USDA Natural Resources Conservation Service

Ecological site R078CY105TX
Loamy Sand 23-31" PZ

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Accessed: 05/13/2024

General information

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

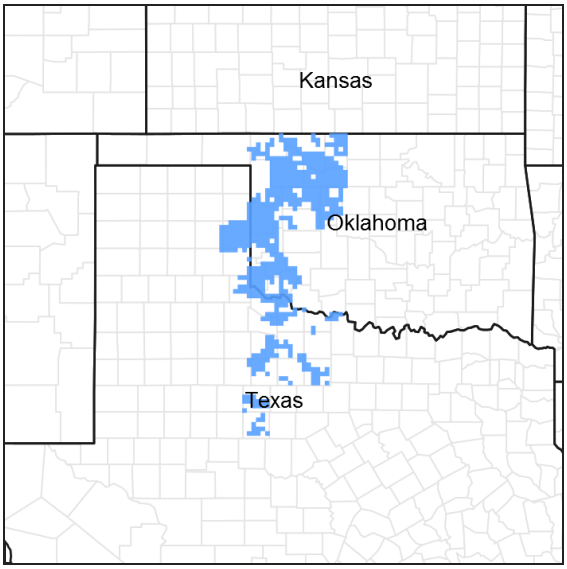


Figure 1. Mapped extent

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

MLRA notes

Major Land Resource Area (MLRA): 078C–Central Rolling Red Plains, Eastern Part

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

LRU notes

NA

Classification relationships

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

Ecological site concept

These sites occur on rolling to flat eolian sand sheets. The reference vegetation consists of native tallgrasses and forbs with less than 10% woody canopy cover. Without fire or other brush management treatments, woody species

like sand sagebrush will increase canopy cover to 30% or greater. These sites have good infiltration and water is readily available for plant use during periods of favorable precipitation. Careful grazing management practices must be followed to maintain the reference vegetation. Particularly in periods of below average precipitation.

Associated sites

R078CY110TX	**Sandy Loam 23-31" PZ** Both on similar terrain, sandy loam soils have higher clay content.
R078CY098TX	**Deep Sand 23-30" PZ** Both are located on similar terrain. Deep Sand has lower annual production due to soil texture. Higher oak canopy.

Similar sites

R078CY107TX	**Sand Hills 23-31" PZ** Both sites have deep sandy soils, the sand hills being deeper.
R078CY098TX	**Deep Sand 23-30" PZ** Both are located on similar terrain. Deep Sand has lower annual production due to soil texture. Higher oak canopy.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia filifolia*
Herbaceous	(1) *Andropogon hallii*

Physiographic features

The Loamy Sand Prairie 23-31” PZ ecological site was formed in loamy and sandy alluvium, and eolian sediments of Pleistocene age. These nearly level to hummocky soils occur on treads, inter-dunes and dunes on sand sheets of stream terraces on alluvial plains and terrace pediments in the Central Rolling Red Plains. Slopes are 0 to 8 percent. Elevation is 1000 to 3000 feet.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Plain (2) Alluvial plain > Sand sheet (3) Alluvial plain > Dune
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None
Elevation	305–914 m
Slope	0–8%
Water table depth	183 cm
Aspect	Aspect is not a significant factor

Climatic features

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

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

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

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

Table 3. Representative climatic features

Frost-free period (characteristic range)	188-200 days
Freeze-free period (characteristic range)	200-220 days
Precipitation total (characteristic range)	660-686 mm
Frost-free period (actual range)	170-201 days
Freeze-free period (actual range)	193-226 days
Precipitation total (actual range)	635-711 mm
Frost-free period (average)	191 days
Freeze-free period (average)	211 days
Precipitation total (average)	660 mm

Climate stations used

- (1) MUTUAL [USC00346139], Mutual, OK
- (2) CLINTON SHERMAN AP [USW00003932], Dill City, OK
- (3) VERNON [USC00419346], Vernon, TX
- (4) MUNDAY [USC00416146], Munday, TX
- (5) ABILENE RGNL AP [USW00013962], Abilene, TX

Influencing water features

None.

Wetland description

NA

Soil features

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

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

correlated to the minor components of that particular soil Mapunit.

Representative soil components for this site include:
Devol, Grandfield, Grandmore, Miles, Springer and McKnight.

The soils in the Loamy Sand Upland ecological sites are very deep. Well drained. Permeability is moderate to moderately rapid. Runoff is negligible on slopes less than 1 percent, very low to low on 1 to 5 percent slopes and low to medium on 5 to 8 percent slopes.

Table 4. Representative soil features

Parent material	(1) Eolian sands–sandstone
Surface texture	(1) Loamy fine sand (2) Fine sand (3) Loamy sand
Family particle size	(1) Sandy
Drainage class	Moderately well drained to well drained
Permeability class	Moderately slow to moderately rapid
Soil depth	102–203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	6.6–16 cm
Calcium carbonate equivalent (0-101.6cm)	0–3%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

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

The Loamy Sand 23-31” PZ Ecological Site occurs on uplands where it developed on loamy and sandy alluvium, and eolian sediments of Pleistocene age. It is found on soils that occur on treads, inter-dunes and dunes on sand sheets of stream terraces on alluvial plains and terrace pediments in the Central Rolling Red Plains. Found on flats and gently rolling hills the site is easily erodible by water and wind. The site is low in fertility and much of it has been cultivated in the past. It is located throughout the MLRA so vegetation and productivity will show considerable variability.

The reference vegetation of the Loamy Sand Ecological Site is thought to have been a Tallgrass Prairie Community (1.1) . It is assumed that the vegetation on the site consisted mostly of warm-season bunchgrasses with scattered motts of woody species and an abundance of forbs. Tallgrasses dominated the plant structure, contributing as much

as 50 to 60 percent of the plant annual production. The most characteristic grasses were sand bluestem , Indiangrass, switchgrass, little bluestem, purpletop tridens and giant dropseed. Characteristic midgrasses were cane and silver bluestem, plains bristlegrass, sand lovegrass, Scribner panicum and sand paspalum. Hackberry and post oak often occurred in infrequent motts in locales protected from frequent fires. Sand sagebrush was a common shrub in northern portions of the MLRA while Havard oak was often common in the southern part of the MLRA. A good population of cool-season grasses and sedges occurred as well as an abundance of forbs. See the Species Composition List and Annual Production Table below for estimated composition and production of the species assumed to have been present in the reference plant community.

Pre-settlement disturbances included grazing or browsing by endemic, deer, pronghorn antelope and migratory bison, re-occurring droughts and frequent fires. Wildfires re-occurred at frequent intervals (Frost 1998) suppressing woody species and forbs. Since settlement in the late 1800s, continuous overgrazing by livestock and possibly climate change (Milchunas 2006) have interacted with reduced fire frequency and intensity to give the competitive advantage to woody plant species. Although continued overgrazing is most likely the major culprit, the interaction of these disturbances has changed the composition and structure of the plant community dramatically on many areas of this site. Most areas of the site are now shrub dominated unless brush management practices have been applied.

Abusive grazing causes a reduction of more palatable species, such as Indiangrass, switchgrass and the bluestems, a decline in soil cover and organic matter and reduction in fire intensity. The shift in plant cover and decline in frequency and intensity of fires favors woody plant encroachment. The woody, and herbaceous, invaders are generally endemic species released from competition from grasses and fire suppression. As sand sagebrush, Havard oak, mesquite, and yucca invade the site under continuous heavy grazing, the plant community shifts from a tallgrass dominated grassland to a Mixed-grass Community (1.2). Grasses still dominate annual herbage production in this plant type, but the encroaching woody species increase in density and production.

With continued abusive grazing and reduction of the frequency and intensity of fires the Mixed-grass Community (1.2) transitions into one that is increasingly occupied by woody plants. Droughts, which occur at approximately 20-year intervals in this region, amplify this situation. During the transition the more grazing resistant grasses such as perennial three-awns, sand dropseed, hooded windmillgrass, silver bluestem, fringed signalgrass and less palatable forbs begin replacing the tall and midgrasses. As the grass cover declines, litter, mulch and soil organic matter decline and bare ground, erosion and other desertification processes increase. This trend can be reversed, or at least slowed under the present climate, with proper stocking and brush suppression practices, such as prescribed fire or individual plant treatments (IPT). When the woody plant community exceeds 25 percent canopy on this site and/or the plants reach fire resistant age (two years) and/or reproductive maturity, rest from grazing will generally not restore the grassland community. The Mixed-grass Community (1.2) transitions into a Shortgrass/Mixed-brush Community (2.1) when this threshold is reached. The Shortgrass/Mixed-brush Community (2.1) represents the beginning of a new stable state, the Woodland State (2.0), where the shrubs dominate production. Once the threshold is passed, reversal of this transition is not possible without accelerating conservation and management practices that control the woody invaders.

Sand sagebrush and yucca generally dominate the Shortgrass/Mixed-brush Community (2.1) in the northern portion of the MLRA while Havard oak often dominates in the southern or western side. Occasional post oak thickets may also occur. Mesquite invades the site throughout the MLRA and will eventually dominate once it invades and is not controlled. The grass component is a mixture of low palatability grasses, low quality forbs and annuals. With continued livestock overgrazing, the more palatable tall and midgrasses continue to decrease and are replaced by shortgrasses, such as hooded windmillgrass, sand dropseed and threeawns. In early stages (25-35% shrub cover) the increase of noxious species can be reversed with relatively inexpensive brush control practices such as chemical aerial applications and/or individual plant treatments along with good grazing management. Generally, prescribed burning is not an option once this site has reached this threshold. The lack of fine fuel and poor continuity will limit the effectiveness of prescribed burning. The high possibility of wind erosion generally excludes mechanical brush control treatments, but herbicide treatments can be effective. If these practices are not applied and overgrazing continues, the woody species will continue to increase in dominance. Once the brush canopy exceeds 45 percent, annual production for the herbaceous species is limited to low quality shortgrasses and annual grasses and forbs within shrub interspaces. This plant community, the Mixed-brush/Shortgrass/Annuals Community (2.2), becomes a stable shrubland, dominated by either mesquite or oak. Reversal of this plant type requires extensive reclamation practices.

Many areas of the Loamy Sand Prairie site are currently cultivated, or have been cultivated for cash crops. When cropping ceases (State 3) the site should be re-seeded with native or adapted exotic species. If let go back to native species naturally the site is subject to erosion and generally supports mostly annuals such as camphorweed, prairie senna and wild buckwheat. It will also be quickly invaded by brushy species from adjacent sites.

State and Transition Diagram:
A State and Transition Diagram for the Loamy Sand Upland (R078CY105TX) site is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.
Plant communities will differ across the MLRA because of the natural variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category.

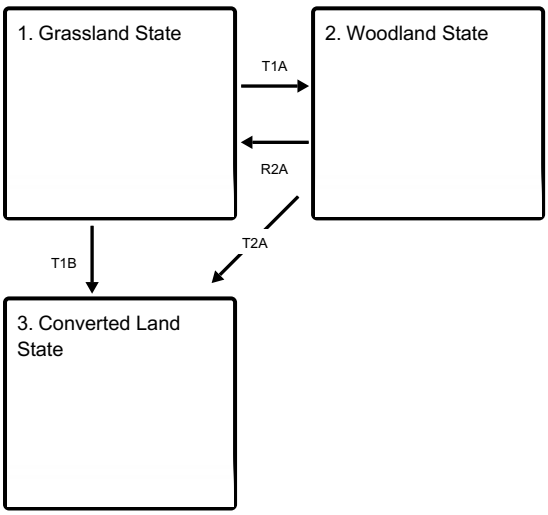
The biological processes on this site are complex. Therefore, representative values are presented in a land management context. The species lists are representative and are not botanical descriptions of all species occurring, or potentially occurring, on this site. They are not intended to cover every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

Composition by dry weight and percent canopy cover are provided to describing the functional groups. Most observers find it easier to visualize or estimate percent canopy for woody species (trees and shrubs).

The following diagram suggests some pathways that the vegetation on this site might take. There may be other states not shown on the diagram. This information is intended to show what might happen in a given set of circumstances. It does not mean that this would happen the same way in every instance. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

Ecosystem states



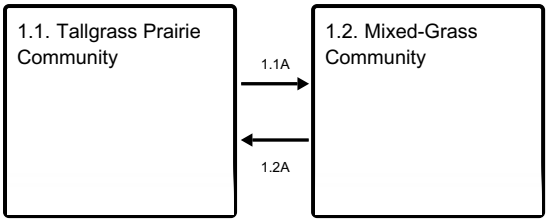
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

T1B - Extensive soil disturbance followed by seeding

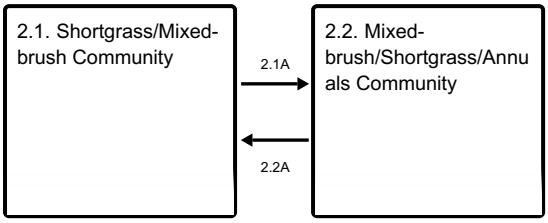
R2A - Adequate rest from defoliation and removal of woody canopy, followed by reintroduction of historic disturbance regimes

T2A - Extensive soil disturbance followed by seeding

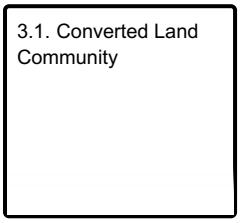
State 1 submodel, plant communities



State 2 submodel, plant communities



State 3 submodel, plant communities



State 1
Grassland State

The interpretive or reference plant community for this site is a Tallgrass Prairie Community (1.1). This community is believed to have been a relatively open prairie with scattered motts of oak and an abundance of forbs. Little bluestem contributed from 20 to 25 percent of the herbage production. Indiangrass, switchgrass, sand bluestem, giant dropseed and purple tridens contributed 30 to 40 percent. Woody species included post oak, Havard oak, sand sagebrush, skunkbush, prickly-ash, bumelia and net-leaf hackberry. Woody plants are thought to have represented five to ten percent of the composition. The woody species were apparently kept at low levels because of frequent wildfires and occasional long droughts. Forbs such as Engelmann’s daisy, prairie clover, and dotted gayfeather thrived. It is estimated that the Tallgrass Prairie Community (1.1) produced as much as 5000 to 6000 pounds herbage in years with good moisture and as little as 3000 pounds to 4000 pounds in unfavorable years. The Mixed-Grass Plant Community (1.2) still have most reference species present but the dominant tallgrasses are being displaced by increases in silver bluestem, Arizona cottontop, sideoats grama, sand lovegrass and weeds. Of the tallgrasses, little bluestem is most persistent, often increasing initially under continued overgrazing before declining. Havard oak, sand sagebrush, skunkbush sumac, yucca, elbowbush and post oak increase in density and cover, varying from 15 to 25 percent canopy cover in this phase. Most climax forbs such as gaura, heath aster, dotted gayfeather, and verbena persist in the Mixed-grass Community. Annual yields range from 2500 to 5500 pounds.

Community 1.1
Tallgrass Prairie Community

The interpretive or reference plant community for this site is a Tallgrass Prairie Community (1.1). The reference plant community is believed to have been a relatively open prairie with scattered motts of oak and an abundance of forbs. Little bluestem contributed from 20 to 25 percent of the herbage production. Indiangrass, switchgrass, sand bluestem, giant dropseed and purple tridens contributed 30 to 40 percent. Woody species included post oak, Havard oak, sand sagebrush, skunkbush, prickly-ash, bumelia and net-leaf hackberry. Woody plants are thought to have represented five to ten percent of the composition. The woody species were apparently kept at low levels because of frequent wildfires and occasional long droughts. Forbs such as Engelmann’s daisy, prairie clover, dotted gayfeather, sagewort and verbena thrived in the sandy soils because of good soil moisture relationships. It is estimated that the Tallgrass Prairie Community (1.1) produced as much as 5000 to 6000 pounds herbage in years with good moisture and as little as 3000 pounds to 4000 pounds in unfavorable years. Grasses and forbs contributed up to 80 to 85 percent of the total annual production in reference conditions. The tallgrasses aided in the

infiltration of rainfall and reduced runoff. Little runoff is thought to have occurred under normal rainfall conditions. Litter and organic matter buildup was limited by the dry climate, but ground cover is presumed to have been sufficient to prevent wind or water erosion under normal conditions. The Tallgrass Prairie Community (1.1) furnished good forage for grass-eating type animals such as bison before settlement and for horses and cattle after settlement. It was excellent habitat for deer, quail, dove, prairie chicken and other wildlife. Near reference grassland conditions can be maintained with proper stocking, prescribed grazing and frequent prescribed burning. The site is responsive to good management. Little bluestem is often persistent even under moderate grazing. Stocking rates must consider the kind of livestock and balance their numbers with current annual forage production and competition from other herbivores. Proper stocking and flexibility in animal numbers is important because of the nature of the soil and the need for plant cover to guard against wind erosion and water erosion on steeper slopes. Livestock overgrazing or a decrease in intensity and frequency of fires and no brush management will allow this plant community to transition into a Mixed-grass Community (1.2), which is relatively open grassland with various amounts of invading shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2690	4035	5380
Shrub/Vine	336	504	673
Tree	168	252	336
Forb	168	252	336
Total	**3362**	**5043**	**6725**

Figure 9. Plant community growth curve (percent production by month). TX2286, Tallgrass Prairie Community. Tallgrass with warm-season growing season dominated site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	3	3	8	20	18	8	10	17	9	2	1

Community 1.2
Mixed-Grass Community

Figure 10. 1.2 Mixed-grass Community

The Mixed-grass Community (1.2) is the result of the interaction of long-term overgrazing, reduction in intensity and frequency of fires and possibly climate change (Milchunas 2006). The reduction in vegetative structure and ground cover resulting from continued overgrazing reduces the competitive advantage of grasses and allows increases in indigenous shrubs and invasion of less palatable shrubs, grasses and forbs from adjacent sites. Reduction in fire frequency and intensity allows the shrubs to become established. Continued overgrazing allows the less palatable grasses and forbs, or more grazing resistant species, to replace the more palatable tall and midgrasses. The composition of the Mixed-grass Community on this site varies with time and intensity of grazing. Most reference community species are present but the dominant tallgrasses are being displaced by increases in silver bluestem,

Arizona cottontop, sideoats grama, sand lovegrass and weeds. Of the tallgrasses, little bluestem is most persistent, often increasing initially under continued overgrazing before declining. Havard oak, sand sagebrush, skunkbush sumac, yucca, elbowbush and post oak increase in density and cover, varying from 15 to 25 percent canopy cover in this phase. Litter and soil organic matter are lower than in climax condition and some wind or water erosion might occur. Most climax forbs such as gaura, heath aster, dotted gayfeather verbena, catclaw sensitivebriar, primrose and wild buckwheat persist in the Mixed-grass phase. Annual yields range from 2500 to 5500 pounds. Total herbage production is only slightly reduced, due primarily to fertility loss, but the proportionate production by woody species and unpalatable forbs increases as their percentage composition increases. The Mixed-grass Community on the Loamy Sand Prairie Ecological Site provides good grazing for grazers, such as cattle and excellent habitat for browsing animals, such as deer and goats. It can be maintained and retrogression reversed by proper grazing, minimal brush management and periodic prescribed burning. With continued overgrazing by livestock and no brush management, however, the shrub component matures and starts to dominate. Concurrently, shortgrasses and weeds continue to replace the tall and midgrasses. When woody plant cover reaches about 25 percent and/or the shrubs become resistant to fire this community transitions into a Shortgrass/Mixed-brush (2.1) Community. Once the Shortgrass/Mixed-brush (2.1) threshold is reached, grazing management and prescribed burning will generally not be effective in maintaining the community. More costly, accelerated brush control practices will be required to reverse the trend toward dense woodland.

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1821	2914	4007
Shrub/Vine	420	673	925
Tree	280	448	616
Forb	280	448	616
Total	**2801**	**4483**	**6164**

Figure 12. Plant community growth curve (percent production by month). TX2276, Mid/Shortgrasses with Forbs. Warm-season mid and shortgrasses, cool-season grasses, and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	4	8	25	25	14	6	8	5	2	1

Pathway 1.1A
Community 1.1 to 1.2

With Heavy Continuous Grazing, No Fires, Brush Invasion, and No Brush Management, the Tallgrass Prairie Community will shift to the Mixed-grass Community.

Pathway 1.2A
Community 1.2 to 1.1

With the implementation of various conservation practices such as Prescribed Grazing, Prescribed Burning, and Brush Management, the Mixed-grass Community can be shifted to the Tallgrass Prairie Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

State 2
Woodland State

The Shortgrass/Mixed-brush Community (2.1) has a 25 to 45 percent woody plant canopy of Mixed-brush species. Post oak and/or mesquite are often becoming the dominant overstory and sand sagebrush or shin oak are the most common shrubs. The Mixed-brush/Shortgrass/Annuals Community on the Loamy Sand Prairie site is a woodland state. Sand sagebrush, yucca, and skunkbush sumac are common. Mesquite and sometimes post oak often become the dominant overstory. Sand sagebrush will often form dense stands. With continued heavy grazing and no brush control, the trees and shrubs can approach 75 percent or more ground cover. Shortgrasses and low seral stage annual and perennial forbs occupy the woody plant interspaces.

Community 2.1
Shortgrass/Mixed-brush Community

Figure 13. 2.1 Shortgrass/Mixed-brush Community

The Shortgrass/Mixed-brush Community (2.1) has a 25 to 45 percent woody plant canopy of Mixed-brush species. Post oak and/or mesquite are often becoming the dominant overstory and sand sagebrush or shin oak are the most common shrubs. The Shortgrass/Mixed-brush Community is the result of selective overgrazing by livestock and deer and the differential response of plants to defoliation over a long period of time. Fire frequency and intensity has also been reduced as a disturbance factor because of a paucity of fine fuel available and fire prevention. With or without livestock grazing, there is a continued decline in diversity of the grassland component and an increase in woody and annual species. Plant composition and production shifts toward the non-grass component as selective grazing reduces preferred species. Annual herbage production by the grassland component is reduced due to the shift to shorter species and less vigorous plants. There is a concomitant decline in soil structure, organic matter and ground cover. The site is susceptible to water or wind erosion. All, except the more palatable woody species, have increased in size and density. Many of the reference community shrubs are present. Typically, sand sagebrush plum, skunkbush sumac, pricklyash, shin oak and mesquite are increasing in density and frequency in this vegetation type. Remnants of historic climax grasses and forbs and unpalatable invaders occupy the interspaces between shrubs. Common grasses include fringed signalgrass, hooded windmillgrass, sand dropseed, sand paspalum, three-awns and many forbs. Little bluestem, giant dropseed, and sand lovegrass are often persistent. Western ragweed, woollywhite, prairie clover, dotted gayfeather, wild buckwheat and anemone are characteristic forbs. As the grassland vegetation declines, more soil is exposed leading to erosion on steeper slopes. The increasing woody canopy causes higher interception losses coupled with higher evaporation losses. Soil organic matter and soil structure decline within the interspaces but soil conditions improve under the woody plant cover. Wind blowouts are infrequent but do occur in bare areas. Total plant production declines somewhat, being approximately 2000 to 4500 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 grass component. 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. Unless brush management and good grazing management are applied at this stage, the transition toward the Mixed-Brush/Shortgrass/Annuals Community (2.2) will continue. The trend cannot be reversed with good grazing management alone. Woody species will eventually dominate the site.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	1121	1793	2522
Shrub/Vine	673	1076	1513
Tree	224	359	504
Forb	224	359	504
Total	**2242**	**3587**	**5043**

Figure 15. Plant community growth curve (percent production by month). TX2277, Shortgrasses/Mixed-Brush Community. Shortgrasses, annual grasses, and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	5	8	24	25	12	7	10	5	2	0

Community 2.2
Mixed-brush/Shortgrass/Annuals Community

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

The Mixed-brush/Shortgrass/Annuals Community on the Loamy Sand Prairie site is a shrubland resulting from many years of overgrazing, lack of periodic fires and little brush management. Sand sagebrush, yucca, skunkbush sumac, pricklyash and sand plums are common. Mesquite and sometimes post oak often become the dominant overstory. Sand sagebrush will often form dense stands. With continued heavy grazing and no brush control, the trees and shrubs can approach 75 percent or more ground cover. Shortgrasses and low seral stage annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are hooded windmillgrass, tumble windmillgrass, gummy lovegrass, fall witchgrass, fringed paspalum, sand paspalum and sand dropseed. Forbs commonly found in this community include camphorweed, prairie clover, verbena, astragalus, heath aster, wollywhite wildbean and anemone. Numerous annual grasses and forbs may be present. Grasses and forbs make up 30 percent or less of the annual herbage production. The Mixed-brush/Shortgrass/Annuals Community provides good cover for wildlife, but only limited preferred forage, or browse. Major high cost and high energy, accelerating practices are required to restore the Mixed-brush/Shortgrass/Annuals Community (2.2) back to a grassland state. Generally, brush management practices such as aerial herbicide application, along with other conservation practices such as range planting, grazing deferment, prescribed grazing and prescribed burning are necessary to return the shrubland state the grassland state. In practice this may not be practical or desirable depending on objectives of the land manager.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	897	1345	2018
Tree	673	1009	1513
Grass/Grasslike	448	673	1009
Forb	224	336	504
Total	**2242**	**3363**	**5044**

Figure 18. Plant community growth curve (percent production by month). TX2291, MixedBrush/Shortgrass/Annuals Community. Spring & Fall growth of grasses, annuals and woody shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	6	10	20	22	6	8	12	10	2	1

Pathway 2.1A
Community 2.1 to 2.2

Shortgrass/Mixed-brush Community

Mixed-brush/Shortgrass/Annuals Community

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

Pathway 2.2A
Community 2.2 to 2.1

Mixed-brush/Shortgrass/Annuals Community

Shortgrass/Mixed-brush Community

With Brush Management and Prescribed Grazing, the Mixed-brush/Shortgrass/Annuals can shift back to the Shortgrass/Mixed-brush Community.

Conservation practices

Brush Management
Prescribed Grazing

State 3
Converted Land State

Community 3.1
Converted Land Community

The Loamy Sand Prairie Ecological Site is planted into the Converted Land Community (3.1) and planted to crops or pasture grasses. Technical advice as to adapted crops, cropping systems, production, and cultivation practices

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

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

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

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

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

Transition T1A
State 1 to 2

With continued overgrazing by livestock and no brush management, however, the shrub component matures and starts to dominate. Concurrently, shortgrasses and weeds continue to replace the tall and midgrasses. When woody canopy cover reaches about 25 percent and/or the shrubs become resistant to fire, the Grassland State transitions 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

Converting the Woodland State back to the Grassland state requires extensive and expensive reclamation practices. Without major brush control and management inputs, this plant community cannot be returned to grassland. Range planting, prescribed grazing and prescribed burning, must follow intensive mechanical brush control.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T2A
State 2 to 3

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

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
0	**Tallgrass**			673–1345	
1	**Tallgrasses**			1177–2354	
	sand bluestem	ANHA	*Andropogon hallii*	353–706	–
	switchgrass	PAVI2	*Panicum virgatum*	353–706	–
	Indiangrass	SONU2	*Sorghastrum nutans*	353–706	–
	giant dropseed	SPGI	*Sporobolus giganteus*	67–123	–
	purpletop tridens	TRFL2	*Tridens flavus*	56–112	–
2	**Midgrasses**			504–1009	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	84–168	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	84–168	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	84–168	–
	Arizona cottontop	DICA8	*Digitaria californica*	84–168	–
	sand lovegrass	ERTR3	*Eragrostis trichodes*	84–168	–
	plains bristlegrass	SEVU2	*Setaria vulpiseta*	84–168	–
3	**Shortgrasses**			168–336	
	purple threeawn	ARPU9	*Aristida purpurea*	17–34	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	17–34	–
	fall witchgrass	DICO6	*Digitaria cognata*	17–34	–
	thin paspalum	PASE5	*Paspalum setaceum*	17–34	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	17–34	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	17–34	–
	fringed signalgrass	URCI	*Urochloa ciliatissima*	17–34	–
4	**Cool-season grasses**			168–336	
	Canada wildrye	ELCA4	*Elymus canadensis*	56–112	–
	western wheatgrass	PASM	*Pascopyrum smithii*	56–112	–
	Texas bluegrass	POAR	*Poa arachnifera*	56–112	–
Forb					
5	**Forbs**			168–336	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	7–13	–
	anemone	ANEMO	*Anemone*	7–13	–
	bluestem pricklypoppy	ARALT	*Argemone albiflora ssp. texana*	7–13	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	7–13	–
	milkvetch	ASTRA	*Astragalus*	7–13	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	7–13	–
	whitemouth dayflower	COER	*Commelina erecta*	7–13	–
	prairie clover	DALEA	*Dalea*	7–13	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	7–13	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	7–13	–

	buckwheat	ERIOG	*Eriogonum*	7–13	–
	beeblossom	GAURA	*Gaura*	7–13	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	7–13	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	7–13	–
	coastal indigo	INMI	*Indigofera miniata*	7–13	–
	bush morning-glory	IPLE	*Ipomoea leptophylla*	7–13	–
	dotted blazing star	LIPU	*Liatris punctata*	7–13	–
	blazingstar	MENTZ	*Mentzelia*	7–13	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	7–13	–
	evening primrose	OENOT	*Oenothera*	7–13	–
	groundcherry	PHYSA	*Physalis*	7–13	–
	globemallow	SPHAE	*Sphaeralcea*	7–13	–
	slickseed fuzzybean	STLE6	*Strophostyles leiosperma*	7–13	–
	queen's-delight	STSY	*Stillingia sylvatica*	7–13	–
	white heath aster	SYERE	*Symphyotrichum ericoides var. ericoides*	7–13	–
	vervain	VERBE	*Verbena*	7–13	–
Shrub/Vine					
6	**Shrubs/Vines**			336–673	
	acacia	ACACI	*Acacia*	28–34	–
	sand sagebrush	ARFI2	*Artemisia filifolia*	28–34	–
	prairie clover	DALEA	*Dalea*	28–34	–
	stretchberry	FOPUP	*Forestiera pubescens var. pubescens*	28–34	–
	plum	PRUNU	*Prunus*	28–34	–
	Harbison oak	QUHA	*Quercus ×harbisonii*	28–34	–
	fragrant sumac	RHAR4	*Rhus aromatica*	28–34	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	28–34	–
	saffron plum	SICE2	*Sideroxylon celastrinum*	28–34	–
	greenbrier	SMILA2	*Smilax*	28–34	–
	yucca	YUCCA	*Yucca*	28–34	–
	pricklyash	ZANTH	*Zanthoxylum*	28–34	–
Tree					
7	**Trees**			168–336	
	post oak	QUST	*Quercus stellata*	84–168	–
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	56–112	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	28–56	–

Animal community

Many types of grassland reptiles, birds and mammals used the Loamy Sand Ecological Site along with adjacent sites. Small mammals include many kinds of rodents, black-tailed jackrabbit, eastern and desert cottontail, ground squirrel, badger and skunk. Predators include coyote and bobcat. Prairie chicken, quail, doves, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison made infrequent migratory use and pronghorn antelope and deer were indigenous. Free roaming bison are no longer present, but deer still utilize the

Loamy Sand Prairie site in its various states.

The site is suitable for production of many kinds of wildlife and livestock. In the Grassland State (1) it is primarily suited to grass eaters such as cattle. As livestock caused retrogression occurs and woody plants invade (State 2) it becomes better habitat for deer and other wildlife because of the browse and forbs. Livestock should be stocked according to the available grass, forb and browse forage, keeping competition for forbs and browse with deer in mind.

Hydrological functions

The Loamy Sand Ecological Site consists of undulating topography which drains well. The surface soils are loamy fine sands less than 20 inches deep with moderate or rapid permeability. Natural fertility and organic matter is low. Water infiltration is rapid but water holding capacity is low or moderate. There is some water movement off the site, however. Wind or water erosion is a hazard where the site is not protected by vegetation. Wind erosion blowouts can occur on areas not protected by vegetation.

Under reference condition, the grassland vegetation intercepted and utilized much of the incoming rainfall. Hydrologic functions were representative of a tallgrass prairie. Litter and soil movement was slight except on steep slopes. Deposition or erosion was uncommon. However, standing plant cover, duff and soil organic matter decrease as the Tallgrass Prairie Community (1.1) transitions to the Mixed-Grass Community (1.2) and continue to decline in the spaces between the shrubs of the Shortgrass/Mixed-Brush Community (2.1). During the transition, evaporation and interception losses are higher, resulting in less moisture reaching the soil. Soil erosion plus a loss of fertility may take place between shrubs. The deeper-rooted woody invaders are able to extract water from greater depths than the short grasses and may accumulate some windblown soil and litter. The woody plants compete for moisture with the remaining grasses and forbs further reducing production and ground cover in openings. Once the Mixed-Brush/Shortgrass/Annuals Community (2.2) canopy surpasses 50 percent the hydrological and ecological processes, nutrient cycling and energy flow, stabilize within the woody plant canopy and shrubland type ecological processes dominate (Thurow 1991).

Recreational uses

The site has value from an aesthetic standpoint. The undulating topography and proximity to the Sandy Loam and Sand Hills sites make it an interesting site. Hunting, camping, hiking, bird watching, photography and horseback riding are possibilities. Good spring rainfall brings scattered stands of colorful forbs.

Wood products

Mesquite and oaks may be used for firewood.

Other products

Bees may be used to make honey from flowering plants.

Other information

None.

Inventory data references

Information presented has been derived from the Loamy Sand Range Sites PE 36-38 (old area 3 dated 3/1/74) and 36-42 (old area 8 dated9/2/75), and an undated NRCS draft Loamy Sand PE 31-44 Ecological Site Description for 78C, literature, personal experience, field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster.

R-417 forms were taken during sample periods 1981-1986 from Jones and Hardeman Counties.

Photo 2 was taken August 15 2007 in northern Wilbarger County, Texas.

Photo 3 was taken July 30, 2007 in northern Jackson County, OK
Photo 4 was taken August 16, 2007 in northwest Haskell County, TX

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

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Approval

Bryan Christensen, 9/15/2023

Acknowledgments

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

Rangeland health reference sheet

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

Author(s)/participant(s)	Lem Creswell, Zone RMS, NRCS, Weatherford, Texas

Contact for lead author	817-596-2865
Date	01/23/2008
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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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:** None to slight. 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 intermittent streams. Gullies should be vegetated and stable.

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Exposed soils are readily erodible by wind and water movement.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface soils are 12-19 inches thick, reddish brown loamy fine sand with single grain structure. SOM is approximately 1-6%. See Soil Survey Manual for specifics.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savannah of warm-season tsallgrasses, forbs and motts of trees along with moderate of litter and small amounts of bare ground provides for maximuminfiltration and little runoff under normal rainfall events.

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

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 = Cool-season grasses =

    Other: Forbs > Shrubs/Vines > Trees

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Grasses due to their growth habit will exhibit some mortality and decadence, though very slight.

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

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1900-3700 pounds/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:** Sand sagebrush, yucca, Harvard oak, mesquite, juniper, prickly ash and annual weeds.

17. **Perennial plant reproductive capability:** All species should be capable of plant reproduction, except during periods of prolonged drought conditions, heavy natural herbivory or wild fires.