

Ecological site R077DY047TX

Sandy Loam

12-17" PZ

Last updated: 9/11/2023
Accessed: 09/04/2026

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): 077D–Southern High Plains, Southwestern Part

This MLRA 77D is characterized by nearly level to gently undulating plains with scattered playa depressions. Soil temperature regime is thermic and soil moisture regime is aridic bordering on ustic. Sandy and loamy soils are generally well drained and range from shallow to deep and medium- to coarse-textured. Native vegetation is short- to midgrasses and sandy sites support tallgrasses with sand shin oak and mesquite. Current land use is mainly rangeland, although irrigated cropland is expanding.

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 moderately deep and deep sandy loam soils on plains. The reference vegetation consists of Midgrasses, shortgrasses, with few forbs and very few shrubs. Abusive grazing practices may lead to a change in species composition and a shift in the plant community. Without periodic fire, the woody species may increase across the site.

Associated sites

R077DY039TX	Draw 12-17" PZ Draw sites are occasionally associated with Sandy Loam sites MLRA 77D. Draw sites may occur downslope and along Sandy Loam sites. Production is often higher than on the Sandy Loam sites.
R077DY046TX	Sandy 12-17" PZ Sandy sites are generally associated with Sandy Loam sites MLRA 77D. Sandy sites may occur as individual pockets of sandy soils within or near the outer edges of Sandy Loam sites. Production is often higher than on the Sandy sites.
R077DY045TX	Sand Hills 12-17" PZ Sand Hills sites are occasionally associated with Sandy Loam sites MLRA 77D. Sand Hills sites may occur as individual pockets of dunes soils within or near the outer edges of Sandy Loam sites. Production is often higher than on the Sandy Loam sites.

Similar sites

R077CY036TX	Sandy Loam 16-21" PZ Sandy Loam sites (MLRA 77C) have similar forage plant communities with higher production potential due to higher mean annual precipitation (16 - 21 inches).
R077EY066TX	Sandy Loam 16-24" PZ Sandy Loam sites (MLRA 77E) have similar forage plant communities with higher production potential due to higher mean annual precipitation (16 - 24 inches).
R077DY046TX	Sandy 12-17" PZ Sandy sites are generally associated with Sandy Loam sites MLRA 77D. Sandy sites may occur as individual pockets of sandy soils within or near the outer edges of Sandy Loam sites. Production is often higher than on the Sandy sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Acacia greggii</i>
Herbaceous	(1) <i>Bouteloua eriopoda</i> (2) <i>Bouteloua gracilis</i>

Physiographic features

The Sandy Loam site is comprised of nearly level to gently sloping plains, commonly adjacent to relict drainageways, and formed in calcareous, loamy eolian sediments in the Blackwater Draw Formation of Pleistocene age. Runoff is negligible to low on these sandy loam soils and water movement is dependent on amount vegetative cover and intensity of precipitation events. Elevation is 2500 to 4600 feet.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Plain
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	760 – 1,400 m
Slope	0 %

Water table depth	200 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Continental Steppe climate is prevalent in MLRA 77D. This climate type is typical of interiors of continents and is characterized by large variations in the magnitude of ranges in daily temperature extremes, low relative humidity, and irregularly spaced rainfall of moderate amounts. This climate regime is also known for being semi-arid with mild winters.

Droughts occur with monotonous frequency although there will be years having excessive precipitation resulting in large accumulations of water that little benefit is obtained from the rainfall events. If good rains occur in the spring and summer months, annual production will be favorable even if the remainder of the year is not favorable. Most of the annual precipitation occurs as a result from spring and early summer thunderstorms. Due to the fact that the area is mainly flat, local flooding may occur but only of short duration. There is very little precipitation and infrequent snowfall amounts in the winter.

During the late winter and early spring months, dust storms occur very frequently. The flat plains of the area contribute very little resistance to the strong winds. Dust in many of these storms remains in the air for several days after the storms have passed.

Daytime temperatures are warm in the summer but there is a large diurnal range and most nights are comfortable. In summers, the normal daily maximum temperatures are in the low to mid 90s and the normal minimum temperatures are in the upper 60s and low 70s. Even though the temperatures may be high, the low humidity and high evaporation rates create a cooling effect during the nighttime hours. Fall months exhibit extremely variable weather. Winters are mild and are characterized by frequent cold fronts accompanied by strong, gusty, northerly winds. Most of the cold fronts are dry as they pass through the area.

Table 3 Representative climatic features

Frost-free period (characteristic range)	150-190 days
Freeze-free period (characteristic range)	180-190 days
Precipitation total (characteristic range)	380-430 mm
Frost-free period (actual range)	150-200 days
Freeze-free period (actual range)	170-210 days
Precipitation total (actual range)	380-430 mm
Frost-free period (average)	170 days
Freeze-free period (average)	190 days
Precipitation total (average)	410 mm

- (1) MELROSE [USC00295617], Melrose, NM
- (2) ELIDA [USC00292854], Elida, NM

- (3) CROSSROADS 2 [USC00292207], Crossroads, NM
- (4) CAPROCK [USC00291445], Caprock, NM
- (5) TATUM [USC00298713], Tatum, NM
- (6) HOBBS 13W [USC00294030], Lovington, NM
- (7) ANDREWS [USC00410248], Andrews, TX
- (8) ODESSA SCHLEMEYER FLD [USW00003031], Odessa, TX
- (9) K-BAR RCH [USC00414710], Odessa, TX

Influencing water features

Water features are not an influencing factor in this site.

Wetland description

None.

Soil features

These moderately deep to very deep sandy loam soils are part of the Blackwater Draw geologic formation. Slopes primarily range from 0 to 3 percent. They are moderate in fertility, have a moderate level of water storage capacity, and have a moderate infiltration rate depending on slope and vegetative cover. They yield water to plants readily and are subject to wind erosion without good cover. If cover is poor and runoff is excessive, significant water erosion can also occur. Plant roots easily penetrate these soils.

Major Soil Taxonomic Units correlated to this site include: Amarose fine sandy loam, Arizer very fine sandy loam, Douro fine sandy loam, and Faskin fine sandy loam.

Table 4. Representative soil features

Parent material	(1) Eolian deposits – igneous, metamorphic and sedimentary rock
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	50 – 200 cm
Soil depth	50 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified

Available water capacity (0-101.6cm)	10.16 – 17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 70 %
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 – 8.4
Subsurface fragment volume ≤3" (0-101.6cm)	Not specified
Subsurface fragment volume >3" (0-101.6cm)	Not specified

Ecological dynamics

The Reference Plant Community of the Sandy Loam Ecological Site is a Shortgrass/Midgrass Community (1.1) with only occasional shrubs and a limited variety of forbs. Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, re-occurring droughts and frequent fires. Wildfires occurred at frequent intervals (Frost 1998). Frequent fires and the semi-arid climate suppressed woody species to less than one percent canopy. 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 many of the sites.

Most of the plant growth on the site takes place in late spring and fall resulting in warm season bunchgrasses with few browse species and a modest amount of forbs. Black grama (*Bouteloua eriopoda*) was a dominant species, contributing as much as 25 percent of the plant annual production. Other characteristic grasses found include sideoats (*Bouteloua curtipendula*) and blue grama (*Bouteloua gracilis*) and plains bristlegrass (*Setaria macrostachya*). Silver bluestem (*Bothriochloa laguroides*), Arizona cottontop (*Digitaria californica*) and vine mesquite (*Panicum obtusum*) were significant but lesser grasses. See the Plant Composition and Annual Production Table below for estimated composition and production of the species assumed to have been present in the HCPC.

The Shortgrass/Midgrass Community (1.1) was relatively stable and resilient within the climate, soil and fire regime until the advent of animal husbandry and fencing in the late 1800s. Not understanding the limits of rangeland productivity, European 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 black grama, a decline in mulch and organic matter and consequently a reduction in intensity of fires.

The shift in plant cover to less palatable and generally shorter grasses and decline in soil cover, favors woody plant encroachment. The woody and herbaceous invaders were generally endemic species released from competition and fire suppression. Mesquite (*Prosopis*

glandulosa), catclaw acacia (*Acacia greggii*), yucca (*Yucca* spp.), cacti (*Opuntia* and *Cylindropuntia* spp.) and broom snakeweed (*Gutierrezia sarothrae*) are quick to invade the site under abusive grazing. In the resulting Shortgrass Dominant/Invading Shrubs Community (1.2) the more palatable black grama and sideoats grama give way to less palatable or more grazing resistant blue grama and other shortgrasses. Grass vegetation still dominates annual herbage production, but the encroaching woody species increase in the proportion of production compared to the Shortgrass-Midgrass Community (1.1).

Continuous overgrazing of the Shortgrass Dominant/Invading Shrubs 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 more grazing resistant plants such as hooded windmillgrass (*Chloris cucullata*), hairy grama (*Bouteloua hirsuta*), perennial threeawns (*Aristida* spp.), dropseeds (*Sporobolus* spp.) and less palatable forbs begin replacing the midgrasses. As the grass cover declines, litter, mulch and soil organic matter decline and bare ground, erosion and other desertification processes increase. The increasing woody dominants are primarily mesquite, catclaw acacia and broom snakeweed. Rest from grazing and prescribed burning will generally not restore the grassland community when the woody plant community exceeds 15 percent canopy on this site and/or the plants reach maturity or fire resistant age. As the shift in the vegetative community occurs, the Shortgrass Dominant/Shrubs Invading Community (1.2) will transition into a new community, the Shortgrass/Shrubland Community (2.1). This threshold also marks the beginning of a new stable state, the Shrubland State.

Mesquite, catclaw acacia and/or broom snakeweed dominate the Shortgrass/Shrubland Community (2.1). The grass component is a mixture of low palatability midgrasses, shortgrasses, low quality forbs and annuals. With continued livestock overgrazing, the better midgrasses are replaced by grazing resistant shortgrasses, such as gummy lovegrass (*Eragrostis curtispedicellata*), bristlegrass, and threeawns. Invading forbs include western ragweed (*Ambrosia psilostachya*) and croton (*Croton* spp.). In early stages (15-20% shrub cover), the encroachment of noxious 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 shrub cover reaches its maximum potential. Once the brush canopy exceeds 35 to 40 percent, annual production for the herbaceous species is limited low quality shortgrasses and annual grasses and forbs within shrub interspaces. This Shrub/Shortgrass/Annuals Community (2.2) produces only small amounts of useable livestock forage. Total biomass production is considerably less due to erosion of soil fertility and structure during the desertification process.

Major, high cost and high energy, accelerating practices are required to restore the Shrub/Shortgrass/Annuals Community (2.2) back to the Grassland State. Generally, herbicidal brush management practices such as aerial spraying, and/or individual plant treatments (IPT) along with other conservation practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary for the ecological site to return to the historic climax community.

NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

STATE AND TRANSITIONAL PATHWAYS: (DIAGRAM)

Narrative:
The diagram below suggests some pathways that the vegetation on this site might follow. It is designed to show what might happen in a given set of circumstances. This does not mean that the transitions and trajectories 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					
1	Shortgrasses			269-493	
	black grama	BOER4	<i>Bouteloua eriopoda</i>	269-493	–
2	Midgrasses			471-863	
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	235-336	–
	large-spike bristlegrass	SEMA5	<i>Setaria macrostachya</i>	157-224	–
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	157-224	–
3	Midgrasses			202-370	
	cane bluestem	BOBA3	<i>Bothriochloa barbinodis</i>	78-112	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	78-112	–

	Arizona cottontop	DICA8	<i>Digitaria californica</i>	78-112	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	78-112	–
4	Shortgrasses			336-616	
	threeawn	ARIST	<i>Aristida</i>	78-112	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	78-112	–
	hairy grama	BOHI2	<i>Bouteloua hirsuta</i>	78-112	–
	hooded windmill grass	CHCU2	<i>Chloris cucullata</i>	78-112	–
	fall witchgrass	DICO6	<i>Digitaria cognata</i>	78-112	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	78-112	–
5	Tall/Mid/Shortgrasses			11-22	
	gummy lovegrass	ERCU	<i>Eragrostis curtipedicellata</i>	6-17	–
	ear muhly	MUAR	<i>Muhlenbergia arenacea</i>	6-17	–
	little bluestem	SCSCS	<i>Schizachyrium scoparium var. scoparium</i>	6-17	–
	bristlegrass	SETAR	<i>Setaria</i>	6-17	–
	mesa dropseed	SPFL2	<i>Sporobolus flexuosus</i>	6-17	–
	fringed signalgrass	URCI	<i>Urochloa ciliatissima</i>	6-17	–
Forb					
6	Forbs			67-123	
	sleepydaisy	XANTH	<i>Xanthisma</i>	11-62	–
	Cuman ragweed	AMPS	<i>Ambrosia psilostachya</i>	11-62	–
	aster	ASTER	<i>Aster</i>	11-62	–
	croton	CROTO	<i>Croton</i>	11-62	–
	beeblossom	GAURA	<i>Gaura</i>	11-62	–
	prairie sunflower	HEPE	<i>Helianthus petiolaris</i>	11-62	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	11-62	–
	silverleaf nightshade	SOEL	<i>Solanum elaeagnifolium</i>	11-17	–
Shrub/Vine					
7	Shrubs			11-22	
	catclaw acacia	ACGR	<i>Acacia greggii</i>	6-17	–
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	6-17	–
	snakewood	CONDA	<i>Condalia</i>	6-17	–
	yucca	YUCCA	<i>Yucca</i>	6-17	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 2.2 plant community composition

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

Many types of grassland insects, reptiles, birds and mammals used the historic climax plant community of the Sandy Loam Ecological Site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, black-tailed jackrabbit, eastern and desert cottontail, ground squirrel, fox, badger and skunk. Predators include coyote, red fox, kit fox, bobcat and occasionally mountain lion. Prairie chicken, scaled and northern bobwhite quail, doves, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison made infrequent migratory use and pronghorn antelope were indigenous. Free roaming bison, however, are no longer

present, but antelope utilize the Sandy Loam site in its various states, preferably the grassland. The site is suitable for production of all kinds of wildlife and livestock. In the grassland state it is suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for sheep, goats, deer and other wildlife because of the browse and forbs. Any kind of livestock should be stocked in proportion to the available grass, forb and browse forage, keeping competition for forbs and browse in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the Shrub/Shortgrass/Annuals Community (2.2) will eventually have little to offer as habitat except cover.

Hydrological functions

The Sandy Loam Ecological Site consists of nearly level to gently sloping fine sandy loam soils. Because of topography and the texture of the soils, there is little or no runoff. Wind erosion can occur where the site is not protected by vegetation. The grassland vegetation intercepts and utilizes much of the incoming rainfall. Hydrologic functions are representative of a mixed-grass grassland prairie. Litter and soil movement is slight. However, standing plant cover, duff and soil organic matter decrease as the Shortgrass-Midgrass Dominant Community (1.1) transitions to the Shortgrass Dominant/Invading Shrubs type (1.2) and continue to decline in the interstitial spaces of the Shortgrass/Shrubland Community (2.1). Evaporation and interception losses are higher, resulting in less moisture reaching the soil. Fertility erosion takes place between shrubs. Biomass production is reduced and production shifts from primarily grasses to primarily woody plants. The deeper-rooted woody invaders are able to extract water from greater depths than the short grasses and accumulate wind blown 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 Shrub/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.

Recreational uses

The site has little value from an aesthetic standpoint. 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

None.

Other information

None.

Inventory data references

Information presented has been derived from the revised Sandy Loam Range Site, literature, limited NRCS clipping data (417s), field observations and personal contacts with range-trained personnel. Photos were taken by J.L. Schuster and Matt Bruner. Special thanks to the following NRCS personnel for assistance and guidance with development of this ESD: Clint Rollins NRCS Amarillo, Mark Moseley NRCS San Antonio and Justin Clary NRCS Temple, Texas. Special thanks to Matt Pruner NRCS Andrews, Texas for help with field assessments and photos. NRCS FOTG – Section II - Sandy Loam Range Site Description PE 19-25 NRCS Clipping Data summaries (417) over a six-year period in Andrews County, TX.

Other references

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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. Clint Rollins, RMS, NRCS, Amarillo, Texas Stanley Bradbury, RMS, NRCS, Lubbock, Texas Justin Clary, RMS, NRCS, Temple, Texas Kelly Attebury, RSS, NRCS, Lubbock, Texas

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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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):
20-25% bare ground.

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

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): None to slight.

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

9. Soil surface structure and SOM content (include type of structure and A-horizon color and thickness): Fine sandy loam;
friable surface; and medium SOM.

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 is moderately
permeable, runoff is slow and available water holding capacity is high.

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 shortgrasses > Warm-season midgrasses >>

Sub-dominant:

Other: Warm-season tallgrasses > Forbs > Shrubs/Vines

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.
-

14. Average percent litter cover (%) and depth (in): Litter is dominantly herbaceous.
-

15. Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):
1,200 to 2,200 pounds per acre.
-

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 and yucca 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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