tridens (*Tridens muticus*), and tallgrasses such as Indiangrass (*Sorghastrum nutans*) and sand bluestem (*Andropogon hallii*) in the most favorable exposures. Dominant forbs are primrose (*Oenothera* spp.), halfshrub sundrop (*Calylophus serulatus*), trailing ratany (*Krameria lanceolata*), buckwheat species (*Eriogonum* spp.), dotted gayfeather (*Liatris punctata*), aster species (*Chaetopappa ericoides*), penstemons (*Penstemon* spp.), catclaw sensitivebriar (*Mimosa aculeaticarpa* var. *biuncifera*), and annuals. Broom snakeweed

(Gutierrezia sarothrae) is the main half-shrub present. The shrubs include feather dalea (Dalea formosa), skunkbush sumac (Rhus aromatica), and soapweed yucca (Yucca glauca). Occasionally one-seed juniper (Juniperus monosperma) will be scattered throughout the site.

The south and southwest exposures have lower production and the species present are more drought tolerant. Basal density of plants is lower on these exposures due to the shallow and gravelly soils. The northeast and east exposures have more mesic conditions and the plant community is more productive. The presence of gravel in the profile influences plant available water.

On this site, slope affects livestock accessibility and low fertility affects the palatability of the plants. Therefore, livestock grazing has less effect on the plant community. Aspect and percent slope is the primary influencing factors on the plant community. Since this site is not normally heavily grazed, the overall ecological condition tends to be unaffected by animal use.

Hydrologically speaking, this site produces a considerable amount of runoff which finds its way to numerous small and medium sized drainages. If plant cover is a healthy grassland community, the runoff is slowed and the water quality of runoff is improved. Poor cover with significant bare soil promotes runoff and infiltration.

This is not a particularly diverse site as far as habitat for wildlife is concerned. However, grassland birds, pronghorn and mule deer inhabit the site. Mule deer frequent this site more than the other species of wildlife due to the large amounts of available forbs. Woody cover is not sufficient to provide cover on this site. Quail are found in and around this site as they need no more brush cover than actually occurs on site.

Fire played a role in the historic ecology of the site as is true for practically all of the high plains sites. The general effects of fire were to promote grasslands and suppress woody shrubs. However, the rocky soils and steep terrain of this site have much more influence on the plant community than does any external influence. The sparse vegetation and lower production probably affected fire continuity, and the lack of heat generated by natural fire may have limited the degree of damage to woody plants. In general, when burned periodically, tallgrasses tend to benefit and shrubs are suppressed for a few years. Non-sprouting juniper species are especially suppressed by fire. Some of the steeper slopes and canyon walls escape fire altogether. It takes this site longer to recover from a burn than most associated sites due to sparse plant density and dry soils.

Geologic erosion usually occurs on this site. In most cases, this site is more important for wildlife habitat than for livestock grazing. A diverse plant community benefits the animal species utilizing this site as well as promoting natural ecological processes.

State and Transition Diagram:

A State and Transition Diagram for the Gravelly (R077EY053TX) 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 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	Midgrasses			151-266	
	sideoats grama	BOCU	Bouteloua curtipendula	0-266	–
	little bluestem	SCSC	Schizachyrium scoparium	0-266	–
2	Mid/Shortgrasses			186-327	

	black grama	BOER4	<i>Bouteloua eriopoda</i>	0-84	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0-84	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	0-84	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	0-84	–
	ear muhly	MUAR	<i>Muhlenbergia arenacea</i>	0-84	–
	streambed bristlegrass	SELE6	<i>Setaria leucopila</i>	0-84	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0-84	–
	slim tridens	TRMUE	<i>Tridens muticus</i> var. <i>elongatus</i>	0-84	–
3	Midgrasses			20-36	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0-12	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	0-12	–
	hairy woollygrass	ERPI5	<i>Erioneuron pilosum</i>	0-12	–
4	Tallgrasses			20-36	
	big bluestem	ANGE	<i>Andropogon gerardii</i>	0-36	–
	Indiangrass	SONU2	<i>Sorghastrum nutans</i>	0-36	–
Forb					
5	Forbs			81-141	
	lyreleaf greeneyes	BELY	<i>Berlandiera lyrata</i>	0-36	–
	yellow sundrops	CASE12	<i>Calylophus serrulatus</i>	0-36	–
	golden prairie clover	DAAU	<i>Dalea aurea</i>	0-36	–
	pale purple coneflower	ECPA	<i>Echinacea pallida</i>	0-36	–
	buckwheat	ERIOG	<i>Eriogonum</i>	0-36	–
	hoary false goldenaster	HECA8	<i>Heterotheca canescens</i>	0-36	–
	Chalk Hill hymenopappus	HYTE2	<i>Hymenopappus tenuifolius</i>	0-36	–
	mountain laurel	KALA	<i>Kalmia latifolia</i>	0-36	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0-36	–
	yerba de jicotea	LUER	<i>Ludwigia erecta</i>	0-36	–
	plains blackfoot	MELE2	<i>Melampodium leucanthum</i>	0-36	–
	sensitive plant	MIMOS	<i>Mimosa</i>	0-36	–
	purple locoweed	OXLA3	<i>Oxytropis lambertii</i>	0-36	–
	Fendler's penstemon	PEFE	<i>Penstemon fendleri</i>	0-36	–
	curlytop knotweed	POLA4	<i>Polygonum lapathifolium</i>	0-36	–
	Drummond's skullcap	SCDR2	<i>Scutellaria drummondii</i>	0-36	–
	stemmy four-nerve daisy	TESC2	<i>Tetraneuris scaposa</i>	0-36	–
	stiff greenthread	THFI	<i>Thelesperma filifolium</i>	0-36	–
	zinnia	ZINNI	<i>Zinnia</i>	0-36	–
Shrub/Vine					
6	Shrubs			67-114	
	sand sagebrush	ARFI2	<i>Artemisia filifolia</i>	0-28	–
	featherplume	DAFO	<i>Dalea formosa</i>	0-28	–
	jointfir	EPHED	<i>Ephedra</i>	0-28	–
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-28	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	0-28	–
	fragrant sumac	RHAR4	<i>Rhus aromatica</i>	0-28	–
Tree					
7	Trees			20-36	

	oneseed juniper	JUMO	<i>Juniperus monosperma</i>	20-36	–
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Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.1 plant community composition

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

This site is used for the production of domestic livestock and to provide habitat for native wildlife. Cow-calf operations are the primary livestock enterprise although stocker cattle are also grazed. Sustainable stocking rates have declined drastically over the past 100 years due to deterioration of the historic climax plant community. Initial starting stocking rates will be determined with the landowner or decision maker. An assessment of current vegetation is needed to determine stocking rates. Calculations used to determine an initial starting stocking rate will be based on forage production. This site is important to many wildlife species. Major species include bobwhite and scaled quail, muledeer, pronghorn antelope, coyote, swift fox, jackrabbit, mourning dove, hawks, owls, and badger. Being an open grassland, this site is also home to a variety of small herbivores, birds and their associated predators. Water development is very important to these and other wildlife on this site. The values of this site for food and cover requirements for specific wildlife species change with the vegetative transitions that occur from one plant community to another. Each plant community and each animal species must be considered individually.

Hydrological functions

Hydrologically speaking, this site produces a considerable amount of runoff due to the steep slopes. Runoff finds its way to numerous small and medium sized drainages. If plant cover is a healthy grassland community, the runoff is slowed and the water quality of runoff is improved. Poor cover with significant bare soil promotes runoff and infiltration.

Recreational uses

Hunting, Camping, Bird watching, Hiking, Horseback riding

Wood products

No wood products.

Other products

Some native plant seeds are collected for planting materials.

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. NRCS FOTG - Section II - Range Site Descriptions and the NRCS Clipping Data Summaries over a 20 year period were used in the process.

Other references

J.R. Bell , USDA-NRCS Rangeland Management Specialist (retired)
 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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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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Date	09/04/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

3. Number and height of erosional pedestals or terracettes: Due to 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):
10-15% mineral soil, low percent due to rock fragments scattered throughout soil profile.

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

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

7. Amount of litter movement (describe size and distance expected to travel): None to slight.

8. Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values): Very resistant to surface erosion.

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Very gravelly loam, friable, low SOM.

10. Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff: Basal cover, density and rock fragments will make rainfall impact minimal. This site is a moderately permeable soil, runoff is medium, and available water holding capacity is medium.

11. Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None.

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 >

Sub-dominant: Warm-season tallgrasses > Warm-season shortgrasses > Forbs >

Other: Shrubs/Vines > Trees

Additional:

13. Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):
Grasses due to their growth habit will exhibit some mortality and decadence, though minimal.
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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 - 1050 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, catclaw acacia, prickly pear, and juniper can become 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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