USDA Natural Resources Conservation Service

Ecological site R077DY047TX
Sandy Loam 12-17" PZ

Last updated: 9/11/2023
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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.

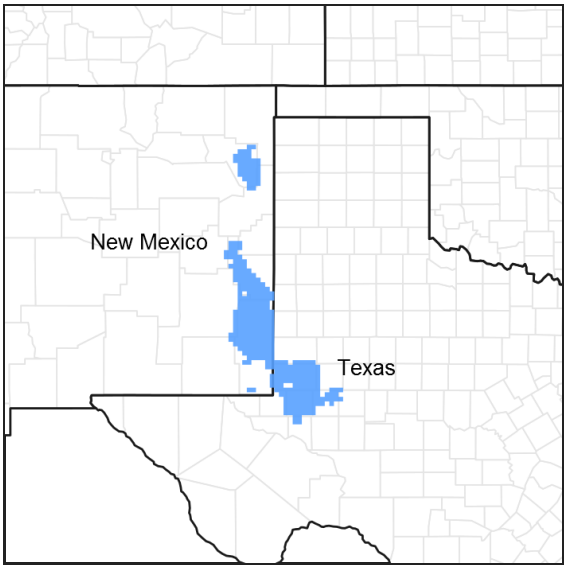


Figure 1. Mapped extent

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): 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) *Acacia greggii*
Herbaceous	(1) *Bouteloua eriopoda* (2) *Bouteloua gracilis*

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	762–1,402 m
Slope	0–3%
Water table depth	203 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)	154-191 days
Freeze-free period (characteristic range)	181-194 days
Precipitation total (characteristic range)	381-432 mm
Frost-free period (actual range)	147-195 days
Freeze-free period (actual range)	171-213 days
Precipitation total (actual range)	381-432 mm
Frost-free period (average)	167 days
Freeze-free period (average)	190 days
Precipitation total (average)	406 mm

Climate stations used

- (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	51–203 cm
Soil depth	51–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.16–17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0–65%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–2
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (0-101.6cm)	0–2%
Subsurface fragment volume >3" (0-101.6cm)	0%

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 curtipedicellata*), 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.

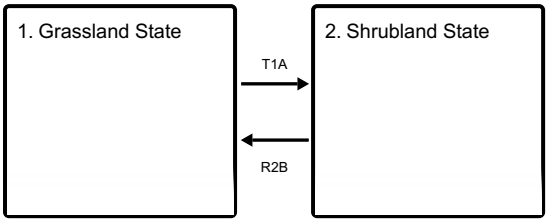
NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

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

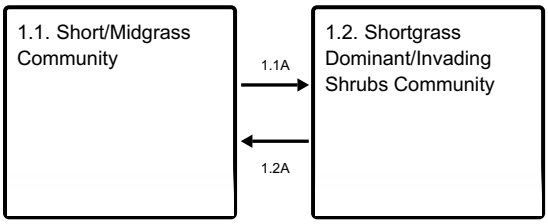
Ecosystem states



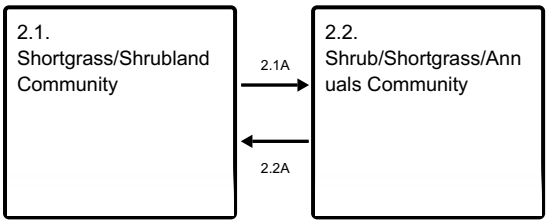
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Grassland State

The Short/Midgrass Community (1.1) is the interpretive or "reference" plant community for the Sandy Loam Ecological Site. Herbivory by migrating bison and indigenous antelope influenced the plant composition and structure, but not as much as frequent and intense wildfires and recurring long-term droughts, which kept woody species in check. A variety of short and midgrasses comprised most of the production. The plant community is characterized by sideoats grama, black grama, blue grama and plains bristlegrass. Cane and silver bluestem, Arizona cottontop and vine mesquite are locally abundant. Perennial three-awns, hairy grama, fall witchgrass, sand dropseed and buffalograss are common shortgrasses. Four-winged saltbush, lotebush, catclaw and yucca are infrequent, shrubs. Gaura, dotted gayfeather, sleepy daisy, western ragweed, croton, and prairie sunflower are characteristic forbs. This community produces from 1,200 to 2,200 pounds of biomass annually, depending upon soil property variation and the amount of precipitation. The Shortgrass Dominant/Invading Shrubs Community (1.2) is shortgrass dominated grassland. It is being encroached by woody species that had been held at low densities by repeated fires, droughts and competition from a vigorous grass component. Shrubby species are increasing in density because continuous heavy grazing by livestock has reduced grass cover, caused reduction of soil cover and reduced the frequency and/or intensity of fires. Selective grazing and differential response of plants to defoliation also causes changes in composition of the plant community. Typically, mesquite, catclaw acacia and yucca are early and persistent invaders. Broom snakeweed and four-winged saltbush are also common. The preferred midgrasses are being replaced by the more grazing resistant hooded windmillgrass, hairy grama, fall witchgrass and threeawns. Most of the reference grama species, bristlegrasses and feathery bluestems persist in this phase. The perennial forbs found in the reference plant community are still present, although in lesser amounts. Annual

primary production is reduced slightly ranging from 1000 to 2000 pounds per acre.

Dominant plant species

- black grama (*Bouteloua eriopoda*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

Community 1.1
Short/Midgrass Community

Figure 8. 1.1 Short/Midgrass Community

The Short/Midgrass Community (1.1) is the interpretive plant community for the Sandy Loam Ecological Site. It developed under the prevailing climate found by European settlers in the late 1800s. Herbivory by migrating bison and indigenous antelope influenced the plant composition and structure, but not as much as frequent and intense wildfires and recurring long-term droughts, which kept woody species in check. A variety of short and midgrasses comprise most of the production. The plant community is characterized by sideoats grama, black grama, blue grama and plains bristlegrass. Cane (*Bothriochloa barbinodis*) and silver bluestem, Arizona cottontop and vine mesquite are locally abundant. Perennial three-awns, hairy grama, fall witchgrass (*Digitaria cognata*), sand dropseed (*Sporobolus cryptandrus*) and buffalograss (*Bouteloua dactyloides*) are common shortgrasses. Four-winged saltbush (*Atriplex canescens*), lotebush (*Ziziphus obtusifolia*), catclaw and yucca are infrequent, shrubs. Gaura (Gaura spp.), dotted gayfeather (*Liatris punctata*), sleepy daisy (Xanthisma spp.), western ragweed, croton and prairie sunflower (*Helianthus petiolaris*) are characteristic forbs. The Short/Midgrass Community (1.1) produces from 1,200 to 2,200 pounds of biomass annually, depending upon soil property variation and the amount of precipitation. Severe extended drought conditions could reduce this even further. Grasses produce as much as 95 percent of the annual production. It is presumed that shrubs were limited in this state by an interaction of the competition from the herbaceous grassland component, recurring fires and periodic droughts. The good cover of grasses and mulch aided in the infiltration of rainfall into the moderately permeable soil and reduced runoff. Little runoff occurs and good soil-moisture relationships allow for high vegetative production during good moisture years. The Short/Midgrass Community (1.1) furnishes good habitat for grazing type wildlife such as bison and pronghorn antelope and, in recent times, sheep and cattle. This plant type is resilient and recovers well under good grazing management. However, with continuous overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions into a Shortgrass Dominant/Invading Shrubs Community (1.2). The retrogression is reversible, however, with good grazing management that provides a competitive advantage to the grass component and provides fine fuels for periodic prescribed fires.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1278	1810	2343
Forb	67	95	123
Shrub/Vine	11	17	22
Tree	–	–	–
Microbiotic Crusts	–	–	–
Total	**1356**	**1922**	**2488**

Figure 10. Plant community growth curve (percent production by month). TX1251, Warm-season bunchgrasses w/ forbs & shrubs. Warm-season bunchgrasses with forbs and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	5	12	16	15	20	18	9	1	0

Community 1.2
Shortgrass Dominant/Invading Shrubs Community

Figure 11. 1.2 Shortgrass Dominant/Invading Shrubs Community

The Shortgrass Dominant/Invading Shrubs Community (1.2) is shortgrass dominated grassland. It is being encroached by woody species that had been held at low densities by repeated fires, droughts and competition from a vigorous grass component. Shrubby species are increasing in density because continuous heavy grazing by livestock has reduced grass cover, caused reduction of soil cover and reduced the frequency and/or intensity of fires. Selective grazing and differential response of plants to defoliation also causes changes in composition of the plant community. Typically, mesquite, catclaw acacia and yucca are early and persistent invaders. Broom snakeweed and four-winged saltbush are also common. The preferred midgrasses are being replaced by the more grazing resistant hooded windmillgrass, hairy grama, fall witchgrass and threeawns. Most of the climax grama species, bristlegrasses and feathery bluestems persist in this phase. The perennial forbs are still present, although in lesser amounts. The encroaching woody species are generally less than three feet tall and subject to control by prescribed burning enhanced by proper grazing management. The woody canopy varies between 5 and 15 percent depending on length and severity of grazing, timing and frequency of fires and seed availability of invading species. Annual primary production is reduced slightly ranging from 1000 to 2000 pounds per acre depending on precipitation amounts and the soil series. Grasses remain the dominant producers of forage. Heavy continuous grazing reduces plant cover, litter and mulch and increases bare ground exposing the soil to wind erosion. There could be some mulch and litter movement during rainstorms but due to gentle slopes, little soil movement takes place in this vegetation type. The changes in species composition are small initially. However, unless proper grazing and prescribed burning are applied, the invading species continue to increase in size and density. When the canopy of the woody plants becomes dense enough (15 %) or tall enough (> 3 feet) to suppress grass growth and resist fire damage, a threshold in ecological succession is crossed. This threshold can also occur when the fine fuel load provided by grasses is too low to control brush effectively with fire. The Shortgrass Dominant/Invading Shrubs

Community (1.2) then becomes the Shortgrass/Shrubland Community (2.1). In that plant community, normal range management practices, such as prescribed grazing, cannot reverse the trend to woody plant dominance.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	953	1429	1905
Shrub/Vine	112	168	224
Forb	56	84	112
Microbiotic Crusts	–	–	–
Tree	–	–	–
Total	**1121**	**1681**	**2241**

Figure 13. Plant community growth curve (percent production by month). TX1252, Shortgrass Dominant/Invading Shrub Community. Warm-season shortgrasses with increasing shrubs and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	3	5	12	16	15	20	18	9	1	0

Pathway 1.1A
Community 1.1 to 1.2

Short/Midgrass Community

Shortgrass Dominant/Invading Shrubs Community

With Heavy Continuous Grazing, No Fire, and Brush Invasion, the Short/Midgrass Community will transition into the Shortgrass Dominant/Invading Shrubs Community.

Pathway 1.2A
Community 1.2 to 1.1

Shortgrass Dominant/Invading Shrubs Community

Short/Midgrass Community

With the implementation of various conservation practices such as Prescribed Grazing, Brush Management, and Prescribed Burning, the Shortgrass Dominant/Invading Shrubs Community will be converted into the Short/Midgrass Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Shortgrass/Shrubland Community (2.1) supports a 15 to 35 percent woody canopy with mesquite, catclaw acacia, broom snakeweed and yucca the most common shrubs. Mesquite generally dominates although broom snakeweed can be locally dominant. This plant type is primarily the result of the interaction of selective overgrazing by livestock, the differential response of plants to defoliation and a reduction in the intensity and frequency of fires over a long period of time. Total plant production declines somewhat, being approximately 800 to 1800 pounds per acre. The Shrub/Shortgrass/Annuals Community (2.2) is a shrubland resulting from many years of overgrazing, lack of periodic fires and little brush management. Mesquite generally dominates, but broom snakeweed, yucca, sand sagebrush, condalia, and catclaw acacia are common. With continued heavy grazing and no brush control, the shrubs can approach 70 percent or more ground cover. Shortgrasses and low quality annual and perennial forbs occupy the woody plant interspaces. Grasses and forbs make up 25 percent or less of the annual herbage production.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub
- catclaw acacia (*Acacia greggii*), shrub

Community 2.1
Shortgrass/Shrubland Community

Figure 14. 2.1 Shortgrass/Shrubland Community

The Shortgrass/Shrubland Community (2.1) supports a 15 to 35 percent woody canopy with mesquite, catclaw acacia, broom snakeweed and yucca the most common shrubs. Mesquite generally dominates although broom snakeweed can be locally dominant. This plant type is primarily the result of the interaction of selective overgrazing by livestock, the differential response of plants to defoliation and a reduction in the intensity and frequency of fires over a long period of time. There is a decline in diversity of the grassland component and an increase in woody species. Annual herbage production is reduced due to decline in soil fertility, structure and organic matter, and plant composition has shifted strongly toward the non-grass component. Total plant production declines somewhat, being approximately 800 to 1800 pounds per acre, depending on precipitation. Annual production is balanced between herbaceous plants and woody plants. Browsing animals such as goats and deer can find fair food value and cover. Forage quantity and quality for cattle is less than in the grassland state. Remnants of palatable grasses and forbs and unpalatable invaders occupy the interspaces between shrubs. Bristlegrass, plus other grazing resistant climax species, can be found under and around woody plants. Because of grazing pressure, lowered fertility and competition for nutrients and water from the woody plants the grassland component shows general lack of plant vigor and productivity. Common herbaceous species include gummy lovegrass, fringed signalgrass (Urochloa cilliatissima), three-awns, croton, western ragweed, silverleaf nightshade (*Solanum elaeagnifolium*) and a variety of annuals, including sandbur (*Cenchrus spinifex*). Unless brush management and good grazing management are applied at this stage, the transition toward a dense shrubland the Shrub/Shortgrass/Annuals Community (2.2) will continue. The trend toward dense shrubland cannot be reversed with good grazing management alone. Accelerated brush management practices along with range planting and prescribed grazing are required to return this plant type to grassland.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	448	785	1009
Grass/Grasslike	359	628	807
Forb	90	157	202
Microbiotic Crusts	–	–	–
Tree	–	–	–
Total	**897**	**1570**	**2018**

Figure 16. Plant community growth curve (percent production by month). TX1253, Mixed Shortgrass/Shrub Community. Spring and fall growth of mixed shortgrasses and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	4	6	10	16	15	20	15	12	1	0

Community 2.2
Shrub/Shortgrass/Annuals Community

Figure 17. 2.2 Shrub/Shortgrass/Annuals Community

The Shrub/Shortgrass/Annuals Community (2.2) is a shrubland resulting from many years of overgrazing, lack of periodic fires and little brush management. Mesquite generally dominates, but broom snakeweed, yucca, sand sagebrush (*Artemisia filifolia*), condalia (Condalia spp.) and catclaw acacia are common. With continued heavy grazing and no brush control, the shrubs can approach 70 percent or more ground cover. Shortgrasses and low quality annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are bristlegrass, gummy lovegrass, fringed signalgrass, tumble windmillgrass, sand dropseed and white tridens (*Tridens albescens*). Forbs commonly found in this community include gaura, western ragweed, croton, buffalo gourd (*Cucurbita foetidissima*) and silverleaf nightshade. Grasses and forbs make up 25 percent or less of the annual herbage production. The Shrub/Shortgrass/Annuals Community (2.2) provides good cover for wildlife, but only limited preferred forage, or browse, is available for livestock or wildlife. 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, brush management practices such as aerial herbicide application, along with other conservation practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary to return the shrubland state the grassland state. In practice this may not be practical or desirable depending on objectives of the land manager.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	504	841	1177
Grass/Grasslike	101	168	235
Forb	67	112	157
Microbiotic Crusts	–	–	–
Tree	–	–	–
Total	**672**	**1121**	**1569**

Figure 19. Plant community growth curve (percent production by month). TX1254, Shrub/Shortgrass/Annuals Community. Spring and fall growth of shortgrasses, annuals, and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	4	6	10	16	15	20	15	12	1	0

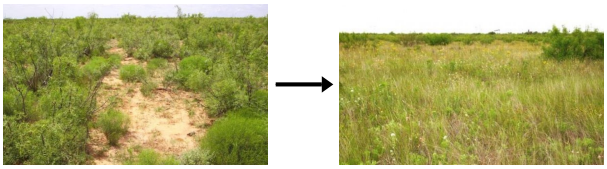
Pathway 2.1A
Community 2.1 to 2.2

Shortgrass/Shrubland Community

Shrub/Shortgrass/Annuals Community

Heavy Continuous Grazing, No Fire, No Brush Management, and Brush Invasion all contribute to the shift from the Shortgrass/Shrubland Commmunity to the Shrub/Shortgrass/Annuals Community.

Pathway 2.2A
Community 2.2 to 2.1



Shrub/Shortgrass/Annuals Community

Shortgrass/Shrubland Community

Major, high cost and high energy, accelerating practices are required to restore the Shrub/Shortgrass/Annuals Community back to the Shortgrass/Shrubland Community. Generally, brush management practices such as aerial herbicide application, along with other conservation practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T1A
State 1 to 2

With Heavy Continuous Grazing, No Fire, and No Brush Management, the Grassland State will be converted into

the Shrubland State.

Restoration pathway R2A
State 2 to 1

Prescribed grazing, Brush Management, and Prescribed Grazing are several conservation practices that can be implemented for the shift from the Shortgrass/Shrubland Community to the Shortgrass Dominant/Invading Shrubs Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Restoration pathway R2B
State 2 to 1

Reclamation, Prescribed Grazing, Brush Management, and Range Planting are required conservation practices in order to reclaim the Shrub/Shortgrass/Annuals Community back to the Short/Midgrass Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Grazing Land Mechanical Treatment
Range Planting

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Shortgrasses**			269–493	
	black grama	BOER4	*Bouteloua eriopoda*	269–493	–
2	**Midgrasses**			471–863	
	blue grama	BOGR2	*Bouteloua gracilis*	235–336	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	157–224	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	157–224	–
3	**Midgrasses**			202–370	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	78–112	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	78–112	–
	Arizona cottontop	DICA8	*Digitaria californica*	78–112	–
	vine mesquite	PAOB	*Panicum obtusum*	78–112	–
4	**Shortgrasses**			336–616	
	threeawn	ARIST	*Aristida*	78–112	–
	buffalograss	BODA2	*Bouteloua dactyloides*	78–112	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	78–112	

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

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 and 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

1. Archer S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In Ecological implications of livestock herbivory in the West, pp.13-68. Edited by M. Vavra, W. Laycock, R. Pieper, Society for Range Management Publication. , Denver, CO.
2. Archer, Steve and F.E. Smeins.1991. Ecosystem-level Processes, Chapter 5 in: Grazing Management: An Ecological Perspective edited by R. K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
3. Brown, J. K. and J.K. Smith, Eds. 2000. Wildfire in Ecosystems: Effects of Fire on Flora. Gen. Tech. Rep.

RMFRS-GTR-42-vol.2 Ogden, UT: USDA-FS Rocky Mtn. Res. Sta. 257pp.
4. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20
5. Hatch, S.L., K.N. Gandhi and L.E. Brown. 1990. Checklist of the Vascular Plants of Texas. TX. Ag. Exp. Sta. MP-1655, 158 pp.
6. Milchunas, D.G. 2006. Responses of Plant Communities to grazing in the southwestern United States. USDA-Forest Service. Rocky Mtn. Sta. GTR. 169
7. Thurow T.L., 1991. Hydrology and erosion. Chapter 6 in: Grazing Management: An Ecological Perspective Edited by: R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
8. USDA/NRCS Soil Survey Manuals for Andrews and Midland Counties, Texas.
9. Vines, RA. 1990. Trees, Shrubs and Woody Vines of The Southwest. University of Texas Press. Austin, Texas.

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Approval

Bryan Christensen, 9/11/2023

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.

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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
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:** 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:

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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):** 1,200 to 2,200 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:** 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.
