USDA Natural Resources
Conservation Service

Ecological site R078CY110TX
Sandy Loam 23-31" PZ

Last updated: 9/15/2023
Accessed: 05/12/2025

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.

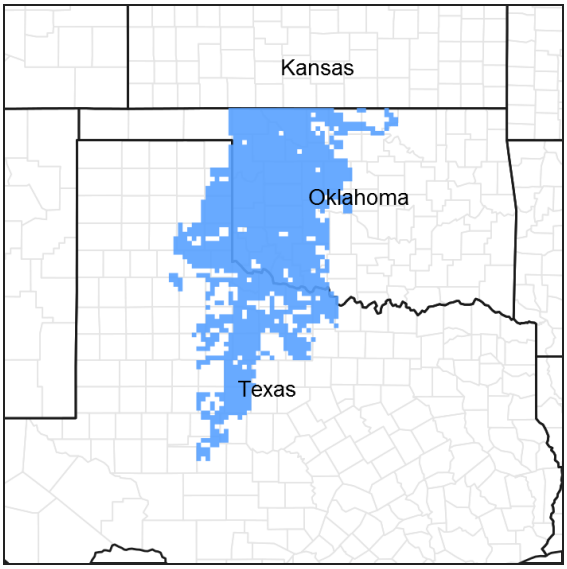


Figure 1. Mapped extent

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

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

LRU notes

NA

Classification relationships

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

Ecological site concept

The Sandy Loam ecosite occurs on very deep, sandy loam soils plains and terraces. The reference vegetation is native midgrass species with forbs and few shrubs. Shrubs may begin to encroach on the site in the absence of fire

or other brush management practices. Continuous abusive grazing practices may lead to a decrease in palatable plant species.

Associated sites

R078CY096TX	**Clay Loam 23-30" PZ** Adjacent to the site.
R078CY105TX	**Loamy Sand 23-31" PZ** Both on similar terrain, loamy sand soils have lower clay content.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Yucca* (2) *Rhus*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Bouteloua curtipendula*

Physiographic features

Sandy Loam soils are on nearly level to moderately steep plains on terrace pediments of erosional uplands having convex to plane surfaces. Slope gradients are mostly 0 to 8 percent, but range up to 20 percent. The soil formed in as much as 20 feet of moderately coarse textured loamy and clayey eolian and alluvial material, which has blown from nearby streams. Most of the deposits have been reworked by wind. An eolian mantle is common to many areas. The soil formed in alluvium presumed to be of Quaternary of Pliocene age. Elevation ranges from 900 to 3,000 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Plain (2) Alluvial plain > Stream terrace (3) Alluvial plain > Hill
Flooding frequency	None
Ponding frequency	None
Elevation	274–914 m
Slope	0–20%
Water table depth	102–183 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	156-198 days
Freeze-free period (characteristic range)	194-223 days
Precipitation total (characteristic range)	635-762 mm
Frost-free period (actual range)	149-202 days
Freeze-free period (actual range)	190-225 days
Precipitation total (actual range)	635-813 mm
Frost-free period (average)	177 days
Freeze-free period (average)	206 days
Precipitation total (average)	686 mm

Climate stations used

- (1) COLDWATER [USC00141704], Coldwater, KS
- (2) BUFFALO 2 SSW [USC00341243], Buffalo, OK
- (3) WAYNOKA [USC00349404], Waynoka, OK
- (4) REYDON 2SSE [USC00347579], Reydon, OK
- (5) CLINTON [USC00341909], Clinton, OK
- (6) ERICK [USC00342944], Erick, OK
- (7) ALTUS AFB [USW00003981], Frederick, OK
- (8) OLNEY [USC00416636], Olney, TX
- (9) ROTAN [USC00417782], Rotan, TX
- (10) WINTERS 1 NNE [USC00419847], Winters, TX

Influencing water features

None.

Wetland description

NA

Soil features

Soils are mapped for each county within the MLRA. Mapunits are representations of the major soil series component(s) and named accordingly. Each Mapunit is spatially represented on a digital soils map as polygons of different shapes and sizes. Within these Mapunits, there are often minor soil series components included. These minor components are soils that occur within a Mapunit polygon but are of small extent (15% or less of the Mapunit area). However, it is difficult to separate these minor soils spatially due to the scale of soil mapping.

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

Representative soil components for this site include:

Altus, Arnett, Cobb, Cosh, Enterprise, Granfield, Hardeman, Miles, Shep, and Winters

The Sandy Loam ecological site contains very deep, moderately well, to well drained, moderately slowly to moderately rapidly permeable soils. Runoff is negligible on slopes less than 1 percent, very low to low on 1 to 5 percent slopes, and low to medium on 5 to 20 percent slopes.

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam
Family particle size	(1) Loamy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	102–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.57–20.07 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–12
Soil reaction (1:1 water) (0-101.6cm)	4.5–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–6%

Ecological dynamics

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

The reference plant community of the Sandy Loam Ecological Site is a Midgrass Prairie Community (1.1). 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). The frequent fires and the semi-arid climate kept woody species suppressed to less than five 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 the vegetation dramatically where brush control has not been practiced.

Historically, the vegetation on the site consisted mostly of warm-season bunchgrasses with few browse species and an abundance of forbs. Sideoats grama and little bluestem were the most abundant species and frequently co-dominants, contributing as much as 50 percent of the plant annual production. Other characteristic grasses found include sand bluestem, blue grama and plains bristlegrass. Texas wintergrass, Arizona cottontop and vine-mesquite were significant but lesser abundant grasses. See the Plant Composition and Annual Production Table below for estimated composition and production of the species assumed to have been present under reference conditions.

The Midgrass Prairie Community (1.1) was relatively stable and resilient within the herbivory, climate, soil and fire regime until the advent of animal husbandry and fencing in the late 1800s. Not understanding the limits of rangeland productivity most 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 sideoats grama and sand bluestem, a decline in mulch and organic matter and concurrently a reduction in frequency and intensity of fires. The shift in plant cover to less palatable and generally shorter grasses, and the decline in soil properties, favored woody plant encroachment. The woody and herbaceous invaders were generally endemic species, released from competition and fire suppression, although human activities supplied exotic species. Mesquite, pricklypear, and lotebush and are quick to invade the site under continuous heavy grazing. Juniper also invades in the southern and western portion of the MLRA. In the resulting Mixed-grass Community (1.2), sand bluestem and sideoats grama give way to more grazing resistant blue grama, buffalograss and other shortgrasses. Little bluestem increases initially, but decreases under continuous heavy grazing by cattle. Grass vegetation dominates annual herbage production, but the encroaching woody species increase in the proportion of production compared to the Midgrass Prairie Community (1.1).

Abusive grazing of the Mixed-grass Community (1.2) and reduction of the frequency and intensity of fires transitions the plant community into one that is increasingly occupied by woody plants. Droughts, which occur at approximately 20-year intervals in this region, magnify this situation. During the transition the more grazing resistant plants such as hooded windmillgrass, buffalograss, silver bluestem, perennial three-awns, dropseeds and less palatable forbs begin replacing the midgrasses. As the grass cover declines, litter, mulch and soil organic matter declines while bare ground, erosion and other desertification processes increase. The increasing woody dominants are primarily mesquite, lotebush and pricklypear. Juniper is a prominent invader in the western and southern portion of the MLRA. Rest from grazing and prescribed burning will generally not restore the grassland community once the woody plant community exceeds 15 percent canopy on this site and/or the plants reach maturity or fire resistant age. When this threshold occurs, the Mixed-grass Community (1.2) transitions into the Shortgrass/Mixed-brush Community (2.1). This threshold also marks the beginning of a new steady state, the Shrubland State.

Mesquite, pricklypear, lotebush and sometimes juniper dominate the Shortgrass/Mixed-brush Community (2.1). The grass component is a mixture of low palatability midgrasses, shortgrasses, low quality forbs and annuals. Cool-season grasses such as Texas wintergrass, Canada wildrye, and annuals increase. With continued livestock overgrazing, the better midgrasses are replaced by grazing resistant shortgrasses and forbs. The characteristic grasses in this community are buffalograss, hooded windmillgrass, sand dropseed, meadow dropseed and three-awns. Increaser forbs include western ragweed and gaura. In early stages (15-20% shrub cover) the encroachment of invasive species can be reversed with relatively inexpensive brush control practices such as individual plant treatments (IPT) and good grazing management that allows the application of prescribed burning. If these practices are not applied and overgrazing continues, the woody species will continue to increase in dominance and ground cover until the shrub cover reaches its maximum potential. Once the brush canopy exceeds 45 to 50 percent, annual production for the herbaceous species is limited to low quality shortgrasses and annuals within shrub interspaces. Texas wintergrass persists in and around shrubs. Cool-season annuals are abundant following wet winters. This Mixed-brush/Shortgrass/Annuals Community (2.2) produces only small and often variable amounts of useable livestock forage. Total biomass production is considerably less than reference community production due to erosion of soil fertility and structure during the desertification process that often occurs during the transition from grassland to shrubland.

Major high cost and high energy, accelerating practices are required to restore the Mixed-brush/Shortgrass/Annuals Community (2.2) back to a Grassland State. Generally, herbicidal brush management practices such as aerial spraying and/or individual plant treatments (IPT) along with other restoration 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.

State and Transition Diagram:
A State and Transition Diagram for the Sandy Loam (R078CY110TX) 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.

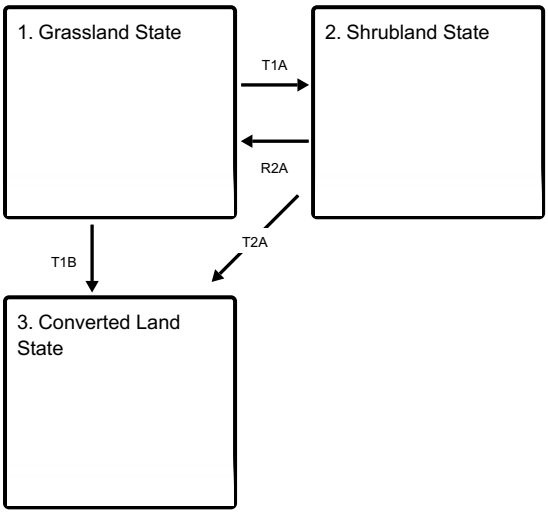
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every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

Ecosystem states



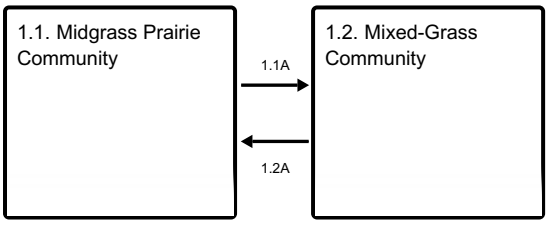
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T1B - Extensive soil disturbance followed by seeding

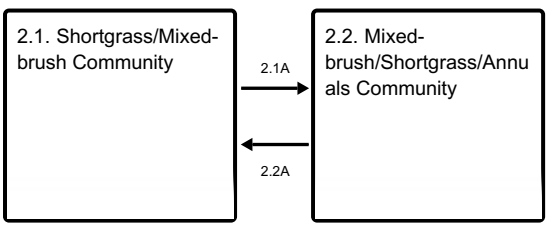
R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T2A - Extensive soil disturbance followed by seeding

State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities

3.1. Converted Land Community

State 1
Grassland State

This is the reference or diagnostic community for the site. The description is based on early range site descriptions, clipping data, professional consensus of experienced range specialists, and analysis of field work. The Midgrass Prairie Community (1.1) is the interpretive plant community for the Sandy Loam Prairie Ecological Site. A variety of midgrasses comprised most of the production. The historic plant community was characterized by sideoats grama and little bluestem. Arizona cottontop, plains bristlegrass and vine-mesquite were locally abundant. Tallgrasses occurred occasionally, with sand bluestem the most common. Sand dropseed, three-awns, hairy grama, fall witchgrass, sand dropseed, blue grama and buffalograss were common shortgrasses. Yucca, catclaw acacia, lotebush, sumac, wolfberry, plum and bumelia were infrequent shrubs. Gaura, dotted gayfeather, primrose, western ragweed, trailing ratany, Mexican sagewort, guara, and Engelmann's daisy were characteristic forbs. The Midgrass Prairie Community produced from 1,800 to 3,600 pounds of herbage annually. The Mixed-grass Community (1.2) is mixed-grass dominated grassland. Shrubby species are increasing in density. Typically, mesquite, lotebush and pricklypear are early and persistent invaders. Juniper often invades on the western side of the MLRA. The preferred tall and midgrasses are being replaced by the more grazing resistant meadow dropseed, sand dropseed, hooded windmillgrass, silver bluestem, buffalograss, blue grama and threeawns. Most of the historic grammas, bristlegrasses and feathery bluestems persist in this phase. The perennial forbs found in the historic climax are still present, although in lesser amounts. Annual grasses and forbs invade as ground cover increases and more soil is exposed to erosion. The encroaching woody species are generally less than three feet tall and subject to suppression by prescribed burning in combination with proper grazing management. The woody canopy varies between 5 and 15 percent. Annual primary production is reduced, ranging from 1200 to 3000 pounds per acre.

Community 1.1
Midgrass Prairie Community

The Midgrass Prairie Community (1.1) is the interpretive plant community for the Sandy Loam Prairie 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 droughts, which kept woody species in check. A variety of midgrasses comprised most of the production. The historic plant community was characterized by sideoats grama and little bluestem. Arizona cottontop, plains bristlegrass and vine-mesquite were locally abundant. Tallgrasses occurred occasionally, with sand bluestem the most common. Sand dropseed, three-awns, hairy grama, fall witchgrass, sand dropseed, blue grama and buffalograss were common shortgrasses. Yucca, catclaw acacia, lotebush, sumac, wolfberry, plum and bumelia were infrequent shrubs. Gaura, dotted gayfeather, primrose, western ragweed, trailing ratany, Mexican sagewort, guara, and Engelmann's daisy were characteristic forbs. The Midgrass Prairie Community produced from 1,800 to 3,600 pounds of herbage annually, depending upon soil property and the amount of precipitation. Severe extended drought conditions could reduce this amount even further. Grasses produced as much as 90 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 occurred and good soil-moisture relationships allowed for high vegetative production during good moisture years. The Midgrass Prairie Community furnished 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 Mixed-grass Community (1.2) with invading shrubs becoming established. The tallgrasses give way to little bluestem and various midgrasses initially. With continued overgrazing, shortgrasses and unpalatable species replace the historic dominants and woody plants invade. 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	1816	2724	3632
Forb	101	151	202
Shrub/Vine	101	151	202
Tree	–	–	1
Total	**2018**	**3026**	**4037**

Figure 9. Plant community growth curve (percent production by month). TX2280, Midgrass Prairie Community. Warm-season native grassland with some cool-season grasses..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	6	15	25	20	5	3	12	7	2	1

Community 1.2
Mixed-Grass Community

Figure 10. 1.2 Mixed-Grass Community

The Mixed-Grass Community (1.2) is mixed-grass 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. 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, lotebush and pricklypear are early and persistent invaders. Juniper often invades on the western side of the MLRA. The preferred tall and midgrasses are being replaced by the more grazing resistant meadow dropseed, sand dropseed, hooded windmillgrass, silver bluestem, buffalograss, blue grama and threeawns. Most of the historic grammas, bristlegrasses and feathery bluestems persist in this phase. The perennial forbs found in the reference community are still present, although in lesser amounts. Annual grasses and forbs invade as ground cover increases and more soil is exposed to erosion. The encroaching woody species are generally less than three feet tall and subject to suppression by prescribed burning in combination with 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, ranging from 1200 to 3000 pounds per acre depending on precipitation amounts and the soil series. Grasses remain the dominant producers of forage. Heavy continuous grazing has reduced plant cover, litter and mulch and increased bare ground exposing the soil to erosion. Mulch and litter movement during rainstorms is possible, especially on steeper slopes. The changes in species composition are small initially. However, unless proper grazing and prescribed burning are applied, the invading woody 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 Mixed-Grass Community (1.2) then becomes the Shortgrass/Mixed-brush 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	1076	1793	2690
Shrub/Vine	188	314	471
Forb	67	112	168
Tree	13	22	34
Total	**1344**	**2241**	**3363**

Figure 12. Plant community growth curve (percent production by month). TX2284, Mixedgrass Prairie with Forbs . Warm-season rangeland with some cool-season species along with some shrubs and trees component..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	5	15	25	20	4	5	15	5	2	1

Pathway 1.1A
Community 1.1 to 1.2

With continuous overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions into a Mixed-grass Community (1.2) with invading shrubs becoming established.

Pathway 1.2A
Community 1.2 to 1.1

The retrogression is reversible to the Midgrass Prairie Community, however, with good grazing management that provides a competitive advantage to the grass component and provides fine fuels for periodic prescribed fires.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Shortgrass/Mixed-brush Community supports a 15 to 30 percent woody plant canopy with mesquite, lotebush, pricklypear and yucca the most common shrubs. Mesquite generally dominates although juniper can be locally dominant. There is a decline in diversity of the grassland component and an increase in woody species. Annual herbage production is reduced to approximately 1000 to 2800 pounds per acre. The Mixed-brush/Shortgrass/Annuals Community is a shrubland with mesquite generally dominates, but pricklypear, lotebush, yucca, and catclaw acacia are common. With continued heavy grazing and no brush control, the shrubs can approach 75 percent or more ground cover. Shortgrasses and low seral stage annual and perennial forbs occupy the woody plant interspaces.

Community 2.1
Shortgrass/Mixed-brush Community

Figure 13. 2.1 Shortgrass/Mixed-brush Community

The Shortgrass/Mixed-brush Community supports a 15 to 30 percent woody plant canopy with mesquite, lotebush, pricklypear and yucca the most common shrubs. Mesquite generally dominates although juniper 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 1000 to 2800 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 historic grasses and forbs and unpalatable invaders occupy the interspaces between shrubs. Texas wintergrass, bristlegrass, plus other grazing resistant historic 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 buffalograss, blue grama, silver bluestem, sand and meadow dropseed, three-awns, western ragweed and a variety of annuals. An extended period of above average winter precipitation brings increases in cool season species such as Texas wintergrass. Unless brush management and good grazing management are applied during this phase, the transition toward a dense shrubland the Mixed-Brush/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 proper 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)
Grass/Grasslike	740	1233	1849
Shrub/Vine	404	673	1009
Forb	135	224	336
Tree	67	112	168
Total	**1346**	**2242**	**3362**

Figure 15. Plant community growth curve (percent production by month). TX2285, Shortgrass/Mixedbrush Community. Shortgrasses, annual grasses and shrubs dominate the plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	6	15	24	18	3	5	15	7	2	1

Community 2.2
Mixed-brush/Shortgrass/Annuals Community

Figure 16. 2.2 Mixed-brush/Shortgrass/Annuals Community

The Mixed-brush/Shortgrass/Annuals Community is a shrubland resulting from many years of overgrazing, lack of periodic fires and little brush management. Mesquite generally dominates, but pricklypear, lotebush, yucca, and catclaw acacia are common. With continued heavy grazing and no brush control, the shrubs can approach 75 percent or more ground cover. Shortgrasses and low seral stage annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are Texas wintergrass, hooded windmillgrass, fall witchgrass, sand dropseed and silver bluestem. Forbs commonly found in this community include gaura, western ragweed, Mexican sagewort, dotted gayfeather, purple groundcherry and silverleaf nightshade. Grasses and forbs make up 30 percent or less of the annual herbage production. The Mixed-brush/Shortgrass/Annuals Community 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 Mixed-brush/Shortgrass/Annuals Community (2.2) back to a 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	1020	1603	2331
Grass/Grasslike	392	616	897
Forb	78	123	179
Tree	78	123	179
Total	**1568**	**2465**	**3586**

Figure 18. Plant community growth curve (percent production by month). TX2278, Mixed-Brush/Annuals/Cool-season Grasses. Warm-season mixed-brush species, shortgrasses, and cool-season annuals..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	12	17	21	16	3	4	12	5	2	1

Pathway 2.1A
Community 2.1 to 2.2

Shortgrass/Mixed-brush Community

Mixed-brush/Shortgrass/Annuals Community

Unless brush management and good grazing management are applied during this phase, the transition toward a dense shrubland the Mixed-brush/Shortgrass/Annuals Community (2.2) will continue.

Pathway 2.2A
Community 2.2 to 2.1

Mixed-brush/Shortgrass/Annuals Community

Shortgrass/Mixed-brush Community

The trend toward dense shrubland cannot be reversed with good grazing management alone. Accelerated brush management practices along with proper grazing are required to return this plant type to grassland.

Conservation practices

Brush Management
Prescribed Grazing

State 3
Converted Land State

The Converted Land Community has been cultivated for cropland or pastureland purposes. Small grain or forage sorghum may be cropped. Permanent native and introduce pasture may also be planted. Sometimes the community may be abandoned and let “go back” to native species encroached by woody species.

Community 3.1
Converted Land Community

The Sandy Loam Prairie Ecological Site, with its productive soils, is often converted (3.1) and planted to crops. Technical advice as to adapted crops, cropping systems, production, and cultivation practices are available from local NRCS or Extension Service offices. When abandoned from cropping, the site should be re-vegetated with adapted native plant mixtures, which include reference community species. Cultivation and erosion may have reduced soil productivity but near historic forage production may be obtained with a native plant mix that approximates the species composition of the reference plant community. Introduced species often require more care, but can also be productive as pasture. In any case brush management is required to prevent brush invasion from adjacent areas. If fields are abandoned and left to re-vegetate naturally, weedy grasses, forbs and shrubs will be the first species in secondary succession. Even without grazing, woody species will encroach and eventually dominate unless brush management practices such as individual plant treatments (IPT) and prescribed burning are applied.

Figure 19. Plant community growth curve (percent production by month). TX2252, Small Grains. Cool-season small grain crops..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	5	10	10	5	0	0	0	20	25	15	5

Figure 20. Plant community growth curve (percent production by month). TX2264, Warm-season Pasture Grasses. warm-season pasture grasses having nutrient management, pest management, and prescribed grazing..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	5	12	25	20	5	5	14	8	2	1

Transition T1A
State 1 to 2

Due to heavy continuous grazing, no brush management, and no fires to keep the brush species in check, the Grassland State will transition into the Shrubland State.

Transition T1B
State 1 to 3

The transition to the Converted Land State occurs when crop cultivation practices, plowing, range planting, pasture planting, pest management, and nutrient management are applied to cropland, pastureland or go back land.

Restoration pathway R2A
State 2 to 1

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

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T2A
State 2 to 3

The transition to the Converted Land State occurs when crop cultivation practices, plowing, range planting, pasture planting, pest management, and nutrient management are applied to cropland, pastureland or go back land.

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					
0	**Tallgrass**			404–807	
1	**Midgrass**			504–1009	
	sideoats grama	BOCU	*Bouteloua curtipendula*	504–1009	–
2	**Tallgrasses**			90–191	
	sand bluestem	ANHA	*Andropogon hallii*	90–151	–
	switchgrass	PAVI2	*Panicum virgatum*	90–151	–
	Indiangrass	SONU2	*Sorghastrum nutans*	90–151	–
3	**Midgrasses**			404–807	
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	404–807	–
	Arizona cottontop	DICA8	*Digitaria californica*	404–807	–
	vine mesquite	PAOB	*Panicum obtusum*	404–807	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	404–807	–

	bristlegrass				
4	**Shortgrasses**			303–594	
	buffalograss	BODA2	*Bouteloua dactyloides*	90–336	–
	blue grama	BOGR2	*Bouteloua gracilis*	90–336	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	56–224	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	56–168	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	11–56	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	11–56	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	11–56	–
	fall witchgrass	DICO6	*Digitaria cognata*	11–56	–
	threeawn	ARIST	*Aristida*	11–56	–
5	**Cool-season Grasses**			112–224	
	Canada wildrye	ELCA4	*Elymus canadensis*	50–112	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	50–112	–
Forb					
6	**Forbs**			101–202	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–22	–
	flat-top pussytoes	ANCO	*Antennaria corymbosa*	0–22	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–22	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–22	–
	aster	ASTER	*Aster*	0–22	–
	rose heath	CHER2	*Chaetopappa ericoides*	0–22	–
	dayflower	COMME	*Commelina*	0–22	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–22	–
	beeblossom	GAURA	*Gaura*	0–22	–
	Dakota mock vervain	GLBIB	*Glandularia bipinnatifida var. bipinnatifida*	0–22	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–22	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–22	–
	dotted blazing star	LIPU	*Liatris punctata*	0–22	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0–22	–
	blazingstar	MENTZ	*Mentzelia*	0–22	–
	Florida mimosa	MIQUF	*Mimosa quadrivalvis var. floridana*	0–22	–
	cutleaf evening primrose	OELA	*Oenothera laciniata*	0–22	–
	groundcherry	PHYSA	*Physalis*	0–22	–
	white milkwort	POAL4	*Polygala alba*	0–22	–
	Chinese lantern	QULO2	*Quincula lobata*	0–22	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	0–22	–
	copper globemallow	SPAN3	*Sphaeralcea angustifolia*	0–22	–
	pricklyash	ZANTH	*Zanthoxylum*	0–22	–
Shrub/Vine					
7	**Shrubs/Vines**			101–202	
	plum	PRUNU	*Prunus*	13–56	–
	sumac	RHUS	*Rhus*	13–56	–

	yucca	YUCCA	*Yucca*	13–56	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	13–56	–
	bully	SIDER2	*Sideroxylon*	13–22	–
	acacia	ACACI	*Acacia*	13–22	–
	desert-thorn	LYCIU	*Lycium*	13–22	–
	algerita	MATR3	*Mahonia trifoliolata*	13–22	–
Tree					
8	**Tree**			0–1	
	hackberry	CELTI	*Celtis*	0–1	–

Animal community

Many types of grassland insects, reptiles, birds and mammals used the Sandy Loam ecological Site along with 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, 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 deer and antelope utilize the Sandy Loam Prairie site in its various states.

The site is suitable for production of many kinds of wildlife and livestock. In the grassland state it is suited to primary grass eaters such as cattle. As livestock caused retrogression occurs and woody plants invade it becomes better habitat for sheep, goats, deer and other wildlife because of the browse and forbs. Livestock should be stocked according to the available grass, forb and browse forage, keeping competition for forbs and browse with deer in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the Mixed-Brush/Shortgrass/Annuals Community will eventually have little to offer as habitat except cover.

Hydrological functions

The Sandy Loam Ecological Site consists of nearly level to moderately sloping fine sandy loam soils. The soils are well drained and have moderate to permeability. Wind and water erosion can occur where the site is not protected by vegetation. Some soils are eroded. Natural fertility and organic matter is medium. Water holding capacity varies from low to high depending on soil series. The rooting zone is shallow on Cosh soil, moderate on Cobb soils and deeper than 60 inches on all other soils of the site.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall. Hydrologic functions were representative of a midgrass prairie. Litter and soil movement was slight. However, standing plant cover, duff and soil organic matter decrease as the Midgrass Prairie Community (1.1) transitions to the Mixed-grass Community (1.2) and continue to decline in the spaces between the shrubs of the Shortgrass/Mixed-brush Community (2.1). During the transition, evaporation and interception losses are higher, resulting in less moisture reaching the soil. Fertility erosion takes place between shrubs. Biomass production is reduced relative to HCPC 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 may some 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 Mixed-brush/Shortgrass/Annuals Community (2.2) canopy surpasses 50 percent the hydrological and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy and shrubland type ecological processes dominate.

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

Posts and novelty products are possible using mesquite, juniper and shrubs.

Other products

Jams and jelly are sometimes made from agarito and pricklypear fruits and honey bees used to make honey from flowering plants.

Other information

None.

Inventory data references

Information presented has been derived from the revised Sandy Loam Range Site PE 30-38 and an undated NRCS draft Ecological Site Description for Sandy Loam PE 31-44 78C, literature, personal experience, field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster.

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. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20

3. Thurow T.L., 1991. Hydrology and erosion. Chapter 6 in: Grazing Management: An Ecological Perspective Edited by: R.K. Heischmidt and J.W. Stuth. Timber Press, Portland, Oregon.
4. USDA/NRCS Soil Survey Manuals for Knox, Wilbarger, Baylor, Foard, Jones and Haskell Counties, Texas.
5. Plant symbols, common names and scientific names according to USDA/NRCS Texas Plant List (Unpublished)
6. Bestelmeyer, B. T., J.R. Brown, K. M. Havsted, R. Alexander, G. Chavez and J. E. Hedrick. 2003. Development and use of state-and-transition models for rangelands. J. Range Management. 56(2): 114-126.
7. Hamilton W. and Darrell Ueckert. 2005. Rangeland Woody Plant Control--Past, Present, and Future.Ch 1 in: Brush Management-Past, Present, and Future. Texas A & M University Press. Pp.3-16.
8. Milchunas, D.G. 2006. Responses of Plant Communities to grazing in the southwestern United States. USDA-Forest Service. Rocky Mtn. Sta. GTR. 169

Special thanks to the following NRCS personnel for assistance and guidance with development of this ESD: Reggie Quiett and Cody Bauman NRCS, Vernon, Texas, Melissa Teague NRCS Hollis, OK. Mark Moseley NRCS, San Antonio, Texas and Justin Clary NRCS Temple, Texas.

Contributors

Joe B. Norris, State Range Conservationist, NRCS, Abilene, Texas
Joe Norris
Joseph Schuster, Range & Wildlife Habitat, Bryan, Texas
PES Edits by Tyson Morley, MLRA Soil Scientist, Altus, Oklahoma

Approval

Bryan Christensen, 9/15/2023

Acknowledgments

Site Development and Testing Plan
Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site

Description is needed. This will include field activities to collect low, medium and high intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document.
Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Lem Creswell, Zone RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	12/20/2007
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:** Water flow patterns are common and follow old stream meanders. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events.

---

3. **Number and height of erosional pedestals or terracettes:** None to slight. Uncommon for this site.

---

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

---

5. **Number of gullies and erosion associated with gullies:** Some gullies may be present on side drains into perennial and intermittent streams. Gullies should be vegetated and stable.

---

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

---

7. **Amount of litter movement (describe size and distance expected to travel):** Under normal rainfall, little litter movement should be expected, however, litter of all sizes may move long distances depending on obstructions under intense storm events.

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is resistant to erosion. Stability class range is expected to be 5 to 6.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0 to 8 inches thick dark grayish brown fine sandy loam with weak granular structure. SOM is approximately 1-6%. See soil survey for specific soils information.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savannah of trees, shrubs, vines, grasses and forbs along with adequate litter and little bare ground provides for maximum infiltration and little runoff under normal rainfall events.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** No evidence of compaction under HCPC.

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Warm-season tallgrasses >>

    Sub-dominant: Warm-season midgrasses > Cool-season grasses = Forbs = Shrubs/Vines >

    Other: Trees

    Additional:

---

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

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1800 - 3600 lbs/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:** Mesquite, pricklypear, lotebush, curlycup gumweed, annual broomweed, redberry juniper.

---

17. **Perennial plant reproductive capability:** All perennial plants should be capable of reproducing except during periods of

prolonged drought conditions, heavy natural herbivory or wildfires.