

Ecological site R078CY097TX Claypan 23-30" PZ

Last updated: 9/15/2023

Accessed: 05/21/2025

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. Vegetation consists of native grasses and shrubs with scattered infestations of mesquite. Current land uses are rangeland, pastureland, wildlife habitat, and cropland. Dryland crops include cotton, wheat, and grain sorghum.

LRU notes

NA

Associated sites

R078CY099TX	Draw 23-30" PZ Draw site often runs through Claypan Prairie site and serves as a drainage downslope.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Bouteloua curtipendula</i> (2) <i>Panicum obtusum</i>

Physiographic features

The Claypan Prairie 23-30" PZ was formed in clayey slope wash alluvium and/or clayey residuum derived from red bed clays and shales. These soils are on nearly level or very gently sloping plains and broad treads of ancient terraces on uplands. Slope gradients are mostly less than 1 percent, but some are as much as 3 percent. Elevation ranges from 900 to 2200 feet.

Table 2. Representative physiographic features

Landforms	(1) Plains > Plain (2) Plains > Hill (3) Plains > Pediment
Runoff class	High to very high
Flooding frequency	None
Ponding frequency	None
Elevation	900–2,200 ft
Slope	0–3%
Water table depth	60–72 in
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. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall.

This region lies in the path of polar air masses that move down from the north during the winter. With the passage of cold fronts during the fall and winter, abrupt temperature drops sometimes occur. While the area is subject to a wide range of temperature, winters are generally mild. Low humidity and good wind movements characterize the summers.

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.

Normal rainfall averages 23 to 30 inches a year but distribution of rainfall patterns are so erratic short dry periods are common. The majority of the rainfall occurs as showers, rather than general rain events between March and November. Dry periods of three to four weeks can be expected during this time as well. Even if these dry conditions occur, complete crop failures seldom results. May is the wettest month and December is the driest. Effective precipitation is low due to high temperatures, amounts received and intensity.

Table 3. Representative climatic features

Frost-free period (characteristic range)	198-202 days
Freeze-free period (characteristic range)	224-230 days
Precipitation total (characteristic range)	28-30 in
Frost-free period (actual range)	198-205 days
Freeze-free period (actual range)	223-232 days
Precipitation total (actual range)	26-31 in
Frost-free period (average)	201 days
Freeze-free period (average)	227 days
Precipitation total (average)	29 in

Climate stations used

- (1) ALTUS AFB [USW00003981], Frederick, OK
- (2) LAKE KEMP [USC00414982], Seymour, TX

- (3) OLNEY [USC00416636], Olney, TX
- (4) WICHITA FALLS MUNI AP [USW00013966], Sheppard AFB, TX

Influencing water features

None.

Wetland description

NA

Soil features

The soils in the Claypan Prairie 23-30" PZ ecological sites are deep to very deep. Moderately well to well drained; runoff is low to high on slopes less than 1 percent and medium to very high on slopes of 1 to 3 percent; slow to moderate runoff; and slow to very slow permeability. Where irrigated, the water table may be 4 to 7 feet below the surface.

Associated soil series include: Deandale, Kamay, and Kirkland.

Table 4. Representative soil features

Parent material	(1) Alluvium–shale
Surface texture	(1) Silt loam
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to slow
Soil depth	76–80 in
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	5–8 in
Calcium carbonate equivalent (0-40in)	0%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	6.1–7.8

Subsurface fragment volume <=3" (Depth not specified)	0–4%
Subsurface fragment volume >3" (Depth not specified)	0%

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 Claypan Prairie Ecological Site in MLRA (Major Land Resource Area) 78C is a Midgrass Prairie Community (1.1) . Pre-settlement disturbances which shaped the site included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, severe droughts and frequent fires. Wildfires are thought to have occurred at 4 to 6 years intervals in this region (Frost 1998).

The frequent fires, weather patterns and relatively frequent droughts favored grasses over woody plants, but there was a wide diversity of forbs present. Sideoats grama and vine-mesquite were the dominant species throughout the MLRA contributing as much as 40 percent of the annual production. Other characteristic grasses in the historic climax community include Arizona cottontop, tall and meadow dropseed, Texas wintergrass and western wheatgrass. Buffalograss and blue grama were characteristic Shortgrass. See the Plant Composition and Annual Production Table below for estimated composition of the reference community species.

The Midgrass Prairie Community (1.1) was relatively stable and resilient within the climate, grazing and fire regimes until European settlement in the mid to late 1800's brought animal husbandry and fencing. With private land ownership, fencing and development of windmills in the 1880's overstocking with domesticated livestock was almost universal. As overgrazing occurred on the Claypan Prairie site, there was a reduction of palatable grasses and forbs, a reduction in intensity and frequency of fires. The frequency and intensity of fires was reduced because of less fire fuel and fire suppression. As regression progressed with overgrazing, the highly palatable grasses and forbs were gradually replaced by less palatable or more grazing resistant species. Sideoats grama and vine mesquite generally declined. Blue grama generally persisted while buffalograss, Texas wintergrass, unpalatable forbs increased in density and composition.

The shift in plant cover and decline in soil properties favored woody plant encroachment. In the resultant Mixed-grass Prairie Community (1.2) the woody and herbaceous invaders were generally endemic species released from competition and fire suppression. Midgrass and shortgrass species dominated annual herbage production, but the encroaching woody

species increased in the proportion of production compared to the Midgrass Prairie Community (1.1).

When the Mixed-grass Community (1.2) is continually overgrazed and fire is excluded, ecological succession transitions the plant community into one that is dominated by woody plants. This process is amplified by droughts that occur at approximately 20-year intervals in the region. More grazing resistant grasses such as buffalograss, blue grama, meadow dropseed, silver bluestem, white tridens, Texas wintergrass and less palatable forbs begin replacing sideoats grama and vine-mesquite and palatable forbs.

As the midgrass cover declines, litter, mulch and soil organic matter decline and bare ground, erosion and other desertification processes increase. The microclimate in the grassland areas becomes more arid. The invading woody dominants are primarily mesquite, pricklypear and lotebush. Proper stocking or 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 fire resistant age (two years) and/or size (about four feet in height). When this threshold is breached, the plant community transitions into a Shortgrass/Mixed-brush Community (2.1). This threshold also marks the beginning of a new state; a Shrubland State (2) in which woody species dominant the site.

Mesquite generally dominates the Shortgrass/Mixed-brush Community (2.1) with pricklypear and lotebush being common. The grass component is a mixture of low palatability midgrasses, Shortgrass and forbs. With continued livestock overgrazing, the palatable midgrasses are replaced by grazing resistant species such as buffalograss, white tridens, meadow dropseed, western ragweed and. Cool-season grasses such as Texas wintergrass and annual brome also increase, especially during wet cycles. Exposed soil in open spaces crusts readily, subjecting the site to erosion.

With continued abusive grazing the transition of the Shortgrass/Mixed-brush Community (2.1) toward dense mesquite shrubland will continue. However, during this stage the transition to a mesquite dominated community can be reversed, or the type maintained. Relatively inexpensive brush control practices and prescribed grazing management that sets up the application of prescribed burning is needed. If these practices are not applied and overgrazing continues, the woody canopy will continue to increase in dominance and ground cover and a woody-plant dominated community, the Mixed-brush/Shortgrass/Annuals Community (2.2) will occur. Once the brush canopy exceeds 30 to 35 percent, annual production for the understory becomes limited and is generally made up of unpalatable shrubs, grasses and forbs between and under the shrubs. Brushy species such as mesquite, prickly pear, and lotebush dominate production. Shortgrass, cool-season grasses and annuals persist, but in weakened condition.

The Mixed-brush/Shortgrass/Annuals Community (2.2) will persist even without livestock grazing. Major high cost and high energy accelerated management practices are required to restore it back to the Grassland State. Generally, mechanical or herbicidal brush

management practices such as aerial spraying, dozing 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 a grassland state. Regular maintenance practices will be required to maintain the grassland state.

The soils of the Claypan Ecological Site are deep and slowly to very slowly permeable. They are underlain by blocky, clayey sub-soils and tend to be droughty. Overflow water from adjacent sites or during heavy rainfall events are of little benefit because of the very slowly permeable subsoil. Production during drought is very limited. The Claypan Prairie site is suited primarily for range, but many acres have been put under cultivation. However, many acres previously cultivated for crops have been returned to native or introduced grass species and are managed as pasture or range.

State and Transition Diagram:

A State and Transition Diagram for the R078CY097TX (Claypan) 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.

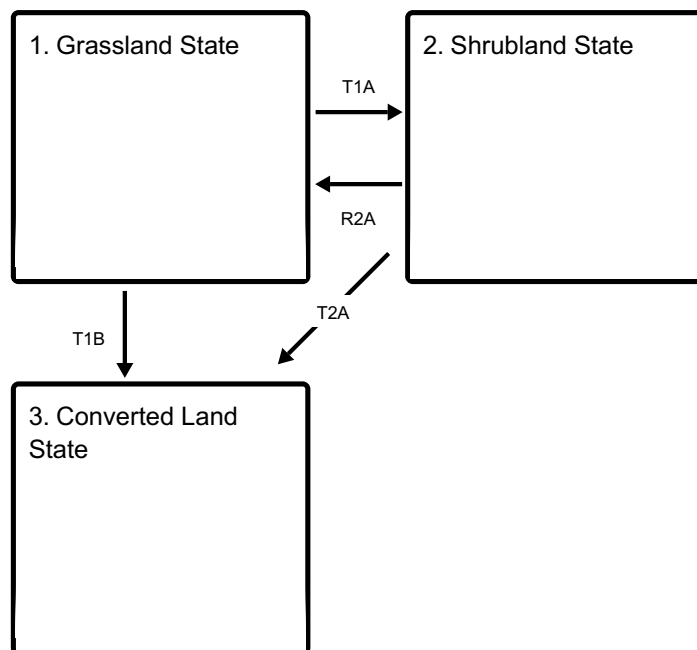
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every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



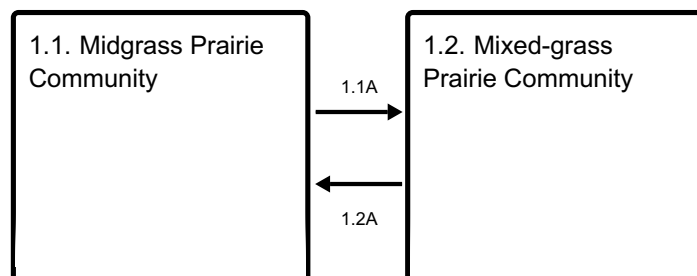
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T1B - Extensive soil disturbance followed by seeding

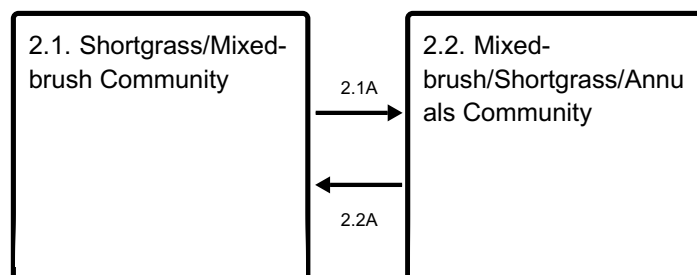
R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

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

The Midgrass Prairie Community (1.1) is the interpretive plant community for the Claypan 23-30" PZ Ecological Site. The site developed as a treeless prairie with few scattered shrubs. Lotebush and ephedra were typical, but infrequent, shrubs. Vine-mesquite occupied favorable micro-sites and was locally dominant. Sideoats grama was the dominant or co-dominant grass throughout the site. Alkali sacaton was prevalent where salt spots occurred in depressions. Blue grama and buffalograss were the most common shortgrasses. Characteristic forbs found on the site include Engelmann daisy, dotted gayfeather, catclaw sensitivebriar, heath aster, western ragweed, and Louisiana sagewort. It is estimated that the Midgrass Prairie Plant Community produced from 1500 to 3000 pounds of biomass annually and that grasses produced as much as 95 percent of the annual production. The Mixed-grass Prairie Community (1.2) is a mixed midgrass and shortgrass dominated grassland being encroached by indigenous or invading woody species that had been held at low densities by repeated fires and competition from a vigorous grass component. The preferred midgrasses, such as sideoats grama and vine-mesquite, are being replaced by the more grazing resistant grasses such as buffalograss, blue grama and Texas wintergrass. Numerous brushy species, including mesquite and pricklypear, are encroaching because overgrazing by livestock has reduced grass cover, exposed more soil and reduced fine fuel for fire. Mesquite is generally less than three feet tall and still subject to suppression by fire. The woody canopy varies between 5 and 15 percent depending on impact of grazing on herbaceous species, time since burned and availability of invading species. Forage production in the Mixed-grass Prairie Community (1.2) is still predominantly grass. Annual production has declined and averages from 1000 to 2,500 pounds per acre.

Community 1.1 Midgrass Prairie Community



Figure 8. 1.1 Midgrass Prairie Community

The Midgrass Prairie Community (1.1) is the interpretive plant community for the Claypan 23-30" PZ Ecological Site. It represents the presumed Historical Climax Plant Community found on the site before European settlement of the region. It developed over time along with the soils under a dry, sub-humid climate with hot dry summers and mild winters. Herbivory by migrating bison and indigenous antelope and deer influenced the plant composition and structure, but not as much as droughts and wildfires, which limited woody species encroachment. The site developed as a treeless prairie with few scattered shrubs. Lotebush and ephedra were typical, but infrequent, shrubs. Vine-mesquite occupied favorable micro-sites and was locally dominant. Sideoats grama was the dominant or co-dominant grass throughout the site. Alkali sacaton was prevalent where salt spots occurred in depressions. Also occurring on the site, but in smaller amounts were Arizona cottontop, tall and meadow dropseed, silver bluestem, western wheatgrass and Texas wintergrass. Blue grama and buffalograss were the most common Shortgrass with lesser amounts of threeawn and sand dropseed. Characteristic forbs found on the site include Engelmann daisy, dotted gayfeather, green thread, catclaw sensitivebrier, heath aster, western ragweed, Louisiana sagewort, and anemone and curlycup gumweed. It is estimated that the Midgrass Prairie Community produced from 1,500 to 3,000 pounds of biomass annually, depending upon the soils and the amount of precipitation. Grasses produced as much as 95 percent of the annual production. The vegetation of the site was seasonally well balanced because of the presence of cool-season species, which tended to increase during wet years. A good cover of grasses and mulch aided in the infiltration of rainfall into the soil but due to the dense clay subsoil water seldom penetrated past the 20-inch depth. Some runoff occurred from steeper slopes during intense rainfall events because of the claypan. The Midgrass Prairie Community furnished good habitat for grazing type wildlife such as bison and pronghorn antelope and, in recent times, cattle. Historically, bison preferred the Claypan Prairie site. Livestock now often abuses it unless good grazing management is practiced. This plant community is productive but the site tends to be droughty because of the Claypan soil. With abusive grazing, a decrease in intensity and frequency of fires and no brush management, this plant community

transitions into a Mixed-grass Prairie Community (1.2).

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1450	2137	2850
Forb	75	113	150
Tree	0	0	0
Shrub/Vine	0	0	0
Total	1525	2250	3000

Figure 10. 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 Prairie Community



Figure 11. 1.2 Mixed-grass Prairie Community

The Mixed-grass Prairie Community (1.2) is the result of abusive grazing by livestock. It is a mixed midgrass and shortgrass dominated grassland being encroached by indigenous or invading woody species that had been held at low densities by repeated fires and competition from a vigorous grass component. The preferred midgrasses, such as sideoats grama and vine-mesquite, are being replaced by the more grazing resistant grasses such as buffalograss, blue grama and Texas wintergrass. Numerous brushy species, including mesquite and pricklypear, are encroaching because overgrazing by

livestock has reduced grass cover, exposed more soil and reduced fine fuel for fire. In this stage the invading woody plants are small and just becoming established. Mesquite is generally less than three feet tall and still subject to suppression by fire. The woody canopy varies between 5 and 15 percent depending on impact of grazing on herbaceous species, time since burned and availability of invading species. Mesquite, pricklypear, tasajillo and lotebush are characteristic invading shrubs. Most of the historic perennial grasses and forbs persist, but less palatable and weedy species increase in the composition. Annual broomweed and western ragweed are often present. Annual broomweed can be cyclic, responding to fall rains and mild winters, even with reasonable grass cover. Forage production in the Mixed-grass Prairie Community (1.2) is predominantly grass. Annual production has declined and averages from 1000 to 2,500 pounds per acre, depending on precipitation. The reduction is due to less plant density and vigor, smaller plant structure and the shift to shallower rooting species. Heavy continuous grazing has reduced plant cover, litter and mulch and has increased bare ground slightly exposing the soil to some erosion. The exposed soil crusts readily. The dense clay subsoil and slow permeability of the surface soil reduce the ability of the site to absorb intense rainfall events. Therefore, there could be some mulch and litter movement during heavy rainstorms. Unless proper grazing and prescribed burning are initiated at this stage, the woody species continue to increase in maturity, size and density and the grassland component declines in density and vigor. When the canopy of the woody plants becomes dense enough (15-20 % canopy) and big enough (greater than four feet) to suppress grass growth and resist fire damage, a threshold in ecological succession is reached. At this threshold the Mixed-grass Prairie Community (1.2) transitions into the Shortgrass/Mixed-brush Community (2.1). Once the Shortgrass/Mixed-Brush (2.1) type occurs, range management practices such as proper grazing and prescribed burning, cannot reverse the trend toward woody plant dominance.

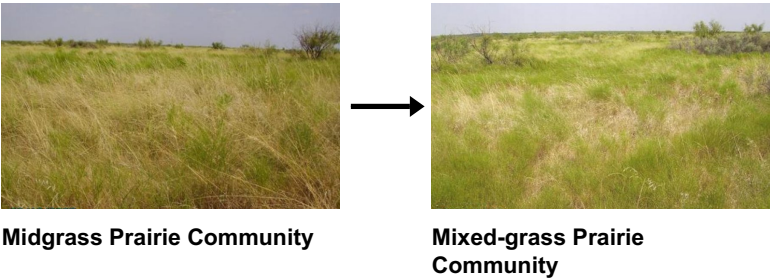
Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	800	1440	2000
Shrub/Vine	150	270	375
Forb	50	90	125
Tree	0	0	0
Total	1000	1800	2500

Figure 13. Plant community growth curve (percent production by month). TX2281, Mid/Shortgrass with Invading Shrubs. Warm-season native grassland with some cool-season grasses and invading shrubs approaching 15% composition..

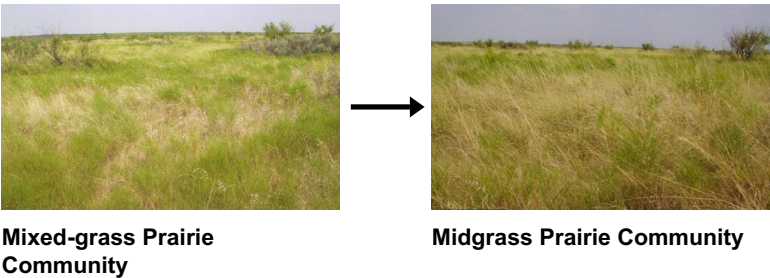
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	5	5	15	20	15	5	5	12	7	5	3

Pathway 1.1A
Community 1.1 to 1.2



With heavy continuous grazing, no fires, brush invasion and no brush management, the Midgrass Prairie Community will shift to the Mixed-grass Prairie Community.

Pathway 1.2A
Community 1.2 to 1.1



With Prescribed Grazing and Prescribed Burning conservation practices implemented, the Mixed-grass Prairie Community can be reverted back to the Midgrass Prairie Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

Shortgrass/Mixed-brush Community (2.1) has a 15 to 35 percent woody plant canopy of mixed-brush. Mesquite is the dominant woody species while pricklypear and lotebush are the most common smaller shrubs. Mesquite is an early increaser throughout the MLRA. Typically, pricklypear, lotebush and tasajillo have also increased in density and frequency in this vegetation type. Remnants of historic climax grasses and forbs and unpalatable invaders occupy the interspaces between trees and shrubs. Cool-season grasses such as Texas wintergrass and annual brome can be found under and around woody plants. Characteristic forbs are heath aster, western ragweed, silverleaf nightshade and annual broomweed. Total plant production declines somewhat, being approximately 900 to 2,300 pounds per acre. The Mixed-brush/Shortgrass/Annuals Community is a dense shrubland dominated by mesquite. Common understory shrubs are pricklypear, lotebush, and

pricklypear. With time and continued heavy grazing and no brush control, the mesquite will become tree-like and approach 75 percent or more canopy cover. Texas wintergrass, shortgrasses and low quality annual and perennial forbs are found under and around the woody species. Characteristic grasses are meadow and sand dropseed, hairy tridens, tumble lovegrass and three-awns. Forbs include heath aster and silverleaf nightshade. Cool-season annuals such as Japanese brome and annual broomweed grow profusely during wet springs. Herbaceous plants produce less than 25 percent of the annual production. Total annual production ranges from 800 to 2200 pounds per acre.

Community 2.1

Shortgrass/Mixed-brush Community



Figure 14. 2.1 Shortgrass/Mixed-brush Commu

Shortgrass/Mixed-brush Community (2.1) has a 15 to 35 percent woody plant canopy of mixed-brush. Mesquite is the dominant woody species while pricklypear and lotebush are the most common smaller shrubs. The Shortgrass/Mixed-brush Community is the result of selective overgrazing by livestock and deer and the differential response of plants to defoliation over a long period of time. Fire has diminished as a disturbance factor because of suppression and a paucity of fine fuel available for hot fires. Plant composition and production has shifted toward the non-grass component as selective grazing reduces preferred species. Annual herbaceous production is reduced in the grassland component due to excessive defoliation and decline in soil fertility and structure. All, except the more palatable woody species, have increased in size and density. Mesquite is an early increaser throughout the MLRA. Typically, pricklypear, lotebush and tasajillo have also increased in density and frequency in this vegetation type. Remnants of historic climax grasses and forbs and unpalatable invaders occupy the interspaces between trees and shrubs. Cool-season grasses such as Texas wintergrass and annual brome, plus other grazing resistant species, can be found under and around woody plants. Other grasses include white tridens, buffalograss, three-awns, silver bluestem, sand dropseed and meadow dropseed. Characteristic forbs are heath aster, western ragweed, silverleaf nightshade and annual broomweed. As the grassland vegetation declines, more soil is

exposed leading to erosion on steeper slopes. The effectiveness of rainfall has been reduced. The increasing woody canopy causes higher interception losses coupled with higher evaporation and runoff. Soil organic matter and soil structure decline within the interspaces but soil conditions improve under the woody plant cover. Total plant production declines somewhat, being approximately 900 to 2,300 pounds per acre, depending on precipitation. Generally, only about 50 percent of annual production comes from the herbaceous component. Unless brush management and good grazing management are applied at this stage, the transition toward the Mixed-brush/Shortgrass/Annuals Community (2.2) will continue. The trend cannot be reversed with good grazing management alone and would probably continue even without livestock grazing unless the shrubs are controlled. Woody species will eventually dominate the site.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	450	800	1150
Grass/Grasslike	360	640	920
Forb	90	160	230
Tree	0	0	0
Total	900	1600	2300

**Figure 16. Plant community growth curve (percent production by month).
TX2282, Shortgrasses/Cool-Season grasses/Mixed Brush Community.
Warm-season native grassland with some cool-season grasses and mixed
brush approaching 50% woody species..**

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

Community 2.2

Mixed-brush/Shortgrass/Annuals Community



Figure 17. 2.2 Mixed-Brush/Shortgrass/Annuals Community

The Mixed-brush/Shortgrass/Annuals Community is a dense shrubland dominated by mesquite. It is the collective result of many years of overgrazing, lack of periodic fires and little brush management. Common understory shrubs are pricklypear, lotebush, and pricklypear. With time and continued heavy grazing and no brush control, the mesquite will become tree-like and approach 75 percent or more canopy cover. Texas wintergrass, shortgrasses and low quality annual and perennial forbs are found under and around the woody species. Characteristic grasses are meadow and sand dropseed, hairy tridens, tumble lovegrass and three-awns. Alkali sacaton is common in salty depressions. Forbs include heath aster and silverleaf nightshade. Cool-season annuals such Japanese brome and annual broomweed grow profusely during wet springs. Herbaceous plants produce less than 25 percent of the annual production. Initially, the shrub canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Soil fauna and organic mulch are reduced. More soil surface is exposed to erosion in the spaces between plants. The exposed soil crusts and readily erodes. However, within the woody canopy hydrologic and ecological processes stabilize. Soil organic matter and mulch also begin to increase and eventually stabilize. Unless erosion has been severe in the retrogression process, the Mixed-brush/Shortgrass/Annuals Community will eventually approach or exceed HCPC total biomass production under the current climate. The majority of the production will be by woody species, such as mesquite, however. The Mixed-brush/Shortgrass/Annuals Community provides cover for wildlife, but only limited and variable preferred forage, or browse, is available for livestock or wildlife. Alternatives for restoration include brush control and range planting to return the shrubland to grassland. Proper stocking, prescribed grazing and prescribed burning would then be necessary to maintain the desired community.

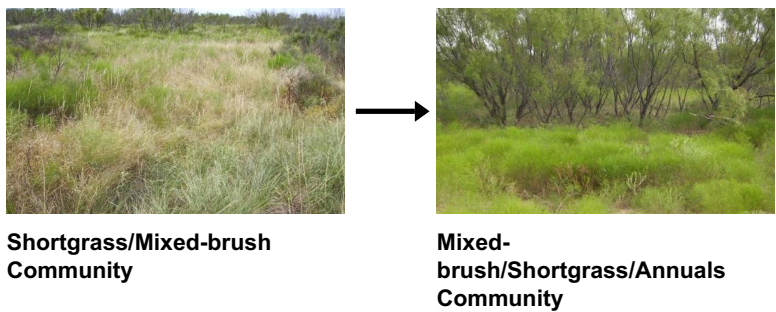
Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	520	975	1430
Grass/Grasslike	200	500	550
Forb	80	150	220
Tree	0	0	0
Total	800	1625	2200

Figure 19. Plant community growth curve (percent production by month). TX2283, Mesquite/Cool-season grasses/Annuals Community. Cool-season grasses, annuals, and mixed brush. Woody species comprise approximately 65% composition..

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

Pathway 2.1A Community 2.1 to 2.2



With continued heavy grazing, no fires, and no brush management, the Shortgrass/Mixed-brush Community will shift to the Mixed-brush/Shortgrass/Annuals Community.

Pathway 2.2A Community 2.2 to 2.1



The trend cannot be reversed to the Shortgrass/Mixed-brush Community with good grazing management alone and would probably continue even without livestock grazing unless the shrubs are controlled.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 3
Converted Land State

The Claypan Prairie Ecological Site, with its productive soils, is often cultivated (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.

Community 3.1
Converted Land Community

The Claypan Prairie Ecological Site, with its productive soils, is often cultivated (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 historic climax species. Cultivation and erosion may have reduced soil productivity but near historic forage production may be obtained with a native plant mix that approximates HCPC specie composition. 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 20. 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 21. 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

Unless proper grazing and prescribed burning are initiated at this stage, the woody species continue to increase in maturity, size and density and the grassland component declines in density and vigor. When the canopy of the woody plants becomes dense enough (15-20 % canopy) and big enough (greater than four feet) to suppress grass growth and resist fire damage, a threshold in ecological succession is reached. At this threshold the Grassland State transitions into the Shrubland State.

Transition T1B
State 1 to 3

The Grassland State is sometimes converted into a Converted Land State such as cropland and pastureland. Crop cultivation, Plowing, Range Planting, Pasture Planting, Pest Management, Nutrient Management, and Prescribed Grazing are necessary.

Restoration pathway R2A
State 2 to 1

With the implementation of brush management, range planting, prescribed grazing, IPT, and prescribed burning, the Woodland State can be restored to the Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

The Shrubland State is sometimes converted into a Converted Land State such as cropland and pastureland. Crop cultivation, Plowing, Range Planting, Pasture Planting, Pest Management, Nutrient Management, and Prescribed Grazing are necessary.

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	...			275-1050	

1	Midgrasses			675–1350	
	sideoats grama	BOCU	<i>Bouteloua curtipendula</i>	300–600	–
	vine mesquite	PAOB	<i>Panicum obtusum</i>	235–475	–
	Arizona cottontop	DICA8	<i>Digitaria californica</i>	170–340	–
2	Midgrasses			225–450	
	composite dropseed	SPCOC2	<i>Sporobolus compositus</i> var. <i>compositus</i>	45–100	–
	Drummond's dropseed	SPCOD3	<i>Sporobolus compositus</i> var. <i>drummondii</i>	45–100	–
	white tridens	TRAL2	<i>Tridens albescens</i>	35–75	–
	silver beardgrass	BOLAT	<i>Bothriochloa laguroides</i> ssp. <i>torreyana</i>	35–75	–
	alkali sacaton	SPAI	<i>Sporobolus airoides</i>	0–75	–
3	Shortgrasses			375–750	
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–300	–
	Wright's threeawn	ARPUW	<i>Aristida purpurea</i> var. <i>wrightii</i>	0–300	–
	buffalograss	BODA2	<i>Bouteloua dactyloides</i>	150–300	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–300	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	75–150	–
4	Cool-season Grasses			150–300	
	sedge	CAREX	<i>Carex</i>	0–300	–
	Texas wintergrass	NALE3	<i>Nassella leucotricha</i>	0–300	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	0–300	–
Forb					
5	Forbs			75–150	
	Drummond's onion	ALDR	<i>Allium drummondii</i>	0–15	–
	onion	ALLIU	<i>Allium</i>	0–15	–
	anemone	ANEMO	<i>Anemone</i>	0–15	–
	white sagebrush	ARLUM2	<i>Artemisia ludoviciana</i> ssp. <i>mexicana</i>	0–15	–
	prairie clover	DALEA	<i>Dalea</i>	0–15	–
	larkspur	DELPH	<i>Delphinium</i>	0–15	–
	Engelmann's	ENPE4	<i>Engelmannia peristenia</i>	0–15	–

	daisy				
	beeblossom	GAURA	<i>Gaura</i>	0–15	–
	curlycup gumweed	GRSQ	<i>Grindelia squarrosa</i>	0–15	–
	hoary false goldenaster	HECA8	<i>Heterotheca canescens</i>	0–15	–
	Maximilian sunflower	HEMA2	<i>Helianthus maximiliani</i>	0–15	–
	Indian rushpea	HOGL2	<i>Hoffmannseggia glauca</i>	0–15	–
	trailing krameria	KRLA	<i>Krameria lanceolata</i>	0–15	–
	flax	LINUM	<i>Linum</i>	0–15	–
	dotted blazing star	LIPU	<i>Liatris punctata</i>	0–15	–
	catclaw mimosa	MIACB	<i>Mimosa aculeaticarpa</i> var. <i>biuncifera</i>	0–15	–
	Nuttall's sensitive-briar	MINU6	<i>Mimosa nuttallii</i>	0–15	–
	awnless bushsunflower	SICA7	<i>Simsia calva</i>	0–15	–
	globemallow	SPHAE	<i>Sphaeralcea</i>	0–15	–
	greenthread	THELE	<i>Thelesperma</i>	0–15	–
	prairie spiderwort	TROC	<i>Tradescantia occidentalis</i>	0–15	–
	vervain	VERBE	<i>Verbena</i>	0–15	–
Shrub/Vine					
6	Shrubs			0	
	jointfir	EPHED	<i>Ephedra</i>	0	–
	pricklypear	OPUNT	<i>Opuntia</i>	0	–
	lotebush	ZIOB	<i>Ziziphus obtusifolia</i>	0	–

Animal community

Many types of wildlife used the Claypan site. Bison and pronghorn antelope utilized the site prior to European settlement. Grassland insects, reptiles, birds and mammals frequent the site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunk, opossum and armadillo. Predators include coyote, fox and bobcat. Game birds, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison and pronghorn antelope, however, are no longer present. White-tailed deer utilize the Claypan Prairie site in its various states although year around browse may often be limiting. Deer, turkey and

quail particularly favor the habitat provided by the Mixed-grass (1.2) and Shortgrass/Mixed-brush (2.1) plant communities.

The site is well suitable for production of livestock, including cattle, sheep and goats. The site is very suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for a mixture of cattle, sheep, goats, deer and other wildlife because of the browse and cool season grasses. Although sheep and goats are seldom pastured in the MLRA anymore, any livestock should be stocked in proportion to the available grass, forb and browse forage, keeping deer 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 late Mesquite//Cool-Season/Annuals phase will have little to offer as habitat except cover and seasonal cool-season forage. Cropland in grain crops, pasture or seeded to wildlife food plots can enhance the landscape as wildlife habitat.

Hydrological functions

The Claypan site is found on deep loamy, nearly level to gently sloping uplands. Runoff is slow to moderate and permeability is very slow. Available water holding capacity is high. The site tends to be droughty because the surface soil crusts and rooting depth is limited by the dense clay subsoil. The claypan restricts percolation, so runoff water is often available for down-slope movement under heavy rainfall events.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall in the soil profile. Only during extended rains or heavy thunderstorms was there much runoff. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease and surface runoff increases as the Midgrass Prairie Community (1.1) transitions to the Mixed-grass Prairie Community (1.2). These processes continue in the spaces between plants in the Shortgrass/Mixed-brush Community (2.1) phase. Evaporation and interception losses are higher, however, resulting in less moisture reaching the soil. If overgrazing continues, the plant community deteriorates further and desertification processes continue. The woody plants compete for moisture with the remaining grasses and forbs further reducing ground cover in openings. Decreased litter and more bare ground allow erosion from soils in openings between trees. Once the Mixed-brush/Shortgrass/Annuals Community (2.2) canopy surpasses 50 percent the hydrology and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy.

Wood products

Posts and specialty wood products can be made from mesquite and other shrubs. Mesquite is used for firewood.

Other information

None.

Inventory data references

Information presented has been derived from the revised Claypan Prairie Range Site PE 31-44, literature, personal experience, field observations and personal contacts with range-trained personnel.

Photos by J.L. Schuster taken on Kamay silty loam soil north and south of Highway 277/82, Sheet 15 and 16, Baylor County Soil Survey Manual, 1976.

Special thanks to the following NRCS personnel for assistance and guidance with development of this ESD: Mark Moseley NRCS, San Antonio, Texas and Justin Clary NRCS Temple, Texas

Site Reviewers:

Lem Creswell, RMS, NRCS, Weatherford, Texas

Contributors

Joe McEntire

Joseph Schuster, Range & Wildlife Habitat Consultants, Bryan, Texas

PES Edits by Tyson Morley, MLRA Soil Scientist, Altus, Oklahoma

Approval

Bryan Christensen, 9/15/2023

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, 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.

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:** Pedestals or terracettes would have been uncommon for this site when occupied by the natural HCPC.

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):** 0-8" thick that is brown silty loam and is weak fine subangular blocky on the surface. 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 Midgrass Prairie Community (HCPC) provided for good infiltration and little runoff. However, the claypan layer restricted infiltration and allowed some runoff during periods of high rainfall or during intense rainfall events.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. However the claypan acts as barrier to deep percolation of water.

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

Dominant: Warm-season midgrasses >>

Sub-dominant: Warm-season shortgrasses > Forbs >

Other: Cool-season grasses > Shrubs/Vines > 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):** Litter is dominantly herbaceous.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1500 - 3000 lbs/ac a year
-

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, annual broomweed, Japanese brome, tasajillo, silverleaf nightshade
-

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.
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