USDA Natural Resources
Conservation Service

Ecological site R080BY604TX
Clay Slopes 26-33" PZ

Last updated: 9/19/2023
Accessed: 02/07/2025

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.

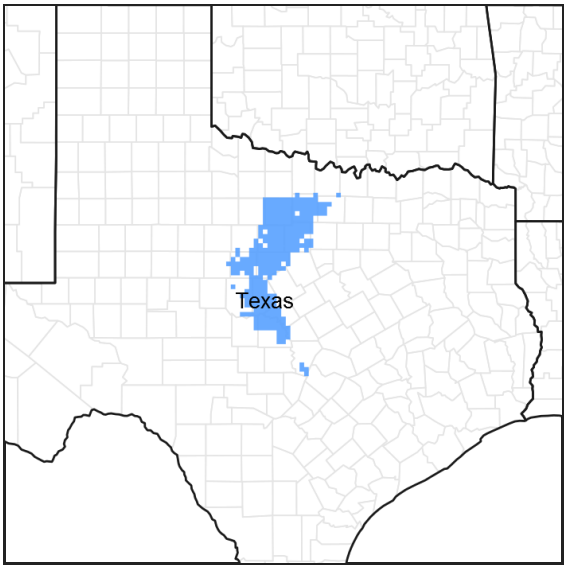


Figure 1. Mapped extent

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): 080B–Texas North-Central Prairies

MLRA 80B consists of gently rolling, dissected plains with very steep hillsides and sideslopes and narrow flood plains associated with small streams. Loamy and clayey soils range from very shallow to deep and developed in sandstones, shales, and limestones of Pennsylvanian age.

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

These sites occur over moderately deep clay soils on uplands. The reference vegetation includes native tall grasses and midgrasses with numerous forbs and very few woody species. These sites may be prone to invasion by mesquite without the use of periodic fire and brush management.

Associated sites

R080BY607TX	**Clayey Upland 26-33" PZ** Typically adjacent up slope.

Similar sites

R080BY607TX	**Clayey Upland 26-33" PZ** Deeper clay soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Andropogon gerardii* (2) *Schizachyrium scoparium*

Physiographic features

This site occurs on undulating, linear hillslopes, ridges, and scarp slopes in the Texas North-Central Prairies. This site is characteristically a water distributing site. Slopes are typically less than 8 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills > Hillslope (2) Hills > Ridge (3) Hills > Scarp slope
Runoff class	High to very high
Elevation	750–2,400 ft
Slope	1–8%

Climatic features

The climate is subtropical subhumid and is characterized by hot humid summers and relatively mild winters. Tropical maritime air controls the climate during spring, summer and fall. In winter and early spring, frequent surges of polar Canadian air cause sudden drops in temperatures and add considerable variety to the daily weather. The average first frost generally occurs about November 5 and the last freeze of the season usually occurs about March 19. The average frost free period ranges from 215 days in the northern counties, to 240 days in the south.

The average relative humidity in mid-afternoon is about 60 percent in the summer months. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible during the summer and 50 percent in winter. The prevailing wind direction is from the southwest and highest windspeeds occur during the spring months.

Approximately 75% of annual rainfall occurs between April 1 and October 31. Rainfall during the months of April through September typically occurs during thunderstorms which tend to be intense and brief, resulting in large amounts of rain in a short time. The wettest months of the year are May, June, September, and October. The driest months during the growing season are July and August. The winter months of November, December, January, and February are the driest months overall.

Average annual precipitation for the entire MLRA is approximately 28 inches. There is a noticeable difference in the average annual precipitation in the northern counties in comparison to the southern and western counties of this Major Land Resource Area. Jack, Clay, Young, and Palo Pinto Counties all have an average annual precipitation of more than 31 inches. Stephens, Eastland, McCulloch, and San Saba Counties all have an average annual precipitation of less than 28 inches.

Winters tend to be mild, with occasional periods of very cold temperatures which can be accompanied by strong northerly winds and freezing precipitation. Snow is infrequent and significant accumulations are rare. These periods

of very cold weather are generally short-lived. Summers tend to be hot and dry. Drought conditions are common during most summers. Air temperatures of more than 95oF are common from mid-June through September. In the northern counties nearest to the Red River, temperatures are generally slightly cooler during winter months and slightly warmer during summer months than in the other counties in the North Central Prairie.

Table 3. Representative climatic features

Frost-free period (characteristic range)	184-200 days
Freeze-free period (characteristic range)	211-225 days
Precipitation total (characteristic range)	30-32 in
Frost-free period (actual range)	183-204 days
Freeze-free period (actual range)	210-226 days
Precipitation total (actual range)	29-33 in
Frost-free period (average)	193 days
Freeze-free period (average)	217 days
Precipitation total (average)	31 in

Climate stations used

- (1) SAN SABA 7NW [USC00417994], Richland Springs, TX
- (2) BROWNWOOD 2ENE [USC00411138], Early, TX
- (3) EASTLAND [USC00412715], Eastland, TX
- (4) MINERAL WELLS AP [USW00093985], Millsap, TX
- (5) BRECKENRIDGE [USC00411042], Breckenridge, TX
- (6) GRAHAM [USC00413668], Graham, TX
- (7) JACKSBORO [USC00414517], Jacksboro, TX

Influencing water features

These sites may shed some water via surface runoff to areas downslope. However, the presence of good ground cover and deep rooted grasses can help facilitate water infiltration into the soils. These sites are not associated with wetlands.

Wetland description

NA

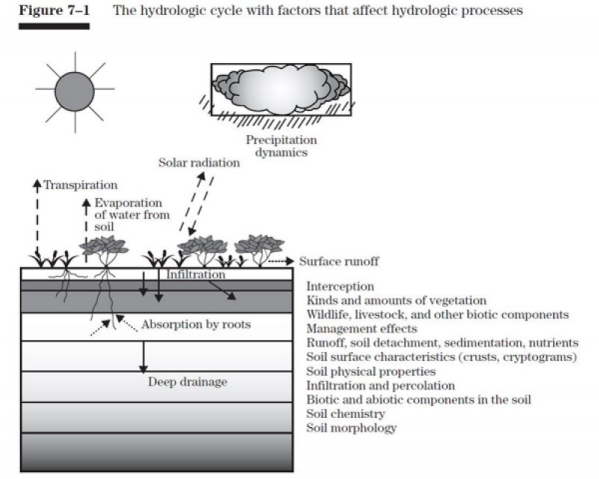


Figure 8.

Soil features

Representative soil components for this ecological site include: Set, Throck

The site is characterized by moderately deep to very deep loamy well drained soils.

Table 4. Representative soil features

Parent material	(1) Residuum–claystone
Surface texture	(1) Clay (2) Clay loam
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	30–60 in
Surface fragment cover <=3"	0–5%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	6–9 in
Calcium carbonate equivalent (0-40in)	10–65%
Electrical conductivity (0-40in)	0–4 mmhos/cm
Sodium adsorption ratio (0-40in)	0–4
Soil reaction (1:1 water) (0-40in)	7.9–8.4
Subsurface fragment volume <=3" (0-40in)	0–10%
Subsurface fragment volume >3" (0-40in)	0–5%

Ecological dynamics

The soils of the Clay Slopes Ecological Site are generally deep and well drained. Runoff is rapid. Permeability is slow and available water capacity is high. The rooting zone is deep, but the clay layers might restrict rooting depth. Quality of forage plants is generally high. The site responds to good grazing management and is moderately resilient.

The reference plant community is the Mixed-grass Prairie Community (1.1) . Pre-settlement disturbances 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 12 year intervals in this region (Frost 1998). The frequent fires, weather patterns and relatively frequent droughts generally favored grasses over woody plants, but there was also a wide variety of forbs. Big and little bluestem were the dominant grasses throughout the MLRA, contributing as much as 40 percent of the annual production. Due to higher precipitation and cooler climate in the northern and eastern portions of the area, big bluestem was generally more abundant in that portion of the area. Other characteristic grasses in the reference community included sideoats grama, Arizona cottontop, vine-mesquite, tall dropseed, Texas wintergrass and meadow dropseed. Buffalograss and curly-mesquite were the most common shortgrasses. Occasionally, wet winters and springs caused an abundance of Texas wintergrass and cool-season annuals. See the Plant Composition and Annual Production Table below for estimated composition of the species.

The Mixed-grass Prairie Community (1.1) was relatively stable and resilient within the climate, grazing and fire regimes until European settlement in the mid 1800’s brought animal husbandry, windmills and fencing. The demise of the Native American Indians, the onset of the livestock industry and reduction of periodic fires changed the ecological dynamics of the vegetation on the Clay Slopes site. Although recent climatic warming trends and

increases in atmospheric carbon dioxide may be enhancing vegetation change, the major forces influencing transition from the historic climax plant community to a woodland state are heavy continuous grazing by livestock and the decrease in frequency and intensity of fire (Brown and Smith 2000).

The intense grazing by cattle, sheep and goats in the late 1800's began a transition in the physiognomy towards a Midgrass Prairie Community (1.2) encroaching woody species. As livestock increased and grazing use exceeded the plants ability to sustain defoliation, the more palatable and generally more productive species gave way to less palatable or more grazing resistant species. There was a decrease in the more palatable grasses and forbs and a reduction in intensity and frequency of fires. The frequency and intensity of fires was reduced because of less fire fuel and fire suppression. Fencing and water developments also helped bring about overgrazing by concentrating livestock.

When abusive grazing continues, the more palatable tall grasses give way initially to secondary species such as sideoats grama, tall dropseed, Arizona cottontop, vine-mesquite, and Texas wintergrass. The better quality forbs decrease while less palatable species, such as orange zexmenia, globemallow, eryngo, primrose, gaura and annuals increase. The shift in plant cover and decline in soil properties favors woody plant encroachment. The woody and herbaceous increasers are generally endemic species released from competition and fire suppression. Woody species such as mesquite, agarito, prickly pear and catclaw acacia increase in density and stature. In this phase Midgrasses, especially little bluestem and other mixed-grasses, still dominate annual herbage production, but the encroaching woody species increase in composition and production compared to the Mixed-grass Prairie Community (1.1).

If the Midgrass Prairie Community (1.2) is continually overgrazed, and fire is excluded, it transitions into a plant community 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 curly-mesquite, buffalograss, meadow dropseed and Texas wintergrass and less palatable forbs begin replacing the mixed-grasses. As the midgrass species 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 Midgrass Prairie Community (1.2) transitions into a Shortgrass/Mixed-brush Community (2.1) when the woody plants exceed 10 to 15 percent canopy and/or the plants reach fire resistant age (about two years) and size (about four feet in height). This threshold also marks the beginning of a new state, the Woodland State (2.0), in which woody species dominant the site. Prescribed grazing or rest from grazing will generally not restore the grassland community without additional brush management

Mesquite generally dominates the Shortgrass/Mixed-brush Community (2.1), although oaks and juniper may often be present. The grass component is a mixture of low palatability mixed-grasses, shortgrasses and low palatability forbs. Meadow dropseed and threeawns increase with continued livestock overgrazing. Texas wintergrass, annual broomweed and annual brome also increase, especially during wet cycles. Exposed soil in open spaces crusts readily, subjecting the site to water erosion.

During this stage, the process of retrogression can be reversed with relatively inexpensive brush control practices and prescribed grazing management. 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) evolves. Once the brush canopy exceeds 30 to 40 percent, annual production for the understory is generally made up of unpalatable shrubs, cool-season grasses and annuals. Brushy species such as mesquite, prickly pear, tasajillo and agarito dominate production. Shortgrasses, cool-season grasses and annuals persist, but their production is limited.

Until maximum canopy cover by woody species is reached, water erosion can be a problem where soil is exposed. The exposed soil crusts readily, creating opportunity for further soil erosion. Considerable litter and soil movement occurs on exposed soil during heavy rainfall events. Interception losses increase with canopy cover and reduce the amount of soil moisture available for herbaceous production. Once canopy cover reaches potential, however, the hydrologic processes, energy flow and nutrient cycling stabilize.

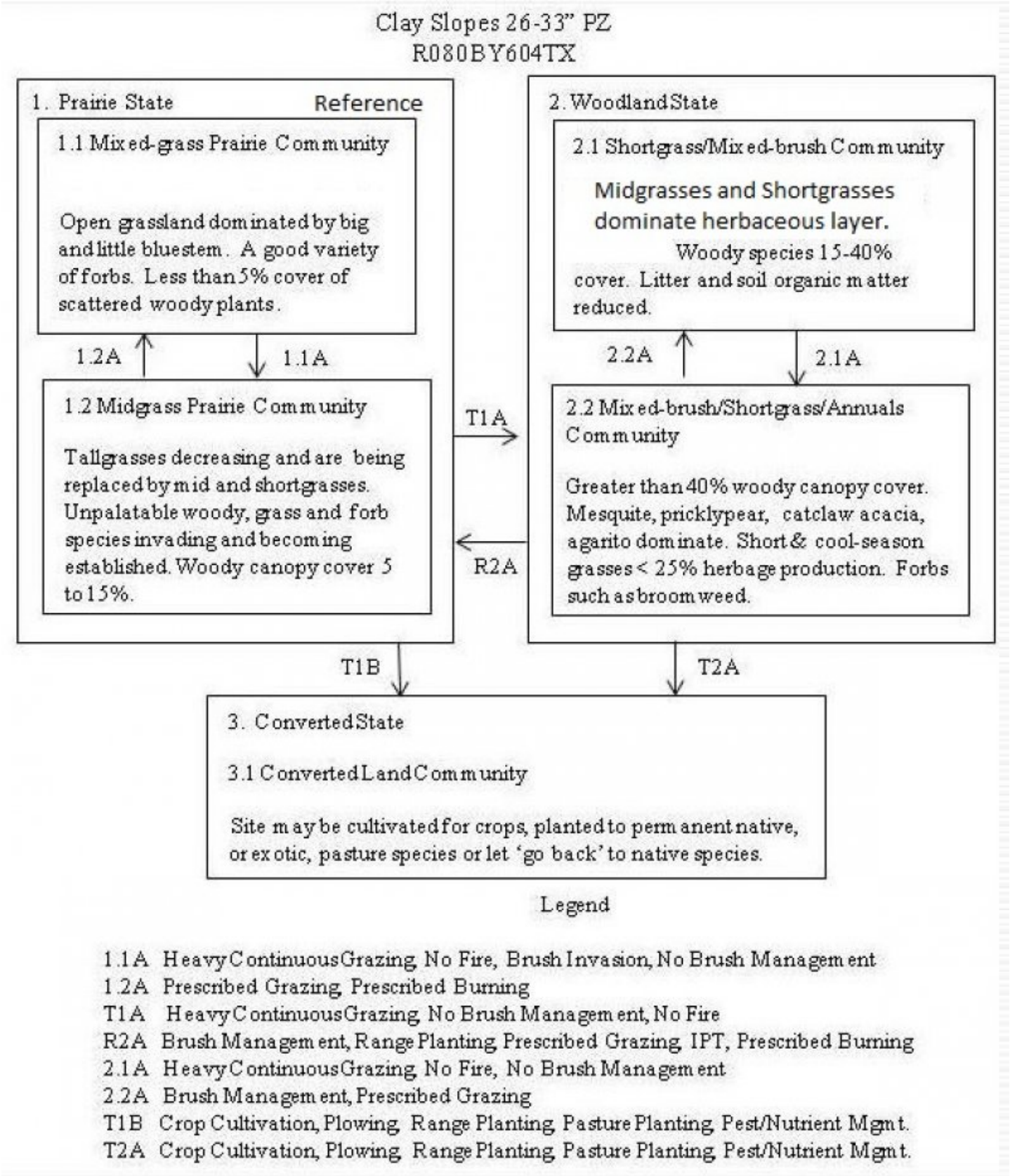
Major high cost and high energy accelerated management practices are required to restore the Mixed-Brush/Shortgrass/Annuals Community (2.2) back to the Grassland State. Generally, mechanical or herbicidal brush management practices such as aerial spraying, dozing and/or individual plant treatments (IPT)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

conservation practices such as range planting, prescribed grazing and prescribed burning are necessary for the ecological site to return to a grassland state.

The Clay Slopes site is suited primarily for range, but many acres have been put under cultivation. The soils on the lesser slopes are arable, especially with terracing. 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 Model:
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



State 1
Prairie State - Reference

The Mixed-grass Prairie Community (1.1) is the interpretive plant community for the Clay Slopes Ecological Site. Big bluestem occupied favorable micro-sites and was locally dominant, especially in the northern portion of the area. Also occurring on the site, but in smaller amounts were Indiangrass and switchgrass. Little bluestem, Arizona cottontop, sideoats grama, tall dropseed, and vine-mesquite were common midgrasses. It is estimated that the Mixed-grass Prairie Community (1.1) produced from 2000 to 4500 pounds of biomass annually. The Midgrass Prairie Community (1.2) is a prairie dominated by midgrasses 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. Big bluestem, little bluestem, Indiangrass and switchgrass have decreased to a small portion of the composition. The midgrasses, such as sideoats grama and vine-mesquite, which increased initially, are being replaced by more grazing resistant midgrasses and shortgrasses. Numerous brushy species are encroaching because overgrazing by livestock has reduced grass cover, exposed more soil and reduced fine fuel for fire. The woody species are generally less than four feet tall and the woody canopy varies between 5 and 15 percent. Most of the historic perennial forbs persist, but less palatable weedy species increase in the composition. Cool-season plants generally increase in composition. Annual primary production has decreased, averaging 1500 to 3500 pounds per acre.

Dominant plant species

- big bluestem (*Andropogon gerardii*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1
Mixed-grass Prairie Community

The Mixed-grass Prairie Community (1.1) is the interpretive plant community for the Clay Slopes Ecological Site. It developed 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 frequent and intense wild fires. Woody species encroachment was apparently limited by the clayey soils and frequent fires. Hackberry, elbowbush, dalea, ephedra, skunkbush sumac, greenbriar and catclaw acacia were scattered throughout the site. Big bluestem occupied favorable micro-sites and was locally dominant, especially in the northern portion of the area. Also occurring on the site, but in smaller amounts were Indiangrass and switchgrass. Little bluestem, Arizona cottontop, sideoats grama, tall dropseed, and vine-mesquite were common midgrasses. Buffalograss, curly-mesquite, white tridens, slim tridens and threeawn were the most common shortgrasses. Texas wintergrass, bromes and sedges added a cool-season grass component. A few of the many forbs found on the site include Engelmann daisy, prairie clover, dotted gayfeather, greenthread, catclaw sensitivebriar, heath aster, western ragweed, broomweed and bundleflower. See the Species Composition Table below for species thought to have made up the historic climax plant community if the Clay Slopes site. It is estimated that the Mixed-grass Prairie Community (1.1) produced from 2000 to 4500 pounds of biomass annually, depending upon the soil and the amount of precipitation. Grasses produced as much as 90 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 slowly permeable soil and reduced runoff. Little runoff occurred during historic condition except during intense storms from steeper slopes. The Mixed-grass Prairie Community (1.1) furnished good habitat for grazing type wildlife such as bison and pronghorn antelope and, in recent times, cattle. This plant community is productive, resilient and flourishes well under good grazing management. However, with continuous overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions into a Midgrass 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	1800	2700	4050
Forb	100	150	225
Shrub/Vine	80	120	180
Tree	20	30	45
Total	**2000**	**3000**	**4500**

Figure 10. Plant community growth curve (percent production by month). TX3040, Tallgrass Prairie Community. True tallgrass prairie with Indiangrass, big bluestem, and little bluestem as co-dominants. .

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	3	14	22	20	7	4	13	8	3	2

Community 1.2
Midgrass Prairie Community

Figure 11. 1.2 Midgrass Prairie Community

The Midgrass Prairie Community (1.2) is the result of overgrazing by livestock over a long period of time. It is grassland dominated by midgrasses 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. Big bluestem, little bluestem, Indiangrass and switchgrass have decreased to a small portion of the composition. The midgrasses, such as sideoats grama and vine-mesquite, which increased initially, are being replaced by more grazing resistant midgrasses and shortgrasses such as Texas wintergrass, white tridens, slim tridens, meadow dropseed, threeawns, buffalograss and curly-mesquite. Numerous brushy species are encroaching because overgrazing by livestock has reduced grass cover, exposed more soil and reduced fine fuel for fire. Typically mesquite, pricklypear, elbowbush, bumelia, skunkbush sumac and tasajillo increase in density. The woody species are generally less than four 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. Most of the historic perennial forbs persist, but less palatable weedy species increase in the composition. Cool-season plants generally increase in composition. Annual primary production has decreased, averaging 1500 to 3500 pounds per acre, depending on precipitation and the soil series. The reduction is due to less plant density and vigor and smaller plant structure. Forage production is still predominantly grass. Heavy continuous grazing has reduced plant cover, litter and mulch and has increased bare ground slightly exposing the soil to some erosion because the exposed soil crusts readily. There could be some, soil, mulch and litter movement during rainstorms on steeper slopes and poor soil conditions. Unless proper grazing and prescribed burning are initiated at this stage, the woody species continue to increase in maturity, size and density and shortgrasses continue to replace midgrasses. 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. The Midgrass Prairie Community (1.2) transitions into a Shortgrass/Mixed-brush Community (2.1). Once the transition into a Shrubland State (2.0) occurs, range management practices such as prescribed grazing and prescribed burning, cannot reverse the trend toward woody plant dominance. Brush control practices, such as individual plant treatment and prescribed burning accompanied by proper grazing, are necessary to maintain this vegetation type or to return the community back to grassland.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1050	1750	2450
Shrub/Vine	150	250	350
Tree	75	125	175
Forb	75	125	175
Total	**1350**	**2250**	**3150**

Figure 13. Plant community growth curve (percent production by month). TX3029, Mid/Shortgrass with Mesquite. Mid and shortgrasses with Mesquite.

Sideoats grama, buffalograss, Texas wintergrass, and Meadow dropseed are the dominant grass species for this condition..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	2	10	20	24	10	5	10	10	3	2

Pathway 1.1A
Community 1.1 to 1.2

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

Pathway 1.2A
Community 1.2 to 1.1

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

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Woodland State

The Shortgrass/Mixed-Brush Community (2.1) has a 15 to 40 percent woody plant canopy of mixed-brush with a grassland component of mostly shortgrasses, cool-season species and unpalatable forbs. There is a continued decline in diversity of the grassland component and an increase in woody and cool season species. All, except the more palatable woody species, increase in size and density. Mesquite eventually becomes the dominant overstory species. 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. Annual broomweed is often abundant, especially following a wet fall and winter. Total plant production declines somewhat, being approximately 1200 to 3200 pounds per acre. The Mixed-brush/Shortgrass/Annuals Community (2.2) is a dense shrubland. Mesquite, and sometimes redberry juniper, dominates the Mixed-brush/Shortgrass/Annuals Community. Trees and shrubs can approach 70 percent woody plant cover. Cool-season grasses, shortgrasses and low quality annual and perennial forbs are common. Grasses and cool-season annuals are found in and around tree/shrub cover. Grasses and forbs make up 25 percent or less of the annual herbage production. Cool-season annuals grow profusely during wet springs. Annual production ranges from 1400 to 3400 pounds per acre.

Dominant plant species

- honey mesquite (*Prosopis glandulosa*), shrub
- Texas wintergrass (*Nassella leucotricha*), grass

Community 2.1
Shortgrass/Mixed-brush Community

Figure 14. 2.1 Shortgrass/Mixed-brush Community

The Shortgrass/Mixed-Brush Community (2.1) has a 15 to 40 percent woody plant canopy of mixed-brush with a grassland component of mostly shortgrasses, cool-season species and unpalatable forbs. It 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 also been reduced as a disturbance factor because of suppression and a lack of fine fuel available for hot fires. With or without livestock grazing, there is a continued decline in diversity of the grassland component and an increase in woody and cool season species. If abusive grazing continues, annual herbage production is reduced in the grassland component due to a plant community composition change and decline in soil properties. Plant composition and production shifts toward the non-grass component as selective grazing reduces preferred grass species. All, except the more palatable woody species increase in size and density. Mesquite eventually becomes the dominant overstory species. Pricklypear, catclaw acacia, agarito, tasajillo and elbowbush are the most common understory shrubs. Redberry juniper may also invade and become dominant. 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 threeawn, buffalograss and meadow dropseed can be found under and around woody plants. Because of grazing pressure and competition for nutrients and water from the woody plants the grassland component shows general lack of plant vigor and productivity. Common grasses include Texas wintergrass, white tridens, threeawns, and meadow dropseed and buffalograss. Prairie coneflower, western ragweed, curlycup gumweed, woolywhite and sagewort are persistent until shrub density reaches maximum canopy. Annual broomweed is often abundant, especially following a wet fall and winter. 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 between shrubs and trees, but soil conditions improve under the woody plant cover. Some soil loss can occur during heavy rainfall events. Total plant production declines somewhat, being approximately 1200 to 3200 pounds per acre, depending on precipitation. The deeper rooting shrubs are able to increase vegetative growth if erosion has not depleted the soil. Generally, only about 50 percent of annual production comes from the grassland component, however. Browsing animals such as goats and deer can find fair food value, if browse plants have not been overgrazed continuously. Forage quantity and quality for cattle is low. The trend toward woody plant dominance cannot be reversed with good grazing management alone. It will continue with, or without, prescribed grazing management. Woody species will eventually dominate the site. Unless brush management and prescribed grazing management are applied at this stage, the transition toward a Mixed-Brush/Shortgrass/Annuals Community (2.2) will continue.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	600	1100	1600
Forb	120	220	320
Tree	240	240	240
Shrub/Vine	240	240	240
Total	**1200**	**1800**	**2400**

Figure 16. Plant community growth curve (percent production by month). TX3039, Shortgrass/Annuals/Mesquite/Shrubs Community. 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

Community 2.2
Mixed-brush/Shortgrass/Annuals Community

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

The Mixed-brush/Shortgrass/Annuals Community (2.2) is a dense shrubland. It is the collective result of many years of overgrazing, lack of periodic fires and little brush management. Mesquite, and sometimes redberry juniper, dominates the Mixed-brush/Shortgrass/Annuals Community. Common understory shrubs are pricklypear, agarito, tasajillo, skunkbush sumac, elbowbush, and catclaw acacia. With continued heavy grazing and no brush control, the trees and shrubs can approach 70 percent woody plant cover. Cool-season grasses, shortgrasses and low quality annual and perennial forbs are common. Texas wintergrass, meadow dropseed, sedges, buffalograss, three-awns and cool-season annuals are found in and around tree/shrub cover. Grasses and forbs make up 25 percent or less of the annual herbage production. Forbs commonly found in this community include dotted gayfeather, western ragweed, prairie coneflower, and curlycup gumweed. Cool-season annuals such as annual broomweed, filaree, little barley, Japanese brome and mustards grow profusely during wet springs. Initially, the shrub canopy acts to intercept rainfall and increase evapo-transpiration 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 and can erode on steeper slopes. However, within the woody canopy hydrologic and ecological processes stabilize. Soil organic matter and mulch also begin to increase and eventually stabilize. The Mixed-brush/Shortgrass/Annuals Community (2.2) 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)
Tree	560	960	1360
Shrub/Vine	420	720	1020
Grass/Grasslike	240	480	680
Forb	140	240	340
Total	**1360**	**2400**	**3400**

Figure 19. Plant community growth curve (percent production by month). TX3052, Mesquite/Mixed-brush/Shortgrass/Annuals Community.

Mesquite/Mixed-brush woodland with cool-season component..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
4	6	10	15	20	20	5	2	5	5	5	3

Pathway 2.1A
Community 2.1 to 2.2

Shortgrass/Mixed-brush Community

Mixed-brush/Shortgrass/Annuals Community

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

Pathway 2.2A
Community 2.2 to 2.1

Mixed-brush/Shortgrass/Annuals Community

Shortgrass/Mixed-brush Community

The trend toward dense shrubland cannot be reversed with good grazing management alone. Accelerated brush management practices along with proper grazing are required to return this community to the Shortgrass/Mixed-brush Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 3
Converted Land State

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

Dominant plant species

- Bermudagrass (*Cynodon dactylon*), grass

Community 3.1
Converted Land Community

Figure 20. 3.1 Converted Land Community

The Clay Slopes Ecological Site, with its productive soils, is sometimes cultivated and planted to crops. Technical advice as to adapted crops, cropping systems, production, and cultivation practices are available from local NRCS or Extension AgriLife offices. When abandoned from cropping, the site should be re-vegetated with adapted native plant mixtures, which include reference community species. Cultivation and erosion may have reduced soil productivity but near historic forage production may be obtained with a native plant mix that approximates the reference species 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 21. Plant community growth curve (percent production by month). TX3003, Native Seeding. Native Seeding of grasses and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	15	20	20	5	5	14	7	3	2

Figure 22. Plant community growth curve (percent production by month). TX3037, Converted Land Community. Planted to monocultures of introduced species, or monocultures or mixtures of commercially available native tallgrasses. .

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

Figure 23. Plant community growth curve (percent production by month). TX3249, Introduced Seeding. Introduced seed mixtures used instead of native grass seed mixtures. This method will least likely reach the Historic Climax Community..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	15	20	20	5	5	14	7	3	2

Transition T1A
State 1 to 2

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

Transition T1B
State 1 to 3

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

Restoration pathway R2A
State 2 to 1

Major high cost and high energy, accelerating practices are required to restore the Woodland State back to the Prairie State. Generally, herbicidal brush management practices such as aerial spraying and/or individual plant treatments (IPT) along with other restoration practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary for the ecological site to return to Sate 1.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

Transition T2A
State 2 to 3

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

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			1000–2250	
	big bluestem	ANGE	*Andropogon gerardii*	600–1350	–
	little bluestem	SCSC	*Schizachyrium scoparium*	200–450	–
	Indiangrass	SONU2	*Sorghastrum nutans*	100–225	–
	switchgrass	PAVI2	*Panicum virgatum*	100–225	–
2	**Midgrasses**			400–900	
	sideoats grama	BOCU	*Bouteloua curtipendula*	100–225	–
	Arizona cottontop	DICA8	*Digitaria californica*	100–225	–
	vine mesquite	PAOB	*Panicum obtusum*	100–225	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	100–225	–
3	**Shortgrasses**			300–675	
	buffalograss	BODA2	*Bouteloua dactyloides*	40–90	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	40–90	–
	white tridens	TRAL2	*Tridens albescens*	40–90	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	20–45	–
	slim tridens	TRMUM	*Tridens muticus var. muticus*	20–45	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	20–45	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	20–45	–
	Texas grama	BORI	*Bouteloua rigidiseta*	20–45	–
	fall witchgrass	DICO6	*Digitaria cognata*	20–45	–

	curly-mesquite	HIBE	*Hilaria belangeri*	20–45	–
	Hall's panicgrass	PAHA	*Panicum hallii*	20–45	–
	threeawn	ARIST	*Aristida*	20–45	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	20–45	–
4	**Cool-season grasses**			80–180	
	Texas wintergrass	NALE3	*Nassella leucotricha*	60–135	–
	brome	BROMU	*Bromus*	20–45	–
5	**Grasslikes**			20–45	
	sedge	CAREX	*Carex*	20–45	–
Forb					
6	**Forbs**			100–225	
	scurfpea	PSORA2	*Psoralidium*	4–9	–
	globemallow	SPHAE	*Sphaeralcea*	4–9	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	4–9	–
	greenthread	THELE	*Thelesperma*	4–9	–
	Forb, annual	2FA	*Forb, annual*	4–9	–
	onion	ALLIU	*Allium*	4–9	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	4–9	–
	pricklypoppy	ARGEM	*Argemone*	4–9	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	4–9	–
	prairie clover	DALEA	*Dalea*	4–9	–
	larkspur	DELPH	*Delphinium*	4–9	–
	bundleflower	DESMA	*Desmanthus*	4–9	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	4–9	–
	spreading buckwheat	EREF	*Eriogonum effusum*	4–9	–
	beeblossom	GAURA	*Gaura*	4–9	–
	Spanish gold	GRPA8	*Grindelia papposa*	4–9	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	4–9	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	4–9	–
	hymenopappus	HYMEN4	*Hymenopappus*	4–9	–
	trailing krameria	KRLA	*Krameria lanceolata*	4–9	–
	dotted blazing star	LIPU	*Liatris punctata*	4–9	–
	plains blackfoot	MELE2	*Melampodium leucanthum*	4–9	–
	evening primrose	OENOT	*Oenothera*	2–5	–
	bedstraw	GALIU	*Galium*	2–5	–
	nicker	CAESA	*Caesalpinia*	2–5	–
	vervain	VERBE	*Verbena*	2–5	–
Shrub/Vine					
7	**Shrubs**			60–180	
	catclaw acacia	ACGR	*Acacia greggii*	0–15	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–15	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–15	–
	prairie clover	DALEA	*Dalea*	0–15	–

	prairie clover	DALEA	*Dalea*	0–15	–
	jointfir	EPHED	*Ephedra*	0–15	–
	stretchberry	FOPU2	*Forestiera pubescens*	0–15	–
	pricklypear	OPUNT	*Opuntia*	0–15	–
	fragrant sumac	RHAR4	*Rhus aromatica*	0–15	–
	bully	SIDER2	*Sideroxylon*	0–15	–
	greenbrier	SMILA2	*Smilax*	0–15	–
Tree					
8	**Trees**			0–45	
	hackberry	CELTI	*Celtis*	0–45	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	0–45	–

Animal community

Many types of wildlife used the Clay Slopes Ecological 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 Clay Slopes site in its various states. Deer, turkey and quail particularly favor the habitat provided by the Midgrass (1.2) and Shortgrass/Mixed-Brush (2.1) plant communities. The increase in the cool-season component makes these communities favorable yearlong habitat for wildlife as well as livestock. 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 advanced Mesquite/Mixed-brush/Shortgrass/Annuals phase will have little to offer as habitat except cover. Cropland in grain crops, pasture or seeded to wildlife food plots can enhance the landscape as wildlife habitat.

Hydrological functions

The Clay Slopes Ecological Site is a moderately fine textured upland with nearly level to gentle slopes. Most soils are deep. They are slowly permeable, slow to take up water and droughty during the summer months. Runoff is slow due to gentle slopes if vegetative cover is adequate. However, soil crusting can cause erosion from bare ground on steeper slopes.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall in the soil solum. 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 Mixed-grass Prairie Community (1.1) transitions to the Midgrass Prairie Community (1.2). These processes continue in the interstitial spaces in the Shortgrass/Mixed-brush Community (2.1) phase. Evaporation and interception losses are higher, resulting in less moisture reaching the soil, however. 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 about 50 percent, however, the hydrology and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy.

Recreational uses

The Clay Slopes Site is well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian and bird watching. This site along with adjacent rocky upland sites and Loamy Bottomland site also provide diverse scenic beauty and many opportunities for recreation and hunting.

Wood products

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

Other products

Seeds are harvested from many plants for commercial sale. Grasses and forbs are harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from the many flowering plants, such as mesquite.

Other information

None.

Inventory data references

Information presented has been derived from the revised Clay Slopes Range Site PE 34-44, literature, personal experience, field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster.

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

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Technical Reviewers:
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, RMS, NRCS, Abilene, Texas
Dr. Joseph Schuster, Range & Wildlife Habitat Consultants, LLC, Bryan, Texas
PES edits by Colin Walden, Stillwater Soil Survey Office

Approval

Bryan Christensen, 9/19/2023

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	03/17/2009
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None.

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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.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been uncommon for this site.

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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.

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5. **Number of gullies and erosion associated with gullies:** 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 to slight.

7. **Amount of litter movement (describe size and distance expected to travel):** Under normal rainfall, 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 in HCPC is resistant to 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):** 0-13 inches thick with dark grayish brown clay loam with generally weak fine and medium subangular blocky structure. SOM approximately 1-6%. See soil survey for specific soil.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savannah of tallgrasses, midgrasses, forbs, and trees having adequate litter and little bare ground can provide 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 tallgrasses >

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

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

    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):** 2000 to 4500 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:** Honey mesquite, Prickly pear, 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.