USDA Natural Resources Conservation Service

Ecological site R078AY119TX
Clay Loam 25-28" PZ

Last updated: 9/12/2023
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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

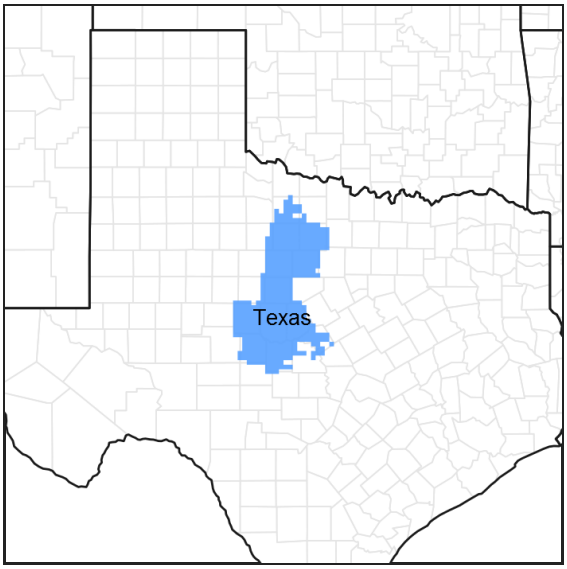


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 078A–Rolling Limestone Prairie

MLRA 78A is characterized by erosional plains with terraces adjacent to perennial and intermittent streams. Loamy and clayey soils range from shallow to deep over limestones and shales of Permian and Pennsylvanian age. Loamy soils are also associated with stream terraces.

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

This site occurs over deep clay loam soils on uplands. The reference vegetation consists of midgrasses with some tallgrasses and forbs. Few woody species persist in the reference plant community. Abusive grazing practices may

lead to a change in the plant community. Without fire or other brush management, woody species may increase.

Associated sites

R078AY117TX	**Clayey Upland 25-28" PZ** Clay Loam site frequently occurs immediately adjacent to Clayey Upland site.
R078AY121TX	**Loamy Bottomland 25-28" PZ** Clay Loam site frequently occurs immediately adjacent to Loamy Bottomland site.
R078AY125TX	**Shallow 25-28" PZ** Clay Loam site occasionally occurs adjacent to Shallow site.

Similar sites

R078AY117TX	**Clayey Upland 25-28" PZ** Similar species and production. Similar position on the landscape.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Bouteloua curtipendula* (2) *Panicum obtusum*

Physiographic features

These nearly level to gently sloping soils in the Clay Loam ecological site occur on plains, broad valleys, hillslopes, stream terraces, paleoterraces and ridges in the Rolling Limestone Prairie. These soils were formed in calcareous loamy and clayey sediments. Slopes range from 0 to 5 percent. Elevation ranges from 1000 to 2300 feet.

Table 2. Representative physiographic features

Landforms	(1) Plains > Terrace
Runoff class	Low to high
Ponding frequency	None
Elevation	305–701 m
Slope	0–5%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate of MLRA 78A is subtropical subhumid, with hot, dry summers and mild, dry winters. The Precipitation is similar north to south throughout the area, but decreases slightly from east to west. Temperature is similar east to west, but warmer from north to south. The area is clear to partly cloudy 80 percent of the time during the summer and 60 percent during the winter. Prevailing winds usually occur from a southerly direction and from north to northwest during passage of fall and winter cool fronts. March and April are the windiest months of the year.

Most precipitation occurs during the warmer months from April to October, in the form of rainfall during thunderstorms, often of short duration and high intensity, with considerable variation in amounts of rain and the area covered. Lightening, strong winds and hail frequently accompany the thunderstorms. Occasional tornadoes are not uncommon. Precipitation distribution is bimodal, with peaks occurring in May-June and September-October. The annual precipitation is about 25 to 28 inches. Timeliness and amount of rainfall are critical to plant growth. Rainfall events of one-fourth inch or less have limited effectiveness. High temperatures and dry winds reduce precipitation effectiveness. Snowfall represents only a small part of the annual precipitation. Snowfall of one inch or more occurs

about one in five years, while snowfall of greater than five inches occurs only about one in ten years. Snow cover generally is of short duration (i.e. one to three days). Probability of snowfall is greater in the northern part of MLRA 78A.

Rainfall in the region is highly erratic, usually with more years below than above average. Periodic droughts of both temporary and prolonged duration are common to the area, although not predictable. Some of the more severe droughts of the past century in this region occurred during 1918-1919, early 1930's, early to mid 1950's, and mid to late 1990's. High temperatures and dry winds accentuate the effects of drought. The extremes in climate have greater influence on plant communities than averages. Historic wet and dry cycles of extended duration likely influenced the evolution of drought hardiness and other survival traits in the endemic flora and fauna of the area.

Temperatures range from 31 degrees F in January to 96 degrees F in July, based on the 30-year average from 1971-2000, although considerably lower and higher temperatures for these months, respectively, have been recorded for some years. Periods of excessive heat, exceeding 100 degrees F, are not uncommon during July and August. Temperatures in the winter are generally mild, but abrupt and large drops in temperature can occur when polar air masses plunge southward across the area. The duration of freezing temperatures usually does not last more than three to five days. Temperatures in the spring are mild, both daytime and nighttime. Summer temperatures are hot, with highs generally in the 80's to mid 90's during the daytime, cooling down to the upper 70's during the night. Fall is usually pleasant with mild, sunny days and crisp, cool nights, as cool northers periodically begin moving south this time of year. The area has a frost-free period of approximately 225 to 233 days and a freeze-free period of about 248 to 259 days. The primary growing season for warm-season plants is approximately 233 to 246 days, increasing from north to south. The first frost generally occurs around November 15 and the last frost occurs around March 15. These dates will vary from north to south and from year to year.

The average relative humidity ranges from 35 to 50 percent in mid-afternoon as diurnal air temperature nears maximum. As nighttime air temperature drops, relative humidity rises, averaging 70 to 80 percent by dawn.

Table 3. Representative climatic features

Frost-free period (characteristic range)	196-207 days
Freeze-free period (characteristic range)	219-237 days
Precipitation total (characteristic range)	686-711 mm
Frost-free period (actual range)	195-215 days
Freeze-free period (actual range)	213-258 days
Precipitation total (actual range)	686-737 mm
Frost-free period (average)	202 days
Freeze-free period (average)	230 days
Precipitation total (average)	711 mm

Climate stations used

- (1) CONCHO PK/IVIE RSVR [USC00411934], Millersview, TX
- (2) COLEMAN [USC00411875], Coleman, TX
- (3) PUTNAM [USC00417327], Baird, TX
- (4) ALBANY [USC00410120], Albany, TX
- (5) THROCKMORTON [USC00419014], Throckmorton, TX

Influencing water features

N/A.

Wetland description

N/A.

Soil features

The soil series in the Clay Loam ecological site consist of moderately deep to very deep, well drained, very slowly to moderately permeable soils over calcareous clay loam to clay sediments.

Major Soil Taxonomic Units correlated to this site include: Aspermont, Abilene, Karnes, Leeray, Nukrum, Nuvalde, Quanah, Rowden, Rowena, Sagerton, Springcreek, Swenson, Valera, Weymouth, and Wichita.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone (2) Residuum–limestone
Surface texture	(1) Loam (2) Clay loam (3) Silty clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Soil depth	51–183 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	7.62–21.59 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–1
Soil reaction (1:1 water) (0-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–7%
Subsurface fragment volume >3" (Depth not specified)	0–2%

Ecological dynamics

The reference plant community for the Clay Loam ecological site is an open prairie dominated by midgrasses, with scattered tallgrasses, and a diverse forb community. Shrubs and other woody plants are a minor component. Sideoats grama and vine mesquite are the most abundant grasses. Little bluestem, Indiangrass, big bluestem, and switchgrass may comprise a significant percentage of the plant community on Clay Loam sites with more open soil profiles, especially in years with higher rainfall. Evidence of the historic vegetation can be found in the journals and records of explorers, military expeditions, boundary survey teams, and scientists studying the vegetation. Some authors and historians have suggested that periodic fires and prairie dogs were significant factors in maintaining the open prairie aspect of this site by keeping seedling and sapling shrubs from maturing and reproducing.

Climate is a major factor influencing vegetation on the site. Long-term droughts lasting multiple years or growing seasons are infrequent, but when they do occur, they can have a negative impact on the vegetation. If abusive grazing occurs during or immediately following the drought period, the results can be devastating. The effects of erratic seasonal moisture and short-term dry spells lasting a few months are not as severe as those caused by long-term droughts. However, the lower the ecological status of the site, the greater the negative impact will be during drought periods regardless of duration.

Fire is also an important part of the ecosystem. Most ecosystems in the Rolling Limestone Prairie developed in a 4 to 6 year regime of recurring fires. Many of these fires resulted from lightning strikes during thunderstorms. Native Americans frequently set fires to manipulate the movement of bison and other animals as well as a defensive or offensive technique when dealing with their enemies. These historic fires were usually severe because of the amount of grass fuel available to carry the fire. The intensity of fires kept shrubs and sapling trees suppressed and allowed grasses and forbs to flourish. Tallgrass species are fire tolerant and are enhanced by periodic burning. Forbs usually increase for a year or two following these fires before the grasses become dominant again.

Lack of fire allows herbaceous vegetation to become senescent and may eventually lead to the loss of the most desirable species. Seedlings of non-native brush species and invasive weeds may encroach on the site from adjacent areas.

Prior to settlement, this site was subject to periodic grazing and browsing by vast herds of bison, wild cattle, wild horses, and deer. Because of the relatively level and open terrain, vast acreages, quality and quantity of available forage species, and easy access, the Clay Loam site was one of the most frequently used sites by these free-ranging herds. At times these grazing and browsing episodes were intense and severe, but periods of heavy use were followed by long periods of non-use as the herds migrated to fresh grazing areas before returning to previously grazed areas. The grazed areas had an opportunity to rest, regrow, regain vigor, and reproduce prior to the next grazing event. Intervals between grazing periods were frequently influenced by the amount of time that had elapsed since the last fire on the area.

As the region was settled, fire was reduced or eliminated and grasslands were fenced off to control movement and facilitate grazing by domestic livestock. As a result of abusive grazing or lack of grazing and/or the elimination of fire, in association with extreme climatic events, the tallgrass component has been eliminated or severely reduced on most Clay Loam sites.

Further deterioration leads to the loss of the perennial warm-season midgrass and forb plant community and an increase in short grasses, annuals, and bare ground. This provides the opportunity for less desirable woody species such as mesquite and juniper to encroach from adjacent sites.

Selective individual removal of undesirable trees and shrubs is relatively easy and more practical when brush plants initially appear on the site. The increase of brush can be fairly rapid and the plants per acre will soon become too numerous for individual control to be feasible. Once woody plants become mature or develop into dense stands, control is expensive, uneconomical, impractical, and difficult to achieve. Brush management is most successful using a systems approach. Initial treatment by mechanical methods can be followed by using approved herbicides, and using prescribed fire as a maintenance technique. Prescribed grazing with a reasonable stocking rate can sustain the grass species composition and production at a near historic climax level.

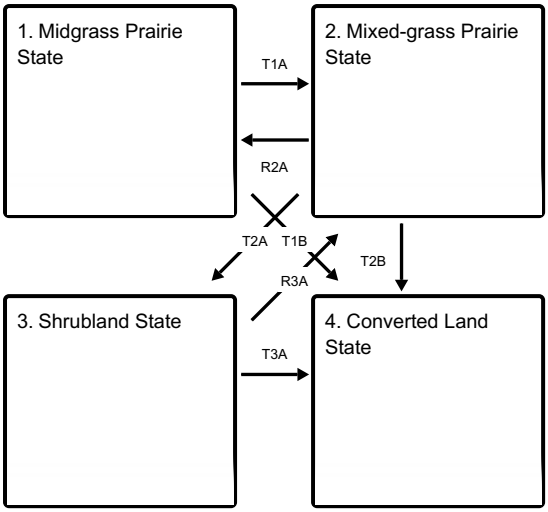
Changes in plant communities and vegetation states on the Clay Loam site are result of the combined influences of natural events (rainfall, temperature, droughts, etc.) and the accompanying management systems implemented on the area (prescribed fire, grazing management, and brush management).

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

State and Transitional Pathways:
The State and Transition Diagram which follows provides information on some of the most typical pathways that the vegetation on this site can follow as the result of natural events, management inputs, and application of conservation treatments. There may be other plant communities that can exist on this site under certain conditions. 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. Consultation with local experts and professionals is recommended prior to application of practices or management strategies in order to ensure that specific objectives will be met.

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

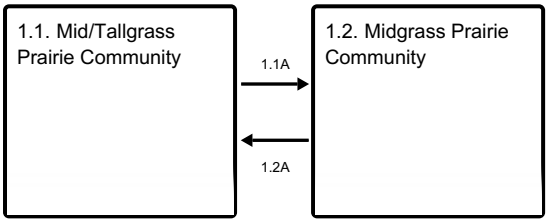
T2A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T2B - Extensive soil disturbance followed by seeding

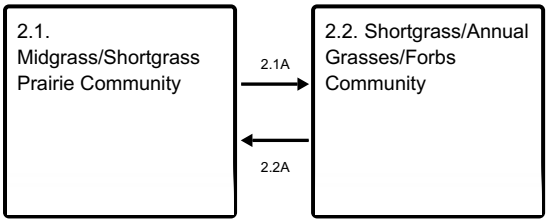
R3A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T3A - Extensive soil disturbance followed by seeding

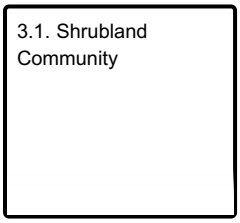
State 1 submodel, plant communities



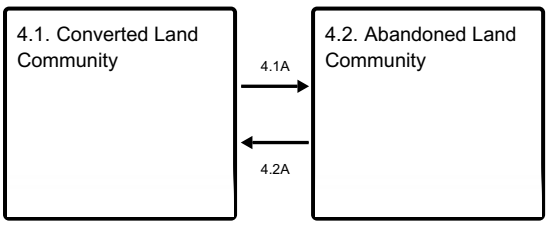
State 2 submodel, plant communities



State 3 submodel, plant communities



State 4 submodel, plant communities



State 1
Midgrass Prairie State

The reference plant community is the midgrass/tallgrass prairie. It is an open prairie dominated by midgrasses, with scattered tallgrasses, some perennial forbs, and a few widely scattered shrubs. Sideoats grama and vine mesquite are the most abundant grasses. Little bluestem, Indiangrass, big bluestem, and switchgrass may occur in areas with more open soil profiles. The Midgrass Prairie Community is totally dominated by sideoats grama and vine mesquite with an increasing amount of Texas wintergrass, silver bluestem, and dropseeds. Early successional forbs and shortgrasses begin to increase. The canopy of shrubs and trees begins to gradually increase as mesquite, pricklypear, lotebush, and similar species encroach from adjacent areas. A viable population of primary midgrasses, little bluestem, and other tallgrasses still persists in remote or protected areas on the site.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- vine mesquite (*Panicum obtusum*), grass

Community 1.1
Mid/Tallgrass Prairie Community

Figure 8. 1.1 Mid/Tallgrass Prairie Community

Figure 9. 1.1 Mid/Tallgrass Prairie Community (2)

The reference plant community for the Clay Loam ecological site in the Rolling Limestone Prairie region is a midgrass/tallgrass prairie. It is an open prairie dominated by midgrasses, with scattered tallgrasses, some perennial forbs, and a few widely scattered shrubs such as lotebush and hackberry. Sideoats grama and vine mesquite are the most abundant grasses. Little bluestem, Indiangrass, big bluestem, and switchgrass may occur in areas with more open soil profiles during growing seasons with above average rainfall.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2242	3363	4595
Forb	280	392	392
Shrub/Vine	168	168	168
Total	**2690**	**3923**	**5155**

Figure 11. Plant community growth curve (percent production by month). TX2532, Midgrass Prairie Community. Open midgrass prairie dominated by warm-season midgrasses with scattered tallgrasses, a diversity of forbs, and woody canopy less than 5%..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	2	18	23	17	6	4	16	6	3	2

Community 1.2
Midgrass Prairie Community

Figure 12. 1.2 Midgrass Prairie Community

Figure 13. 1.2 Midgrass Prairie Community (2)

Abusive grazing practices, elimination of fire from the ecosystem, and severe drought conditions result in the shift from a midgrass/tallgrass plant community to a midgrass plant community totally dominated by sideoats grama and vine mesquite with an increasing amount of Texas wintergrass, silver bluestem, and dropseeds. Early successional forbs and shortgrasses such as western ragweed and buffalograss begin to increase. The canopy of shrubs and trees begins to gradually increase in density and canopy cover as mesquite, pricklypear, lotebush, and similar species encroach from adjacent areas. A viable population of primary midgrasses, little bluestem, and other tallgrasses still persists in remote or protected areas on the site. Tallgrasses are eliminated or severely reduced.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1457	2410	3250
Forb	448	392	336
Shrub/Vine	224	224	224
Total	**2129**	**3026**	**3810**

Figure 15. Plant community growth curve (percent production by month). TX2514, Midgrass Prairie Community. Midgrass Prairie Community..

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

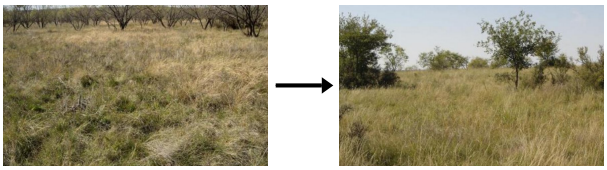
Pathway 1.1A
Community 1.1 to 1.2

Mid/Tallgrass Prairie Community

Midgrass Prairie Community

Abusive grazing practices and the elimination of fire from the ecosystem are the two primary factors that cause the reference plant community to change from an open midgrass prairie with scattered tallgrasses, to a midgrass prairie that is almost exclusively midgrasses with only remnants of tallgrasses. As the tallgrasses, sideoats grama, and vine mesquite are repeatedly selectively grazed, Texas wintergrass and other midgrasses such as silver bluestem, dropseeds, and white tridens become more competitive and begin to dominate the site. Elimination or interruption of the natural fire cycle also contributes to an imbalance in the original plant community, and tends to favor the more competitive and aggressive midgrasses and perennial forbs.

Pathway 1.2A
Community 1.2 to 1.1



Midgrass Prairie Community

Mid/Tallgrass Prairie Community

A viable population of sideoats grama and vine mesquite, and sufficient individual plants of tallgrasses still exist to enable the original plant community to recover if sound management practices are followed. Implementation of a prescribed grazing management strategy and re-introduction of periodic fire into the ecosystem will reverse the shift away from the original plant community. A reasonable and sustainable stocking rate in combination with a grazing system to control the timing, frequency, duration, and degree of grazing can result in the re-establishment of the balanced and diverse midgrass/tallgrass prairie. A strategically planned and implemented prescribed burning program will accelerate the recovery process. Tree and shrub canopy increases slightly at this stage, but is still manageable. Individual treatment of trees and shrubs that have increased or invaded can be an effective and economical method of maintaining the plant community at this stage.

Conservation practices

Brush Management
Prescribed Burning

State 2
Mixed-grass Prairie State

The Mid/Shortgrass Prairie Community occurs as sideoats grama and vine mesquite decline in abundance, the plant community becomes dominated by midgrasses and shortgrasses such as silver bluestem, dropseeds, white tridens, Texas wintergrass, buffalograss, curlymesquite, and threeawns. Western ragweed and broomweed are the dominant forbs. Mesquite, lotebush, catclaw acacia, pricklypear, and tasajillo increase in density or invade from adjacent sites. Bare ground begins to appear in some areas and can become a serious problem. Continued deterioration of the plant community eventually results in the Shortgrass/Annual Grasses/Forbs Community dominated by shortgrasses and midgrasses such as buffalograss, curlymesquite, threeawns, Texas wintergrass, and silver bluestem. Western ragweed and broomweed are the dominant forbs. Mesquite, pricklypear, tasajillo, juniper, and greenbriar begin to increase in density or invade from adjacent sites. Bare ground begins to appear in some areas and can become a serious problem in the most deteriorated state. Annual grasses such as Japanese brome and little barley are abundant in the early spring.

Dominant plant species

- mesquite (*Prosopis*), shrub
- lotebush (*Ziziphus obtusifolia*), shrub
- dropseed (*Sporobolus*), grass
- silver bluestem (*Bothriochloa saccharoides*), grass
- white tridens (*Tridens albescens*), grass

Community 2.1
Midgrass/Shortgrass Prairie Community

Figure 16. 2.1 Midgrass/Shortgrass Prairie Community

Disturbances such as long-term abusive grazing, lack of fire, persistent drought conditions, or combinations of heavy grazing, extreme climatic conditions, and other factors, cause the plant community to change dramatically. As sideoats grama and vine mesquite decline in abundance, the plant community becomes dominated by midgrasses and shortgrasses such as silver bluestem, dropseeds, white tridens, Texas wintergrass, buffalograss, curlymesquite, threeawns, Texas grama, and tumble windmillgrass. Western ragweed and broomweed are the dominant forbs. Mesquite, lotebush, Catclaw acacia, pricklypear, and tasajillo increase in density or invade from adjacent sites. Bare ground begins to appear in some areas and can become a serious problem. Primary midgrasses and all of the tallgrasses are almost completely eliminated from the site, but remnant populations and widely scattered individual plants remain in protected areas. However, they no longer exist in sufficient amounts to allow the site to recover through management alone. These grasses are often unnoticed because they are grazed very short, are in low vigor, and are not prominent on the site.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	448	1121	1793
Forb	560	560	560
Shrub/Vine	560	560	560
Total	**1568**	**2241**	**2913**

Figure 18. Plant community growth curve (percent production by month). TX2533, Midgrass/Shortgrass Prairie, 20% woody canopy. Midgrasses are dominant, shortgrasses are sub-dominant, tallgrasses are almost totally eliminated. Annuals and early successional forbs and grasses are abundant. Shrubs encroach from adjacent areas and increase in density and canopy..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	3	5	12	20	21	5	4	12	10	4	2

Community 2.2
Shortgrass/Annual Grasses/Forbs Community

Figure 19. 2.2 Shortgrass/Annual Grasses/Forbs Community

Figure 20. 2.2 Shortgrass/Annual Grasses/Forbs Community (2)

Severe disturbances such as abusive grazing, persistent drought conditions, or combinations of abusive grazing, extreme climatic conditions, and other factors, cause the plant community to change dramatically. Continued deterioration of the plant community eventually results in a plant community dominated by shortgrasses and midgrasses such as buffalograss, curlymesquite, threeawns, Texas wintergrass, silver bluestem, dropseeds, and tumble windmillgrass. Western ragweed and broomweed are the dominant forbs. Mesquite, pricklypear, tasajillo, juniper, and greenbriar begin to increase in density or invade from adjacent sites. Bare ground begins to appear in some areas and can become a serious problem in the most deteriorated state. Annual grasses such as Japanese

brome and little barley are abundant in the early spring especially in wet years.

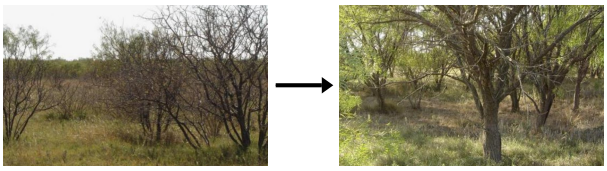
Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	897	897	897
Grass/Grasslike	224	448	785
Forb	560	560	560
Total	**1681**	**1905**	**2242**

Figure 22. Plant community growth curve (percent production by month). TX2515, Shortgrass/Shrub Dominant Community. Shortgrasses and Shrubs dominate this plant community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	10	10	20	20	5	5	10	8	2	3

Pathway 2.1A
Community 2.1 to 2.2



Midgrass/Shortgrass Prairie Community

Shortgrass/Annual Grasses/Forbs Community

Continuous, heavy grazing, extended drought, and lack of fire result in a significant increase in the amount of shortgrasses, and annual forbs and grasses. The density and canopy of shrubs and trees continues to increase.

Pathway 2.2A
Community 2.2 to 2.1

Shortgrass/Annual Grasses/Forbs Community

Midgrass/Shortgrass Prairie Community

Brush management and range planting or seeding may be necessary to reduce excessive woody canopy and density and to re-establish the desired midgrasses. Implementation of a grazing management plan is necessary to allow establishment of seeded vegetation and control the timing, frequency, duration, and degree of grazing following establishment. Prescribed burning will assist with the recovery and maintenance of the desired plant community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

State 3
Shrubland State

The Shrubland Community is composed of brush species such as mesquite, lotebush, pricklypear, and tasajillo. The shrubs become well established by developing a canopy of more than 25% on the site. Annual forbs and grasses as well as early successional grasses and forbs dominate the herbaceous vegetation.

Dominant plant species

- mesquite (*Prosopis*), shrub
- pricklypear (*Opuntia*), shrub
- buffalograss (*Bouteloua dactyloides*), grass

Community 3.1
Shrubland Community

Figure 23. 3.1 Shrubland Community

Continued abusive grazing, lack of fire, and/or severe droughts result in a community dominated by mesquite and other invading species. Brush species such as mesquite, lotebush, pricklypear, and tasajillo become well established eventually developing a canopy of more than 25% on the site. Annual forbs and grasses as well as early successional grasses and forbs dominate the herbaceous vegetation.

Table 9. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	897	785	673
Forb	336	448	560
Grass/Grasslike	224	336	448
Total	**1457**	**1569**	**1681**

Figure 25. Plant community growth curve (percent production by month). TX2531, Shortgrass/Annuals/Mesquite and Shrubs . Shortgrass/Annuals/Mesquite and Shrubs – buffalograss, curlymesquite, broomweed, annual forbs and grasses, mesquite, lotebush..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	8	16	18	12	4	4	10	12	6	3

State 4
Converted Land State

The Clay Loam site is one of the most frequently converted sites because of its deep, fertile soils and level terrain. Hundreds of thousands of acres have been plowed up and converted to cropland, pastureland, or hayland. Wheat is the primary annual crop. Bermudagrass is the primary introduced pasture species used in this area. The Clay Loam site can be an extremely productive forage producing site with the application of optimum amounts of fertilizer.

Refer to Forage Suitability Group Descriptions for specific recommendations, production potentials, species adaptation, etc. Thousands of acres of clay loam soils have been broken out and converted to cropland, pastureland, or hayland. In time, many of these cultivated and intensively managed areas have been abandoned because of adverse economic conditions. These abandoned lands have deteriorated to the point that they will never return to historical vegetation because of soil degradation and lack of natural seed source.

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Community 4.1
Converted Land Community

Figure 26. 4.1 Converted Land Community

Figure 27. 4.1 Converted Land Commmunity

The Clay Loam site is one of the most frequently converted sites because of its deep, fertile soils and level terrain. Hundreds of thousands of acres have been plowed up and converted to cropland, pastureland, or hayland. Wheat is the primary annual crop. Bermudagrass is the primary introduced pasture species used in this area. The Clay Loam site can be an extremely productive forage producing site with the application of optimum amounts of fertilizer. Refer to Forage Suitability Group Descriptions for specific recommendations, production potentials, species adaptation, etc. In the highest state of production following conversion, the trees, shrubs and forbs have been severely reduced or eliminated from the site. The more woodies and forbs that occur on a converted site, the lower the overall production would be. The annual production figures below reflect this change.

Table 10. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2242	4147	5380
Forb	336	280	224
Shrub/Vine	112	56	–
Total	**2690**	**4483**	**5604**

Figure 29. Plant community growth curve (percent production by month). TX2527, Converted Land Community. Planted into monocultures of introduced grasses and cropland species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	5	14	23	20	5	4	12	8	3	2

Community 4.2
Abandoned Land Community

Figure 30. 4.2 Abandoned Land Community

Thousands of acres of clay loam soils have been broken out and converted to cropland, pastureland, or hayland. In time, many of these cultivated and intensively managed areas have been abandoned because of adverse economic conditions. These abandoned lands have deteriorated to the point that they will never return to historical vegetation because of soil degradation and lack of natural seed source. Abandoned croplands and reseeded areas tend to revert back to a more natural state through the process of secondary succession. This is a very slow process that takes decades or centuries to evolve, dependent on the status of the area at the time it is abandoned. The first plants to establish are “pioneer plants” (annual forbs and grasses followed by early successional shortgrasses and midgrasses). If managed properly, some of these abandoned areas may eventually begin to approximate the diversity and complexity of the native Clay Loam ecosystem. Midgrasses, perennial forbs, and tallgrasses may begin to establish if the area is carefully managed. However, it is highly unlikely that abandoned lands can ever return to reference vegetation within a reasonable period of time.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Forb	336	448	560
Grass/Grasslike	224	336	448
Shrub/Vine	112	224	336
Total	**672**	**1008**	**1344**

Figure 32. Plant community growth curve (percent production by month). TX2528, Abandoned Land Community. Abandoned croplands, pasturelands, and seeded areas. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	4	8	16	18	12	4	4	10	12	6	3

Pathway 4.1A
Community 4.1 to 4.2

Converted Land Community | Abandoned Land Community

After conversion to other land uses, these areas must be intensively managed in order to maintain production and quality. Economics, drought, and other outside factors may result in these areas being abandoned or neglected. If fertility is not maintained, and weed control is not routinely carried out, the land will tend to revert to “pioneer” plants such as annual forbs and grasses.

Pathway 4.2A
Community 4.2 to 4.1

Abandoned Land Community | Converted Land Community

Abandoned lands can be re-established to cropland, introduced pasture, or seeded monocultures by cultivation to control unwanted vegetation, seedbed preparation, and seeding or planting desired vegetation with normal with seedbed preparation.

Conservation practices

Brush Management
Conservation Crop Rotation
Prescribed Burning
Forage and Biomass Planting
Prescribed Grazing
Range Planting
Nutrient Management
Integrated Pest Management (IPM)

Transition T1A
State 1 to 2

Continued abusive grazing and a lack of fire will eventually result in further deterioration of the midgrass plant community. Sideoats grama and vine mesquite decline drastically. Texas wintergrass becomes the dominant grass. Silver bluestem, dropseeds, and white tridens increase significantly. Shortgrasses, forbs, and annuals begin to increase as well. Non-native and invasive shrubs begin to increase on the site and invade from adjacent sites. The increase in density and woody canopy of shrubs begins to have an adverse effect on the understory herbaceous vegetation because of increased shading and competition for space and soil moisture.

Transition T1B

State 1 to 4

Thousands of acres of the native vegetation on this site have been “broken out” and converted to other land uses such as cropland, introduced pasture, or seeded monocultures of native grasses. This is a favored site for conversion due to the relatively deep and fertile soils as well as the flat to gently rolling topography. Seedbed preparation can be accomplished with normal cultivation equipment and desired vegetation can be seeded or planted.

Restoration pathway R2A
State 2 to 1

At this stage, there is no longer a viable population of the original primary midgrasses and tallgrasses to reproduce sufficient seed to enable the plant community to recover through management practices alone. Brush management is needed when the density and canopy of shrubs and trees begins to have an adverse effect on the desired grasses and forbs. Brush management treatment methods become more complicated, more expensive, and less effective. At this stage, Range planting will be required to re-introduce the original midgrasses and tallgrasses. Implementation of a grazing management plan is necessary to allow establishment of seeded vegetation and control the timing, frequency, duration, and degree of grazing following establishment. Prescribed burning will assist with the recovery and maintenance of the desired plant community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

Continuous abusive grazing, lack of fire, and extended drought can all be major factors in the deterioration of the plant community from an open prairie to a shrub dominated site. Woody canopy increases to 25% or more and has a noticeable detrimental effect on the understory vegetation. Extensive areas of bare ground may occur. Shortgrasses as well as annual grasses and forbs increase dramatically and invade from adjacent sites. Texas wintergrass and other shade tolerant species increase. Once the site has declined to this stage, it will not return to a higher state of vegetation through management practices alone.

Transition T2B
State 2 to 4

This plant community can be converted to cropland, introduced pasture, or orchard land, but it may require mechanical brush management to remove unwanted shrubs and trees if they are dense enough to interfere with seedbed preparation, seeding or planting operations, or management following establishment. Seedbed preparation methods may require heavier equipment, and seeding or planting methods may have to be modified to overcome more intensive land preparation treatments.

Restoration pathway R3A
State 3 to 2

It is probably not practical or economically feasible to attempt to restore the original plant community through brush management and revegetation. However, brush management can be carried out in selected areas to open up the canopy and reduce tree density to improve wildlife habitat, improve growing conditions for herbaceous vegetation, and provide access. Brush management followed by seeding or planting native vegetation can be expected to establish a midgrass/shortgrass plant community with most of the primary midgrasses, but lacking the diversity of forbs and minor grasses found in the reference plant community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T3A
State 3 to 4

Extensive brush management and seedbed preparation techniques with heavy equipment are required to clear the land in order to convert it to cropland, introduced pasture, or seeded monocultures at this point. These treatments are radical, expensive, and generally not recommended.

Additional community tables

Table 12. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Warm-season tallgrasses**			0–785	
	little bluestem	SCSC	*Schizachyrium scoparium*	0–560	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–224	–
	big bluestem	ANGE	*Andropogon gerardii*	0–112	–
	switchgrass	PAVI2	*Panicum virgatum*	0–112	–
2	**Warm-season midgrasses**			504–1345	
	sideoats grama	BOCU	*Bouteloua curtipendula*	280–1121	–
	vine mesquite	PAOB	*Panicum obtusum*	168–785	–
3	**Warm-season midgrasses**			392–1121	
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	112–336	–
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	0–168	–
	white tridens	TRAL2	*Tridens albescens*	0–168	–
	Arizona cottontop	DICA8	*Digitaria californica*	0–112	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	0–112	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	0–112	–
	marsh bristlegrass	SEPA10	*Setaria parviflora*	0–112	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–112	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–112	–
4	**Cool-season grasses**			168–560	
	Texas wintergrass	NALE3	*Nassella leucotricha*	112–560	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0–112	–
	Canada wildrye	ELCA4	*Elymus canadensis*	0–112	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	0–56	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	0–56	–
5	**Mid/Shortgrasses**			168–785	
	buffalograss	BODA2	*Bouteloua dactyloides*	168–392	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–280	–

	hairy grama	BOHI2	*Bouteloua hirsuta*	0–112	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	0–112	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–112	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–112	–
	Hall's panicgrass	PAHAH	*Panicum hallii var. hallii*	0–112	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–112	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	0–112	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–112	–
	panicgrass	PANIC	*Panicum*	0–56	–
	crowngrass	PASPA2	*Paspalum*	0–56	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	0–56	–
	Texas grama	BORI	*Bouteloua rigidiseta*	0–56	–
	sedge	CAREX	*Carex*	0–56	–
6	**Forbs**			112–336	
	Texas Indian mallow	ABFR3	*Abutilon fruticosum*	0–112	–
	Drummond's onion	ALDR	*Allium drummondii*	0–112	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–112	–
	tenpetal thimbleweed	ANBE	*Anemone berlandieri*	0–112	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–112	–
	milkvetch	ASTRA	*Astragalus*	0–112	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–112	–
	American star-thistle	CEAM2	*Centaurea americana*	0–112	–
	whitemouth dayflower	COER	*Commelina erecta*	0–112	–
	prairie clover	DALEA	*Dalea*	0–112	–
	purple prairie clover	DAPU5	*Dalea purpurea*	0–112	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	0–112	–
	ticktrefoil	DESMO	*Desmodium*	0–112	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–112	–
	Leavenworth's eryngo	ERLE11	*Eryngium leavenworthii*	0–112	–
	Texas stork's bill	ERTE13	*Erodium texanum*	0–112	–
	snow on the mountain	EUMA8	*Euphorbia marginata*	0–112	–
	beeblossom	GAURA	*Gaura*	0–112	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–112	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	0–112	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	0–112	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–112	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–112	–
	Texas skeletonplant	LYTE	*Lygodesmia texana*	0–112	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	0–112	–
	Nuttall's sensitive-briar	MINU6	*Mimosa nuttallii*	0–112	–
	yellow puff	NELU2	*Neptunia lutea*	0–112	–
	evening primrose	OENOT	*Oenothera*	0–112	–
	pitcher sage	SAAZG	*Salvia azurea var. grandiflora*	0–112	–

	golden blue-eyed grass	SICA8	*Sisyrinchium californicum*	0–112	–
	swordleaf blue-eyed grass	SICH2	*Sisyrinchium chilense*	0–112	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	0–112	–
	slender greenthread	THSI	*Thelesperma simplicifolium*	0–112	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0–112	–
	Texas vervain	VEHA	*Verbena halei*	0–112	–
Shrub/Vine					
7	**Trees, Shrubs, and Vines**			0–224	
	sugarberry	CELAL	*Celtis laevigata var. laevigata*	0–224	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	0–224	–
	cedar elm	ULCR	*Ulmus crassifolia*	0–224	–
	Texas Hercules' club	ZAHI2	*Zanthoxylum hirsutum*	0–112	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0–112	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–112	–
	prairie sumac	RHLA3	*Rhus lanceolata*	0–112	–
	gum bully	SILA20	*Sideroxylon lanuginosum*	0–112	–
	catclaw acacia	ACGRG3	*Acacia greggii var. greggii*	0–112	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–56	–
	clapweed	EPAN	*Ephedra antisyphilitica*	0–56	–
	pricklypear	OPUNT	*Opuntia*	0–56	–
	honey mesquite	PRGLG	*Prosopis glandulosa var. glandulosa*	0–56	–

Animal community

Historically, the Clay Loam site was inhabited permanently and intermittently by a variety of grassland mammals, reptiles, and birds. Several historical references and journals written in the 18th and 19th century by explorers, survey parties, and military expeditions refer to herds of bison, wild cattle, wild horses, deer, and antelope roaming freely across the North Central Prairie and adjacent regions. The Clay Loam site was one of the most frequently used sites by these free-ranging herds because of the relatively level and open terrain, quality and quantity of available forage species, vast acreages, and easy access.

Currently, the site is utilized by quail, dove, numerous species of grassland birds, and a variety of small fur-bearing mammals. Quail and dove utilize the site more frequently in the midgrass, Shortgrass, and shrubland plant community phases. White-tail deer and turkey use the site intermittently in association with adjacent sites if sufficient shrub and tree canopy exists. Feral hogs are also frequent visitors to the site in some areas. Animal species and populations fluctuate as the vegetation cycles through temporary phases and different ecological stages.

Livestock grazing should be controlled by implementing grazing management systems that incorporate frequent and timely deferment periods to prevent abusive grazing.

Hydrological functions

When herbaceous vegetation and ground cover are maintained in a healthy and vigorous status, water infiltration into the soil profile is increased significantly, resulting in less runoff. A thick, healthy grass cover also results in improved water quality because it serves as a filter or trap to reduce sediments and pollutants before the water flows offsite.

Recreational uses

The Clay Loam ecological site provides limited outdoor activities such as bird watching, hiking, camping, horseback riding, and off-road vehicle use. Some Clay Loam sites provide good habitat for quail and dove hunting. Deer and turkey hunting is severely limited by the lack of browse, mast, and escape cover.

Wood products

Mesquite wood can be used for firewood and fence posts.

Other products

None.

Other information

None.

Inventory data references

Vegetation data for this site was obtained from existing Range Site Descriptions, SCS-RANGE -417 Production and Composition Records for Native Grazing Lands, and on-site inventories by the author and local experts including ranchers, natural resource specialists from federal and state agencies, and personnel from cooperating agencies and organizations. A total of 15 SCS-RANGE-417's containing data collected from 5 counties (Throckmorton, Shackelford, Coleman) during the period 12/30/1981 to 12/12/1986 were reviewed for this site.

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Sammy Wilson, USDA Natural Resources Conservation Service, Baird, TX

Reviewers and Technical Contributors:
Lem Creswell, RMS, NRCS, Weatherford, Texas
Nathan Haile, RSS, NRCS, Weatherford, Texas
Justin Clary, RMS, NRCS, Temple, Texas
Mark Moseley, RMS, NRCS, Boerne, Texas

Contributors

Dan Caudle, DMC Natural Resources Management, Weatherford, Texas
Justin Clary
PES Edits by Tyson Morley, MLRA Soil Scientist, Altus, Oklahoma

Approval

Bryan Christensen, 9/12/2023

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	10/31/2008
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:** Deposition or erosion is uncommon during normal rainfall events, but may occur in limited areas during intense rainfall events.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been 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 10% bare ground scattered randomly throughout the site.

5. **Number of gullies and erosion associated with gullies:** Few rills or gullies should be present. Some gullies may be present on side drains into perennial and intermitttent 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):** Little or no litter movement or deposition during normal rainfall events.

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The open midgrass/tallgrass prairie has ample ground cover, vegetation cover, and adequate litter with little bare ground. This 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):** None.

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

    Dominant: Warm-season midgrasses >>

    Sub-dominant: Warm-season tallgrasses > Warm-season midgrasses >

    Other: Warm-season shortgrasses > Cool-season grasses > Forbs > Trees/Shrubs/Vines

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Perennial grasses will naturally exhibit a minor amount (less than 5%) of senescence and some mortality every year.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2400 to 4600 pounds per acre.

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Mesquite, pricklypear, tasajillo, broomweed, bermudagrass, Johnsongrass, and King Ranch bluestem.

17. **Perennial plant reproductive capability:** All perennial species should be capable of reproducing every year unless disrupted by extended drought, overgrazing, wildfire, insect damage, or other events occuring immediately prior to, or during the reproductive phase.