USDA Natural Resources Conservation Service

Ecological site R081BY342TX
Shallow 19-23 PZ

Last updated: 9/19/2023
Accessed: 05/11/2025

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.

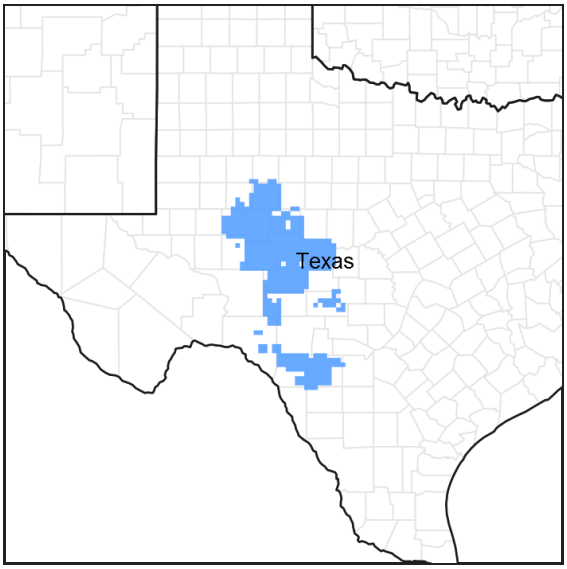


Figure 1. Mapped extent

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): 081B–Edwards Plateau, Central Part

This area is entirely in south-central Texas. It makes up about 11,125 square miles (28,825 square kilometers). The towns of Fredericksburg, Junction, Menard, Rocksprings, and Sonora are in this MLRA. Interstate 10 crosses the middle part of the area. A few State parks and State historic sites are in this MLRA.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 81B

Ecological site concept

The Shallow ecological site is located on uplands with soils 10 to 20 inches deep over a petrocalcic horizon.

Associated sites

R081BY593TX	**Limestone Hill 19-23 PZ** The Limestone Hill site may be encountered uphill.

R081BY333TX	**Loamy 19-23 PZ** The Loamy site has deeper soils.
R081BY325TX	**Clay Loam 19-23 PZ** The Clay Loam site may be encountered on adjacent slopes.
R081BY349TX	**Steep Rocky 19-23 PZ** The Steep Rocky site may be encountered uphill on slopes greater than 20 percent.

Similar sites

R081BY353TX	**Very Shallow 19-23 PZ** The Very Shallow site has shallower and has less production.
R081BY336TX	**Low Stony Hill 19-23 PZ** The Low Stony Hill site is a shallow soil with more gravels, cobbles, and stones.

Table 1. Dominant plant species

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

Physiographic features

The Shallow ecological site consists of nearly level to gently sloping soils on uplands with a petrocalcic horizon. Slope ranges from 0 to 3 percent. Runoff is low to medium depending on the nature of the slope. This site is usually found on stream terraces, alluvial fans, hills, ridges, divides, and foot slopes. The elevation ranges from 1,100 feet to 2,800 feet above sea level. The majority of the site is used for rangeland due to the shallow soils. However, there are some areas that are used for permanent pastureland and small grains.

Table 2. Representative physiographic features

Landforms	(1) Plateau > Stream terrace (2) Plains > Plain (3) River valley > Stream terrace
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	1,100–2,800 ft
Slope	0–3%
Aspect	Aspect is not a significant factor

Climatic features

The climate in the MLRA 81B is subtropical subhumid on the eastern portion and subtropical steppe on the western portion of the MLRA. Winters are dry, and the summers are hot and humid. The precipitation increases from west to east and the temperatures increase from north to south. The area usually receives 65 to 70 percent sunshine each year. The majority of the rainfall occurs during the warm months of April to October. Most precipitation comes from thunderstorms that vary in the amount of water received and the areas covered. Spring is characterized by fluctuating patterns, but mild temperatures prevail. July and August are relatively dry and hot with little weather variability day-to-day. As summer progresses through fall, an increase of precipitation usually occurs in the eastern portions while a decrease of precipitation occurs to the west. Winter temperatures are mild, but polar Canadian air masses bring rapid drops in temperature. These cold spells last 2 or 3 days. Prevailing winds are southerly with

March and April the windiest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	210-240 days
Freeze-free period (characteristic range)	240-280 days
Precipitation total (characteristic range)	19-24 in
Frost-free period (actual range)	210-240 days
Freeze-free period (actual range)	240-280 days
Precipitation total (actual range)	19-25 in
Frost-free period (average)	225 days
Freeze-free period (average)	260 days
Precipitation total (average)	22 in

Climate stations used

- (1) BIG LAKE 2 [USC00410779], Big Lake, TX
- (2) OZONA [USC00416734], Ozona, TX
- (3) CARTA VALLEY [USC00411492], Rocksprings, TX
- (4) ELDORADO [USC00412809], Eldorado, TX
- (5) SONORA [USC00418449], Sonora, TX

Influencing water features

The sites are located on uplands and are not influenced by a stream or wetland.

Wetland description

N/A

Soil features

In a representative profile for Shallow ecological site, the parent material is limestone. The surface layer is dark grayish-brown, calcareous clay loam about six to nine inches thick. The soil depth before hitting petrocalcic horizon ranges from 14 to 20 inches. The soils are well drained and permeability is moderately slow. The available water capacity is low and calcium carbonate makes up 5 to 40 percent of the soil profile. Soil series correlated to this site include: Kavett and Mereta.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone
Surface texture	(1) Clay loam
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	14–20 in
Soil depth	14–20 in
Surface fragment cover <=3"	0–8%
Surface fragment cover >3"	0–1%
Available water capacity (0-20in)	2–3.4 in

Calcium carbonate equivalent (0-20in)	5–40%
Electrical conductivity (0-20in)	0–2 mmhos/cm
Sodium adsorption ratio (0-20in)	0
Soil reaction (1:1 water) (0-20in)	7.9–8.4
Subsurface fragment volume <=3" (4-20in)	0–8%
Subsurface fragment volume >3" (4-20in)	0–1%

Ecological dynamics

The Shallow Ecological Site is a fire influenced midgrass prairie with scattered oak (Quercus spp.) mottes. Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, severe droughts, and frequent fires. Wildfires occurred at 7 to 12 years intervals or less maintaining woody species at less than 10 percent canopy on this relatively level site. The soils of the site vary from very shallow clays to shallow clay loams with pockets and crevices of deeper soils. Productivity of the site varies with these fluctuations and decreases with precipitation from east to west. Moisture holding capacity is relatively limited and often limits productivity. Long-term droughts, occurring three to four times per century, may cause shifts in vegetation by causing woody plant mortality.

Sideoats grama (*Bouteloua curtipendula*) and little bluestem (*Schizachyrium scoparium*) were the co-dominants on the east side of the MLRA while sideoats grama was the dominant species on the western portion of the MLRA. Other midgrasses found in reference conditions include feathery bluestems (Bothriochloa spp.), green sprangletop (*Leptochloa dubia*), vine mesquite (*Panicum obtusum*), and meadow dropseed (*Sporobolus compositus* var. drummondii). The frequent fires favor grasses over woody plants and forbs. There was also a wide variety of forbs and legumes present. Trees, primarily live oak (*Quercus virginiana*) and hackberry (*Celtis laevigata*) occupy rock crevices and deeper soil pockets on areas protected from wildfires, covering less than three percent of the ground area. Shrubs composed of approximately two to six percent canopy cover.

The Midgrass Prairie Community (1.1) is relatively stable and resilient within the climate, soil, and fire regime until European settlement and the advent of fencing and animal husbandry in the late 1800’s. Not understanding the limits of rangeland productivity, European settlers overstocked the area with domesticated livestock almost universally. As continuous overgrazing occurred, there was a reduction of the less grazing resistant tallgrasses, a decline in mulch and organic matter, and a reduction in intensity and frequency of fires. The shift in plant cover and decline in soil properties favored woody plant encroachment. The woody and grassland vegetation invaders were generally endemic species released from competition. The plant community derived after the midgrasses were being overgrazed and fire was being excluded was the Mid/Shortgrass Savannah Community (1.2). In this community, tallgrasses and little bluestem gave way to midgrasses like sideoats grama, feathery bluestems, and plains lovegrass (*Eragrostis intermedia*). Low palatability midgrasses and forbs began replacing the more preferred tallgrasses and forbs. Grasses still dominated primary production, but the encroaching woody species increased the amount of annual production compared to the Midgrass Prairie Community (1.1). The higher percentage of woody species is favorable to browsing animals. When the early settlers recognized that browsing animals foraged on woody species, they stocked the site with higher populations of cattle, sheep, and goats than the site was able to sustain.

When the Mid/Shortgrass Savannah Community (1.2) is continually overgrazed and fire is excluded, the process of succession proceeds toward a community that is dominated by woody plants and replacement of midgrasses with more grazing resistant species such as shortgrasses and less palatable forbs. As grass 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. Increasing woody dominants are primarily mesquite and

Ashe juniper (*Juniperus ashei*). Redberry juniper (*Juniperus pinchotii*) often invades from the west and north. Rest from grazing will generally not restore the grassland community when the woody plant community exceeds 10 to 15 percent canopy on this site and the plants reach fire-resistant size (about 5 feet in height). When this transition occurs, the site develops into the Mixed-brush/Shortgrass Community (2.1). This transition also marks the beginning of a new state, the Shrubland State.

Mesquite and/or juniper dominate the Mixed-brush/Shortgrass Community (2.1) and shrubs begin to form thickets. The grass component is a mixture of midgrasses, shortgrasses, and low-quality forbs. With continued livestock overgrazing, the better midgrasses would be replaced by grazing resistant shortgrasses and forbs such as buffalograss (*Bouteloua dactyloides*), curlymesquite (*Hilaria belangeri*), three-awns (Aristida spp.), and broom snakeweed (Gutierrezia spp.). Cool-season grasses such as Texas wintergrass (*Nassella leucotricha*) and annual bromes (Bromus spp.) also increase.

During this phase, the process of retrogression can be reversed with brush control and good grazing management that includes the application of prescribed burning. If these conservation practices are not applied, the woody canopy will continue to increase in dominance and ground cover and a woody plant dominated community, the Mixed-brush Shrubland Community (2.2), becomes recognizable. Once canopy cover exceeds 30 to 35 percent overstory, annual production for the understory is very limited and is generally made up of unpalatable shrubs, grasses, and forbs within tree/shrub interspaces. Brushy species such as mesquite (*Prosopis glandulosa*), juniper, algerita (Mahonia trifoliata), prickly pear (Opuntia spp.), and condalia (Condalia spp.) often form thickets. Shortgrasses and cool-season grasses and forbs are in a weakened condition.

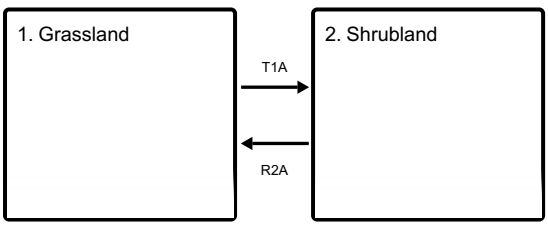
Until maximum ground cover by woody species is approaching desertification, erosion continues to occur within the interspaces. Considerable litter and soil movement occur during heavy rainfall events. Exposed soil crusts readily, creating an opportunity for further soil and wind erosion due to run-offs. The microclimate becomes drier as interception losses increase with canopy cover. Once canopy cover reaches potential, however, the hydrological processes, energy flow, and nutrient cycling begin to stabilize under the Woodland/Shrubland environment.

Major expense and energy inputs are required to restore the Mixed-brush Shrubland Community (2.2) to the Grassland State (1). Generally, mechanical or herbicidal brush management practices such as dozing and individual plant treatments (IPT), along with other conservation practices such as range planting, grazing deferment, prescribed grazing, and prescribed burning are necessary for the ecological site to return back to the reference community. Severe erosion and soil fertility losses during the retrogression process may prohibit the site from returning to reference conditions.

Very little of the Shallow site has been put to crop cultivation. The site is highly erodible and should be cultivated with care, if at all. Most fields previously cultivated for crops have been returned to native or introduced grass species. Various introduced grass species planted include old world bluestem (Bothriochloa spp.) or Kleingrass (*Panicum coloratum*). Most of these introduced grasses are managed as rangeland.

State and transition model

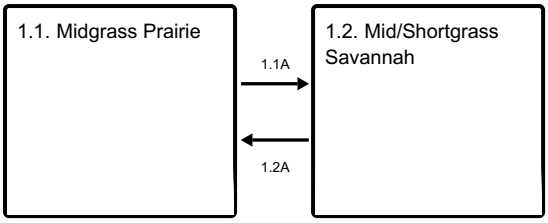
Ecosystem states



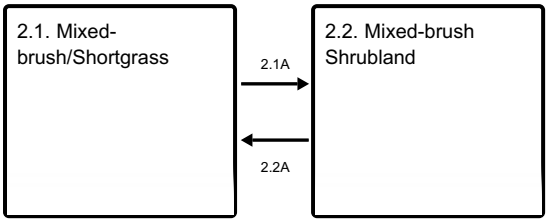
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

R2A - Reintroduction of historic disturbance return intervals

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Grassland

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- little bluestem (*Schizachyrium scoparium*), grass

Community 1.1
Midgrass Prairie

The reference plant community for this site is a fire-induced midgrass prairie. Live oak and other trees were widely scattered in protected areas and along draws, but made up less than three percent canopy. Sumacs (Rhus spp.), Texas kidneywood (*Eysenhardtia texana*), elbowbush (*Forestiera pubescens*), ephedra (Ephedra spp.), and bumelia (Sideroxylon spp.) were typical shrubs. Little bluestem (*Schizachyrium scoparium*) occupied favorable micro-sites and was locally dominant. Sideoats grama was the dominant or co-dominant grass throughout the site. Also occurring on the site, but in smaller amounts, are meadow dropseed (*Sporobolus compositus* var. drummondii), feathery bluestems (Bothriochloa spp.), Arizona cottontop (*Digitaria californica*), Texas wintergrass (*Nassella leucotricha*), Texas cupgrass (*Eriochloa sericea*), vine mesquite (*Panicum obtusum*), and a number of shortgrasses. Common forbs found on the site include awnless bushsunflower (*Simsia calva*), Engelmann's daisy (*Engelmannia peristenia*), Chalkhill wooly-white (Hymenopappus spp.), half-shrub sundrop (*Calylophus serrulatus*), catclaw sensitivebriar (Mimosa quadrivalis var. floridana), and bundleflower (Desmanthus spp.). Live oak, hackberry, Texas redbud (*Cercis canadensis* var. texensis), and mesquite (*Prosopis juliflora*) are indigenous tree species. The Midgrass Prairie Community (1.1) produced from 1,500 to 3,000 pounds of biomass annually, depending upon the amount of precipitation. Annual production declined from east to west due to the decrease in precipitation. Grasses made up to 85 to 92 percent of species composition. The midgrasses aided in the infiltration of rainfall into the slowly permeable soil and reduction of runoff. Historically, the Midgrass Prairie Community furnished good habitat for grazing type wildlife such as bison and pronghorn antelope.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1275	1700	2550
Forb	105	140	210
Shrub/Vine	90	120	180
Tree	30	40	60
Total	**1500**	**2000**	**3000**

Figure 9. Plant community growth curve (percent production by month). TX3605, Midgrass/Oak Savannah with less 10% canopy. Warm season

rangeland with peaks in annual production from herbaceous layer in May and in September..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	3	5	13	22	15	5	3	15	7	5	4

Community 1.2
Mid/Shortgrass Savannah

Figure 10. 1.2 Mid/Shortgrass Savannah Community

Figure 11. 1.2 Mid/Shortgrass Savannah Community (2)

The Mid/Shortgrass Savannah Community (1.2) is a midgrass dominated savannah 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. Live oak is widely scattered but increasing in size and density. Numerous brushy species, including juniper and mesquite, are increasing in density because overgrazing by livestock has reduced grass cover, exposed soil, and reduced fine fuel for fire. In this community, the increasing woody species are generally less than three feet tall and still subject to control by fire and improved grazing management. The woody canopy varies between 10 and 20 percent depending on severity of grazing, time since last burned, and availability of invading species. Typically, oaks increase in size and mesquite and/or juniper increase in density. Less preferred brushy species such as bumelia, Texas persimmon (*Diospyros texana*), spiny hackberry (Celtis pallida), sumacs (Sumac spp.), condalia, elbowbush, and feather dalea (*Dalea formosa*) increase in density. The prairie becomes a savannah being encroached by woody species. The preferred tallgrasses are being replaced by the more grazing resistant midgrasses, although little bluestem persists. Common grasses are sideoats grama, tall dropseed (*Sporobolus compositus* var. compositus), meadow dropseed, vine mesquite, plains lovegrass, Texas cupgrass (*Eriochloa sericea*), Arizona cottontop, Texas wintergrass, and Canada wildrye (*Elymus canadensis*). Most of the reference forbs exist. Annual primary production ranges from 1,500 to 3,000 pounds per acre, depending on precipitation and the soil series, generally decreasing from east to west. Forage production is predominantly grass. Heavy abusive grazing reduces plant cover, litter, and mulch and has increased bare ground slightly exposing the soil to some erosion. There could be some mulch and litter movement during rainstorm events but due to the gentle slopes little soil movement would take place in this vegetation phase. The changes in composition are small initially,

but unless proper grazing and prescribed burning are initiated at this stage the secondary species continue to increase in size and density. When the canopy of the woody plants becomes dense enough (15 to 20 percent canopy) and tall enough (greater than three feet) to suppress grass growth and resist fire damage, a threshold in ecological succession is reached. The Mid/Shortgrass Savannah Community (1.2) becomes the Mixed-brush/Shortgrass Community (2.1). Normal range management practices, such as proper grazing and prescribed burning, cannot reverse the trend to woody plant dominance.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	1200	1600	2400
Shrub/Vine	150	200	300
Tree	75	100	150
Forb	75	100	150
Total	**1500**	**2000**	**3000**

Figure 13. Plant community growth curve (percent production by month). TX3610, Midgrass Savannah with woody encroachment. Midgrass savannah with woody encroachment. Tallgrasses decline in population and increase of woody canopy to 20%..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	3	5	13	22	15	5	3	15	7	5	4

Pathway 1.1A
Community 1.1 to 1.2

With abusive overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community will transition very quickly to the Mid/Shortgrass Savannah Community (1.2).

Pathway 1.2A
Community 1.2 to 1.1

With the application of prescribed grazing and prescribed burning conservation practices, the Mid/Shortgrass Savannah Community reverts back to the Midgrass Prairie Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland

Dominant plant species

- mesquite (*Prosopis*), shrub
- Ashe's juniper (*Juniperus ashei*), shrub

Community 2.1
Mixed-brush/Shortgrass

Figure 14. 2.1 Mixed-brush/Shortgrass Community

The Mixed-brush/Shortgrass Community (2.1) presents a 25 percent or greater woody plant canopy of mixed-brush, including oak, mesquite, and juniper as the dominant species. It is the result of selective overgrazing by livestock and deer and the differential response of plants to defoliation. There is a continued decline in diversity of the grassland component and an increase in woody species and unpalatable forbs. Primary production has decreased due to decline in soil structure and organic matter and has shifted toward the woody component. All, except the more palatable woody species, have increased in size. Mesquite is an early increaser throughout the MLRA. Ashe juniper (*Juniperus ashei*) has spread from the east and some redberry juniper (*Juniperus pinchotii*) is found in the west. Many of the reference shrubs are present. Typically, algerita (Mahonia trifoliata), Texas persimmon, prickly pear (Opuntia spp.), condalia (Condalia spp.), shin oak (*Quercus sinuata*), and sumac (Sumac spp) form thickets on this site. Remnants of reference condition grasses and forbs, and unpalatable invaders occupy the interspaces between trees and shrubs. Cool-season grasses such as Texas wintergrass, plus other grazing resistant species, 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 herbaceous species include three-awns (Aristida spp.), hairy tridens (*Erioneuron pilosum*), hairy grama (*Bouteloua hirsuta*), sedges (Carex spp.), Queen's delight (*Stillingia sylvatica*), prairie coneflower (*Ratibida columnifera*), Texas grama (*Bouteloua rigidiseta* var. rigidiseta), and red grama (*Bouteloua trifida*). Buffalograss (*Bouteloua dactyloides*), curlymesquite, and tobosa (Phleuraphis mutica) are persistent increasers until shrub density reaches maximum canopy. As the grassland vegetation declines, more soil is exposed which can lead to crusting and erosion. During this phase, erosion can be severe. Higher interception losses by the increasing woody canopy combined with evaporation and runoff can reduce the effectiveness of rainfall. Soil organic matter and soil structure decline within the interspaces but soil conditions are improved under the woody plant cover. Some soil loss can occur during heavy rainfall events. Annual primary production is approximately 1,000 to 2,500 pounds per acre. In this plant community, annual production is balanced between herbaceous plants and woody plants. Browsing animals such as goats and deer can find fair food value if browse plants have not been grazed excessively. Forage quality for cattle is low. Unless brush management and good grazing management are applied at this stage, the transition toward the Mixed-brush Shrubland Community (2.2) will continue. The trend cannot be reversed with good grazing management alone.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	500	1000	1250
Tree	250	500	625
Shrub/Vine	150	300	375
Forb	100	200	250
Total	**1000**	**2000**	**2500**

Figure 16. Plant community growth curve (percent production by month). TX3618, Mixedbrush/Shortgrass Community. Yearlong green forage due to shrubs and cool season species growth in winter and spring. Peak rainfall period from April through September provides most productivity during

summer growing season..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5	7	8	14	18	12	6	4	13	2	7	4

Community 2.2
Mixed-brush Shrubland

Figure 17. 2.2 Mixed-brush Shrubland Community

Juniper and/or mesquite dominate the Mixed-brush Shrubland Community (2.2). The trees and shrubs can approach 70 percent ground cover with continued heavy grazing. Common understory shrubs are pricklypear, algerita, sumacs, condalia, yucca, Texas persimmon, elbowbush, pricklyash (Zanthoxylum spp.), and tasajillo (*Cylindropuntia leptocaulis*). Shortgrasses and low quality annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are Texas wintergrass, curlymesquite, buffalograss, Hall's panicum (*Panicum hallii*), rough tridens (*Tridens muticus* var. muticus), slim tridens (*Tridens muticus*), tobosagrass (Phleuraphis muticus), and fall witchgrass (*Digitaria cognata*). Grasses and forbs make up 25 percent or less of the annual biomass production. Forbs found in this community include dotted gayfeather (*Liatris punctata* var. punctata), orange zexmania (Wedelia texana), croton (Croton spp.), western ragweed, prairie coneflower (*Ratibida columnifera*), and broomweed (Gutierrezia spp.). The shrub canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Soil fauna and organic mulch are reduced exposing more soil surface to erosion in the few interstitial spaces. The exposed soil crusts readily. However, within the woody canopy hydrologic processes stabilize and soil organic matter and mulch begin to increase and eventually stabilize under the shrub canopy. Since this plant community was developed by livestock grazing, the Mixed-brush Shrubland Community (2.2) provides good habitat cover for wildlife and limited preferred forage or browse are available for livestock or wildlife. Alternatives for restoration include brush management and range planting to return vegetation back to near reference conditions. Grazing management and prescribed fire are also necessary to maintain the desired community. Without considerable inputs in brush control and range planting plus proper grazing management, the shrubland will continue to thicken until the site stabilizes with the climate and soil factors. Restoration to the reference community may not be possible if erosion has depleted the original soil properties. Brush control with herbicides is generally unsatisfactory in this region and mechanical methods that cause considerable soil disturbance and range plantings can be risky. A proliferation of annuals often follows disturbances such as root plowing and dozing even with range seeding.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	650	1300	1950
Tree	400	1000	1500
Grass/Grasslike	250	500	750
Forb	40	100	150
Total	**1340**	**2900**	**4350**

Figure 19. Plant community growth curve (percent production by month). TX3631, Mixed-Brush Shrubland Community. The mix of warm and cool-season plants extend the green forage period to yearlong. Peak biomass production is in April, May and June with a lesser peak in September and October..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3	5	8	13	18	12	5	3	12	10	7	4

Pathway 2.1A
Community 2.1 to 2.2

Mixed-brush/Shortgrass **Mixed-brush Shrubland**

With heavy abusive grazing, no fire, no brush management, and invasion of brush species, the Mixed-brush/Shortgrass Community will shift to the Mixed-brush Shrubland Community.

Pathway 2.2A
Community 2.2 to 2.1

Mixed-brush Shrubland **Mixed-brush/Shortgrass**

With prescribed grazing, prescribed burning, and brush management (IPT) conservation practices, the Mixed-brush Shrubland Community can revert back to Mixed-brush/Shortgrass Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing

Transition T1A
State 1 to 2

Heavy abusive grazing, no fire, no brush management, and brush invasion leads to a shift from Grassland State to Shrubland State.

Restoration pathway R2A
State 2 to 1

With reclamation, prescribed grazing, prescribed burning, brush management, and range planting, the Mixed-brush Shrubland Community can shift to the Grassland State.

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	**Midgrass**			300–600	
	sideoats grama	BOCU	*Bouteloua curtipendula*	300–600	–
2	**Tallgrasses**			225–450	
	big bluestem	ANGE	*Andropogon gerardii*	225–450	–
	little bluestem	SCSC	*Schizachyrium scoparium*	225–450	–
	Indiangrass	SONU2	*Sorghastrum nutans*	225–450	–
3	**Midgrasses**			450–900	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	450–900	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	450–900	–
	Arizona cottontop	DICA8	*Digitaria californica*	450–900	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	450–900	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	450–900	–
	green sprangletop	LEDU	*Leptochloa dubia*	450–900	–
	vine mesquite	PAOB	*Panicum obtusum*	450–900	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	450–900	–
	Reverchon's bristlegrass	SERE3	*Setaria reverchonii*	450–900	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	450–900	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	450–900	–
4	**Mid/Shortgrasses**			225–450	
	threeawn	ARIST	*Aristida*	225–450	–
	buffalograss	BODA2	*Bouteloua dactyloides*	225–450	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	225–450	–
	Texas grama	BORI	*Bouteloua rigidiseta*	225–450	–
	red grama	BOTR2	*Bouteloua trifida*	225–450	–
	fall witchgrass	DICO6	*Digitaria cognata*	225–450	–
	hairy woollygrass	ERPI5	*Erioneuron pilosum*	225–450	–
	curly-mesquite	HIBE	*Hilaria belangeri*	225–450	–
	slim tridens	TRMU	*Tridens muticus*	225–450	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	225–450	–
5	**Cool-season grasses**			75–150	
	cedar sedge	CAPL3	*Carex planostachys*	75–150	–
	Canada wildrye	ELCA4	*Elymus canadensis*	75–150	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	75–150	–
Forb					
6	**Forbs**			105–210	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	105–210	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	105–210	–
	aster	ASTER	*Aster*	105–210	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	105–210	–
	croton	CROTO	*Croton*	105–210	–
	prairie clover	DALEA	*Dalea*	105–210	–
	purple prairie clover	DAPU5	*Dalea purpurea*	105–210	–

	bundleflower	DESMA	*Desmanthus*	105–210	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	105–210	–
	beeblossom	GAURA	*Gaura*	105–210	–
	Chalk Hill hymenopappus	HYTE2	*Hymenopappus tenuifolius*	105–210	–
	trailing krameria	KRLA	*Krameria lanceolata*	105–210	–
	dotted blazing star	LIPU	*Liatris punctata*	105–210	–
	menodora	MENOD	*Menodora*	105–210	–
	Florida mimosa	MIQUF	*Mimosa quadrivalvis var. floridana*	105–210	–
	yellow puff	NELU2	*Neptunia lutea*	105–210	–
	narrowleaf Indian breadroot	PELI10	*Pediomelum linearifolium*	105–210	–
	leafflower	PHYLL	*Phyllanthus*	105–210	–
	white rosinweed	SIAL	*Silphium albiflorum*	105–210	–
	awnless bushsunflower	SICA7	*Simsia calva*	105–210	–
	fuzzybean	STROP	*Strophostyles*	105–210	–
	queen's-delight	STSY	*Stillingia sylvatica*	105–210	–
	creepingoxeye	WEDEL	*Wedelia*	105–210	–
Shrub/Vine					
7	**Shrubs/Vines**			90–180	
	acacia	ACACI	*Acacia*	90–180	–
	snakewood	CONDA	*Condalia*	90–180	–
	featherplume	DAFO	*Dalea formosa*	90–180	–
	Texas persimmon	DITE3	*Diospyros texana*	90–180	–
	jointfir	EPHED	*Ephedra*	90–180	–
	Texas kidneywood	EYTE	*Eysenhardtia texana*	90–180	–
	stretchberry	FOPU2	*Forestiera pubescens*	90–180	–
	western white honeysuckle	LOAL	*Lonicera albiflora*	90–180	–
	algerita	MATR3	*Mahonia trifoliolata*	90–180	–
	blazingstar	MENTZ	*Mentzelia*	90–180	–
	fragrant sumac	RHAR4	*Rhus aromatica*	90–180	–
	littleleaf sumac	RHMI3	*Rhus microphylla*	90–180	–
	sumac	RHUS	*Rhus*	90–180	–
	bully	SIDER2	*Sideroxylon*	90–180	–
	greenbrier	SMILA2	*Smilax*	90–180	–
Tree					
8	**Trees**			30–60	
	eastern redbud	CECA4	*Cercis canadensis*	30–60	–
	hackberry	CELTI	*Celtis*	30–60	–
	juniper	JUNIP	*Juniperus*	30–60	–
	honey mesquite	PRGL2	*Prosopis glandulosa*	30–60	–
	live oak	QUVI	*Quercus virginiana*	30–60	–

Animal community

Many types of grassland insects, reptiles, birds, and mammals use the Shallow Ecological 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, red fox, gray fox, bobcat, and occasionally mountain lion. Game birds, songbirds, and birds of prey are indigenous or frequent users. Bison and pronghorn antelope, however, are no longer present, but white-tailed and many species of exotic deer utilize the Shallow site. Deer, turkey, and quail particularly favor the habitat. Deer, turkey, quail, and dove hunting is an important sport, or commercial enterprise, providing considerable income to landowners.

The site is suitable for the production of livestock, including cattle, sheep, and goats. The site in reference condition is very suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for sheep, goats, deer, and other wildlife because of the browse and cool-season grasses. Cattle, sheep, and goats 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 mixed-brush shrubland phase will have little to offer as habitat except cover.

Hydrological functions

The Shallow Ecological Site is a well-drained, very shallow upland with nearly level to gentle slopes. Most soils are 10 to 20 inches deep with pockets and crevices of deeper soils included. Shallowness to a hard limestone or caliche layer limits soil moisture holding capacity. Runoff is dependent on slope and amount of vegetative cover. However, soil crusting can cause erosion from bare ground on steeper slopes if plant cover is removed. Under reference conditions, 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 Midgrass Prairie Community transitions to the Midgrass Savannah. These processes continue in the interstitial spaces in the Mixed-brush Shortgrass Community.

Evaporation and interception losses are higher, resulting in less moisture reaching the soil. If, overgrazing continues the plant community deteriorates further and desertification processes continue. Biomass production is reduced relative to reference conditions and production has shifted from primarily grasses to primarily woody plants. The deeper-rooted woody plants extract water from greater depths than the shortgrasses, so less water will be available for down-slope movement. The woody plants compete for moisture with the remaining grasses and forbs further reducing production and ground cover in openings. Openings in the advanced Mixed-brush Shrubland state occur only on very shallow soil areas. Decreased litter and more bare ground allow erosion from soils in openings between trees. Once the Mixed-brush Shrubland Community canopy surpasses 50 percent, the hydrological processes, ecological processes, nutrient cycling, and energy flow stabilize within the woody plant canopy.

Recreational uses

The shallow site occurs in narrow bands with Limestone Hill, Low Stony Hill, and Clay Loam sites. Together, these sites are well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian, and bird watching. The Shallow site, along with adjacent upland and Loamy Bottomland sites, provides diverse scenic beauty and many opportunities for recreation and hunting.

Wood products

Posts and specialty wood products are made from juniper, mesquite, oak, and many shrubs. Mesquite and oak are used for firewood and charcoal.

Other products

Jams and jellies are made from many fruit-bearing species. 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.

Inventory data references

Ten records were used from McCulloch, Sutton and Crockett Counties. Information presented was derived from the revised Shallow Range Site, literature, limited NRCS clipping data (417s), field observations, and personal contacts with range-trained personnel. Photos by J. L. Schuster.

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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.

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Contact for lead author	325-944-0147
Date	12/01/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** None to few. Erosion which might caused rills, flow patterns and pedestals and terracettes would have occurred only if the intense rainstoms occurred during extended drough or shortly after an intense wildife.

3. **Number and height of erosional pedestals or terracettes:** None to few.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Less than 10 percent bare gound. Small and non-connected areas. Lower slopes would have less bare ground.

5. **Number of gullies and erosion associated with gullies:** None to rare. Drainages are stable with adequate vegetative cover to reduce erosive action of runoff. Rare gullies would be vegetated and stabilized.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None to slight. Wind erosion hazard of soil is slight.

7. **Amount of litter movement (describe size and distance expected to travel):** Minimal movement of fine little for short distances. Litter is fairly uniformly distributed.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Erosion stability values estimated at 5 to 6 and water erosion hazard is slight.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Surface layer of the soil is dark grayish-brown clay loam 11 to 19 inches thick. Structure is moderate, fine and medium blocky. There are many fine and medium roots throughout soil profile. SOM is high.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Tall and midgrasses in good distribution and ground cover provide excellent infiltration and slow runoff. Except on steeper slopes runoff is essentially nil but when rainfall exceeds a site's ability to hold water, the runoff is free of erosive action.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Rock layer at 14 inches restricts water and root penetration.

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

    Dominant: Warm-season midgrasses

    Sub-dominant: Warm-season tallgrasses

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

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Minimal, grasses will almost always show some mortality and decadence, especially during drought conditions.

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14. **Average percent litter cover (%) and depth (in):** Interspaces between plant canopies essentially covered with various sizes of litter and mulch. Wildfires, natural herbivory, and/or droughts might reduce litter to none. Recovery would take two to five years.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 1,800 pounds per acre in years with below average moisture, 2,800 pounds per acre in average moisture and 3,500 pounds per acre in above average moisture years.

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

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17. **Perennial plant reproductive capability:** Good. All species should be capable of reproducing except during periods of prolonged drought, heavy natural herbivory or intense fire. Recovery from these disturbances will take 2 to 5 years.
