USDA Natural Resources
Conservation Service

Ecological site R078BY092TX
Very Shallow Clay 19-26" PZ

Last updated: 9/15/2023
Accessed: 05/13/2025

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.

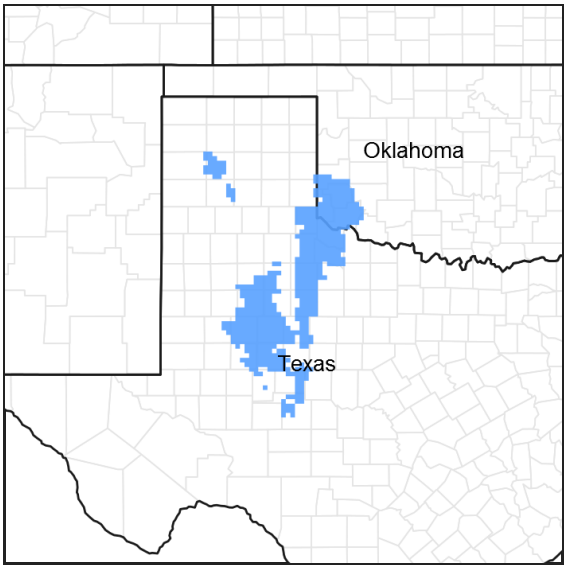


Figure 1. Mapped extent

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): 078B–Central Rolling Red Plains, Western Part

MLRA 78B is characterized by strongly dissected, rolling plains with prominent ridges and valleys and rolling to steep irregular topography. Loamy soils are generally well drained, range from shallow to deep, and developed in sediments of Triassic and 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 very shallow clay soils on uplands. The reference vegetation consists of mid and shortgrasses with forbs and very few shrubs. Abusive grazing practices can lead to a shift in the plant community and an

increase in bare ground. Without periodic fire or alternative brush management, woody species may increase. Aspect may influence the productivity and species composition on these sites.

Associated sites

R078BY074TX	**Draw 19-26" PZ** The Draw Site is down slope of the Very Shallow Clay site. This site is along drainages.
R078BY089TX	**Shallow 19-26" PZ** Adjacent to the Very Shallow Clay Site.

Similar sites

R078BY090TX	**Shallow Clay 19-26" PZ** Both sites have similar physiographic positions on the landscape.

Table 1. Dominant plant species

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

Physiographic features

These soils are on very gently sloping to very steep ridges, side slopes and erosion foot slopes on uplands of the Central Rolling Red Plains (MLRA-78B). Slopes range from 1 to 45 percent. Elevation ranges from 1250 to 2900 feet.

Table 2. Representative physiographic features

Landforms	(1) Plains > Hill (2) Plains > Divide (3) Plains > Ridge
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	381–884 m
Slope	1–45%
Aspect	Aspect is not a significant factor

Climatic features

The climate of the western rolling plains is dry, sub-humid with hot summers and mild winters. Temperatures often reach 100 degrees F for several consecutive days during summer. Cold spells with temperatures less than 20 degrees F only last short periods of time. The soil is not frozen below the 3-inch depth for more than 2 to 3 days. Humidity is low during the winter and early spring months. Sometimes relative humidity is high enough to make summer days seem uncomfortable. Most of the precipitation comes in the form of rain and that in the spring and early summer principally. May is the wettest month followed by June. July and August are dryer and much hotter. Rainfall often comes as intense showers of relatively short duration. Rainfall rate per hour is often high and runoff is significant. Infiltration is diminished due to lack of opportunity time. The growing season begins in April and ends with the first killing frost in Nov.
There is little snowfall with the average being about 10 inches. Rainfall averages about 22 inches.

There is a 70% chance that yearly precipitation will fall between 16 and 24 inches. About 55% of the time, the yearly rainfall is below the mean. Dry spells during the growing season are common and long-term droughts occur in

cycles of about 20 years. Native vegetation is principally warm season.

Table 3. Representative climatic features

Frost-free period (characteristic range)	189-194 days
Freeze-free period (characteristic range)	204-222 days
Precipitation total (characteristic range)	584-610 mm
Frost-free period (actual range)	184-201 days
Freeze-free period (actual range)	202-223 days
Precipitation total (actual range)	559-635 mm
Frost-free period (average)	192 days
Freeze-free period (average)	213 days
Precipitation total (average)	584 mm

Climate stations used

- (1) WELLINGTON [USC00419565], Wellington, TX
- (2) PADUCAH [USC00416740], Paducah, TX
- (3) JAYTON [USC00414570], Jayton, TX
- (4) SNYDER [USC00418433], Snyder, TX
- (5) ROBERT LEE [USC00417669], Robert Lee, TX

Influencing water features

None.

Wetland description

NA

Soil features

These soils consist of very shallow and shallow, well drained, very slowly permeable soils that formed in residuum over dense non-cemented claystone bedrock of Permian age. Runoff is high on 0 to 1 percent slopes, and very high on slopes greater than 1 percent.

Major Soil Taxonomic Units correlated to this site include: Knoco soil series.

Table 4. Representative soil features

Parent material	(1) Residuum–claystone
Surface texture	(1) Bouldery clay (2) Clay loam (3) Silty clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow to slow
Soil depth	10–51 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–20%

Available water capacity (0-101.6cm)	2.79–9.14 cm
Calcium carbonate equivalent (0-101.6cm)	1–8%
Electrical conductivity (0-101.6cm)	1–8 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–8
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	4–8%
Subsurface fragment volume >3" (Depth not specified)	1–5%

Ecological dynamics

The reference plant community of the Very Shallow Clay Ecological Site was a fire influenced midgrass/shortgrass prairie with few perennial forbs and a trace of scattered shrubs. Pre-settlement influences included grazing or browsing by endemic pronghorn antelope, deer and migratory bison, severe droughts and frequent fires. Fires, set by lightening or by Native American Indians, undoubtedly had the most impact on the community structure. Studies show that fires, often severe, occurred at 7-12 year intervals or less (Frost, 1994). The frequent fires favored grass vegetation and kept woody plants and forbs in check, resulting in an open midgrass/shortgrass prairie with less than one percent shrubs. Overgrazing by livestock during the later half of the nineteenth century caused a decline in the reference vegetation, reduced the grass cover, and allowed shrub invasion. This in conjunction with the decline in frequency and intensity of fires allowed many acres of this, and other sites, of the Rolling Plains to become invaded by woody plants. The trend of overgrazing continued through the twentieth century, abated some by development and application of range conservation practices during the last half of the twentieth century.

The Very Shallow Clay Ecological Site is found on uplands. The soils vary from very shallow clays to silty clays and clay loams of varying thickness. Slopes vary from gently sloping to very steep ridges and side slopes. Productivity of the site varies with these fluctuations and is influenced by aspect. North and east facing slopes will generally have higher production and diversity than south and west facing slopes. Moisture holding capacity is relatively limited and often limits productivity. This site is one of the least productive sites in MLRA 78B. The dominant grass species at the time of European settlement in the 1800’s were sideoats grama, buffalograss, blue grama, curly mesquite, alkali sacaton, and silver bluestem with lesser amounts of hairy grama, sand dropseed, meadow dropseed and slim and rough tridens. This site produced a limited variety of forbs and legumes consisting of plains blackfoot daisy, Indian rushpea, western ragweed, dotted gayfeather and catclaw sensitivebriar. Shrubs occupied deeper soil pockets on areas protected from wildfires, covering less than one percent of the ground area. The few shrubs present were lotebush, vine ephedra, fourwing saltbush, pricklypear and tasajillo. (See Plant Preference tables for scientific names of plants mention in the text).

The Midgrass/Shortgrass Prairie Community (1.1) was relatively stable and resilient within the climate, soil and fire regime. Nutrient cycling, biological functions and the water cycle were functioning at their peak. With the arrival of European settlement in the late 1800’s came the advent of fencing and animal husbandry, the settlers had minimal understanding of 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 midgrasses, a decline in mulch and organic matter, and a reduction in intensity and frequency of fires. This shift in plant community composition brought about the Shortgrass/Midgrass/Shrub Community (1.2). Sideoats grama has decreased and buffalograss and other shortgrasses will increase along with annuals and woody shrubs. Nutrient cycling, the water cycle, watershed protection and biological functions have been somewhat reduced. Careful grazing management, chemical and/or mechanical brush control of invading woody/cacti competition can restore this site to near reference conditions.

If long term abusive grazing continues combined with no fire, a threshold will be crossed to the Shortgrass/Mixed-Brush Community (2.1). The shift in plant cover and decline in soil properties favor woody plant encroachment. The

woody and herbaceous plant invaders are generally endemic species released from competition or fire suppression. Woody plant canopies may exceed 40%. In this community type, low vigor shortgrasses dominate with few low-vigor midgrasses remaining. Increasing amounts of bare ground will be found throughout the site with numerous annuals filling the voids. Grass production will still dominate the site, but the encroaching woody species have begur to compete for nutrients, water and space. The higher percentage of woody species favors browsing animals; however, this phase is still somewhat productive for both cattle and browsing animals such as deer. Nutrient cycling, the water cycle, watershed protection and biological functions have been severely reduced. The plant community is so degraded that it cannot reverse retrogression without extensive energy and management inputs. Restoration of the Shortgrass/Mixed-Brush Community (2.1) will require prescribed grazing with rest periods during the growing season for several years. Re-seeding bare areas with adapted native species, and chemical and/or mechanical brush management and some form of pest management will be necessary.

When abusive grazing occurs over a long period of time, combined with periodic droughts, regression proceeds toward a Mixed-brush/Shortgrass/Annuals Community (2.2) phase. The result will be a plant community dominated by woody plants, primarily mesquite and juniper. Annuals will occupy the numerous bare areas scattered throughout the site, few low vigor shortgrasses remaining. 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. This stage of regression is so degraded, very extensive energy and management inputs will be required to return this site to near reference condition. Severe erosion and soil fertility losses during the retrogression process may prohibit the site from returning to near reference condition. At this stage there will not be enough fine fuel to carry an effective fire. With the heavy brush canopy and a very limited grass seed source, heavy mechanical brush control will be required. Following brush management, re-seeding the entire area to an adapted native mixture will be necessary. Several years of prescribed grazing with rest periods during the growing season will be needed. Follow-up chemical brush and pest management should be planned for grass establishment and maintenance of the treated area.

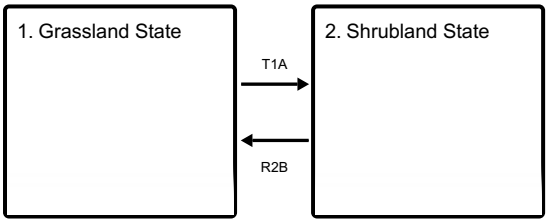
NOTE: Rangeland Health Reference Worksheets have been posted for this site on the Texas NRCS website (www.tx.nrcs.usda.gov) in Section II of the eFOTG under (F) Ecological Site Descriptions.

STATE AND TRANSITIONAL MODEL (Diagram)

Narrative:
The following diagram depicts the vegetation pathways and states that will most likely occur with heavy livestock grazing/browsing under the prevailing climate. There may be alternative trajectories or states, depending on various natural or man-influenced disturbances, which are not shown on this diagram. Local professional guidance should always be sought before pursuing a treatment scenario.

State and transition model

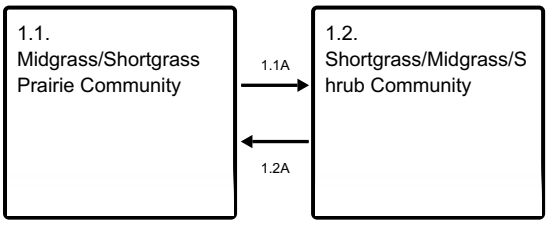
Ecosystem states



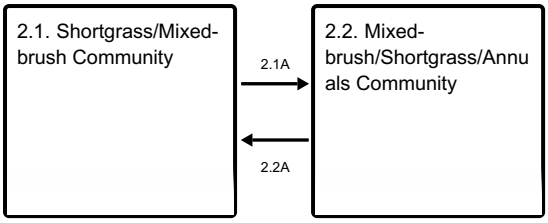
T1A - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

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

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Grassland State

The Midgrass/Shortgrass Prairie Community (1.1) is composed of shrubs that were widely scattered in protected areas and along draws, but made up less than one percent of the total annual production. Sideoats grama is the dominant grass throughout the site. Also occurring on the site, but in smaller amounts, were meadow dropseed, silver bluestem, alkali sacaton and a number of shortgrasses. Characteristic forbs are catclaw sensitivebriar, plains blackfoot daisy, western ragweed, dotted gayfeather and Indian rushpea. Lotebush, four-winged saltbush and pricklypear are common woody plants. The Midgrass/Shortgrass Prairie Community produces from 400 to 1200 pounds of biomass annually, depending upon the amount of precipitation. Grasses made up to 90 to 95 percent of species composition and production. The Shortgrass/Midgrass/Shrub Community (1.2) is composed of less palatable grasses, such as silver bluestem and sand dropseed, and less palatable forbs such as gaura, dotted gayfeather and western ragweed which are replacing the dominants of the reference community. The dominant grasses, such as sideoats grama, meadow dropseed and alkali sacaton, remain, however. Woody species, especially juniper, mesquite, pricklypear, tasajillo and lotebush, are encroaching but are not seriously impacting forage production. Invading brushy species are generally less than four feet tall and provide less than 15 percent canopy.

Dominant plant species

- sideoats grama (*Bouteloua curtipendula*), grass
- buffalograss (*Bouteloua dactyloides*), grass

Community 1.1
Midgrass/Shortgrass Prairie Community

Figure 8. 1.1 Midgrass/Shortgrass Prairie Community

The interpretive or "reference" plant community for the Very Shallow Clay Ecological Site in MLRA 78B is a midgrass-shortgrass prairie. Shrubs are widely scattered in protected areas and along draws, but make up less than one percent of the total annual production. Recurring fires and occasional long-term droughts have kept brush in check. Sideoats grama is the dominant grass throughout the site. Also occurring on the site, but in smaller amounts, are meadow dropseed, silver bluestem, alkali sacaton and a number of shortgrasses. Common shortgrasses include buffalograss, curly mesquite, blue grama, and tridens and sand dropseed. Characteristic forbs are catclaw sensitivebriar, plains blackfoot daisy, western ragweed, dotted gayfeather and Indian rushpea. Lotebush, four-winged saltbush and pricklypear are common woody plants. The Midgrass/Shortgrass Prairie Community (1.1)

produces from 400 to 1200 pounds of biomass annually, depending upon the amount of precipitation. Grasses make up to 90 to 95 percent of species composition and production. The midgrasses aid in the infiltration of rainfall into the slowly permeable soil and reduce runoff, although considerable bare ground may exist. The droughty characteristics of the site kept forage production and forb diversity is low. The Midgrass/Shortgrass Prairie Community (1.1) furnishes good habitat for grazing type wildlife such as bison and pronghorn antelope. With continuous overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions very quickly to the Shortgrass/Midgrass/Shrub Community (1.2).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	421	843	1197
Forb	22	45	135
Shrub/Vine	4	9	13
Tree	–	–	–
Microbiotic Crusts	–	–	–
Total	**447**	**897**	**1345**

Figure 10. Plant community growth curve (percent production by month). TX2020, Midgrass/Shortgrass with few shrubs. Site comprising of mid and shortgrasses with few shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	1	5	15	25	20	5	5	15	8	1	0

Community 1.2
Shortgrass/Midgrass/Shrub Community

Figure 11. 1.2 Shortgrass/Midgrass/Shrub Community

This community represents the first phase in the transition of the Midgrass/Shortgrass Prairie Community (1.1) toward the Mixed-brush/Shortgrass/Annuals Community (2.2). It is the result of continued overgrazing of the site and reduction in frequency and intensity of fires. Woody species, especially juniper, mesquite, pricklypear, tasajillo and lotebush are encroaching, but are not seriously impacting forage production. Invading brushy species are generally less than four feet tall and provide less than 15 percent canopy. This phase may, in fact, present more desirable conditions for livestock husbandry, wildlife and recreational use than the reference community because forage production for browsing animals is enhanced. Overgrazing has reduced the more palatable species and opened up the grass and litter cover for the invasion of the woody species that had been held in check by competition and fire. Less palatable grasses, such as silver bluestem and sand dropseed, and less palatable forbs such as gaura, dotted gayfeather and western ragweed are replacing the dominants of the reference community. The dominants, such as sideoats grama, meadow dropseed and alkali sacaton, remain, however. Nutrient and energy cycling is shifting toward woody plants. Herbage production is slightly less than the reference, averaging from 350 to 1100 pounds of annual production. The herbaceous component still dominates herbage production.

Litter and ground cover are beginning to decrease, however, exposing more soil to erosion and encroachment by previously suppressed species. Proper grazing and prescribed burning can easily improve or maintain this plant community and prevent the transition toward the Shortgrass/Mixed-brush Community (2.1). Without brush management and proper grazing, the woody species will continue to encroach until the woody species dominate. This threshold occurs when woody plant cover exceeds 20 to 25 percent.

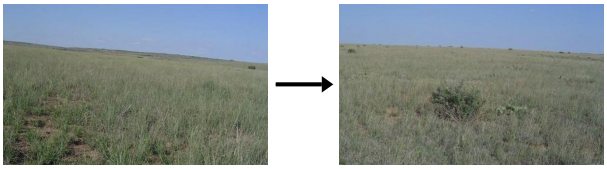
Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	314	673	986
Shrub/Vine	40	84	123
Tree	19	43	62
Forb	20	41	62
Microbiotic Crusts	–	–	–
Total	**393**	**841**	**1233**

Figure 13. Plant community growth curve (percent production by month). TX2040, Midgrass/Shortgrass Community with Forbs and Shrubs. Warm season mid and shortgrasses along with traces of tallgrasses, forbs, and shrubs..

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

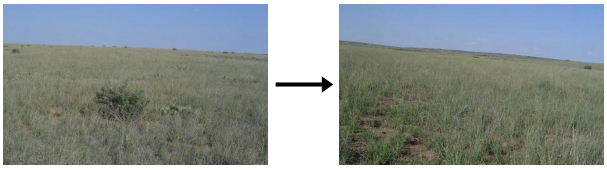


Midgrass/Shortgrass Prairie Community

Shortgrass/Midgrass/Shrub Community

With heavy continuous grazing, no fires, and brush invasion, the Midgrass/Shortgrass Prairie Community will shift to the Shortgrass/Midgrass/Shrub Community.

Pathway 1.2A
Community 1.2 to 1.1



Shortgrass/Midgrass/Shrub Community

Midgrass/Shortgrass Prairie Community

With the implementation of Prescribed Grazing and Prescribed Burning conservation practices, the Shortgrass/Midgrass/Shrub Community can be shifted back to the Midgrass/Shortgrass Prairie Community.

Conservation practices

Prescribed Burning
Prescribed Grazing

State 2
Shrubland State

The Shortgrass/Mixed-brush Community (2.1) on the Very Shallow clay site ranges from 15 to 25 percent woody plant canopy of mixed-brush, depending on how long the site has been in the Shrubland State. There is a continued decline in diversity of the grassland component and an increase in woody species and unpalatable forbs. All, except the more palatable woody species, have increased in size. Mesquite is dominant on the site throughout the MLRA. Juniper has spread considerably in recent years. Many of the climax shrubs are present. Typically, agarito, pricklypear, and lotebush form mixed-brush complexes with mesquite and juniper. Remnants of climax grasses and forbs and unpalatable invaders occupy the interspaces between trees and shrubs. As further regression occurs, sideoats grama is replaced with buffalograss. The Mixed-brush/Shortgrass/Annuals Community (2.2) occurs when the Very Shallow Clay site is overgrazed for many years, fires are excluded, and woody plants are not controlled. With continued overgrazing, the site becomes a shrubland with its interstitial areas occupied by a degraded herbaceous community of shortgrasses and annuals. The shrub canopy acts to intercept rainfall and increase evapotranspiration losses, creating a more xeric microclimate. Juniper and/or mesquite dominate the Mixed-brush/Shortgrass/Annuals Community (2.2). The trees and shrubs can approach 50 percent ground cover. Common understory shrubs are pricklypear, agarita, lotebush, wolfberry, and tasajillo. Shortgrasses and low quality annual and perennial forbs occupy the woody plant interspaces. Characteristic grasses are buffalograss, rough tridens, threeawns, sand muhly, Texas grama and red grama.

Dominant plant species

- juniper (*Juniperus*), tree
- mesquite (*Prosopis*), tree
- buffalograss (*Bouteloua dactyloides*), grass
- threeawn (*Aristida*), grass

Community 2.1
Shortgrass/Mixed-brush Community

Figure 14. 2.1 Shortgrass/Mixed-brush Community

The Shortgrass/Mixed-brush Community (2.1) on the Very Shallow clay site ranges from 15 to 25 percent woody plant canopy of mixed-brush, depending on how long the site has been in the Shrubland State. It is the result of selective overgrazing by livestock, the differential response of plants to defoliation and lack of fire as a deterrent to woody plant encroachment. 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 dominant on the site throughout the MLRA. Juniper has spread considerably in recent years. Many of the reference shrubs are present. Typically, agarito, pricklypear, and lotebush form mixed-brush complexes with mesquite and juniper. Remnants of reference community grasses and forbs and unpalatable invaders occupy the interspaces between trees and shrubs. As further regression occurs, sideoats grama is replaced with buffalograss. Common herbaceous species include silver bluestem, sand dropseed, three-awns, hairy tridens, hairy grama, Queen’s delight, prairie coneflower and Indian rushpea. Buffalograss, curlymesquite and alkali sacaton are persistent increasers. 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. As the grassland vegetation declines, more soil is exposed leading to soil 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. In this plant community, annual production is balanced between herbaceous plants and woody plants (See Forage Production Table below). 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 accelerated 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.

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	168	336	560
Shrub/Vine	84	168	280
Tree	50	101	168
Forb	34	67	112
Microbiotic Crusts	–	–	–
Total	**336**	**672**	**1120**

Figure 16. Plant community growth curve (percent production by month). TX2015, Shortgrass/Mesquite community. Growth curve shows increase plant growth due to increase of woody species..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	2	3	10	25	30	9	4	10	4	2	1

Community 2.2
Mixed-brush/Shortgrass/Annuals Community

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

The Mixed-brush/Shortgrass/Annuals Community (2.2) occurs when the Very Shallow Clay site is overgrazed for many years, fires are excluded, and woody plants are not controlled. With continued overgrazing, the site becomes a shrubland with its interstitial areas occupied by a degraded herbaceous community of shortgrasses and annuals. 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 shortgrass interspaces between shrubs/trees. The exposed soil crusts readily and erosion can be a problem. However, within the woody canopy hydrologic processes stabilize and soil organic matter and mulch begin to increase and ecological processes eventually stabilize under the shrub canopy. Juniper and/or mesquite dominate the Mixed-brush/Shortgrass/Annuals Community (2.2). The trees and shrubs can approach 50 percent ground cover. Common understory shrubs are pricklypear, agarita, lotebush, wolfberry, and tasajillo. Shortgrasses and low quality annual

and perennial forbs occupy the woody plant interspaces. Characteristic grasses are buffalograss, rough tridens, threeawns, sand muhly, Texas grama and red grama. Forbs found in this community include dotted gayfeather, orange zexmania, croton, western ragweed, gaura and broomweed. Annual forbs and grasses are abundant if moisture is available in spring and summer. Grasses and forbs make up 30 percent or less of the annual biomass production and production varies considerably with seasonal moisture. The Mixed-Brush/Shortgrass/Annuals Community (2.2) provides good habitat cover for wildlife but limited preferred forage, or browse, is available for livestock or wildlife. Without considerable energy 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 historic soil properties.

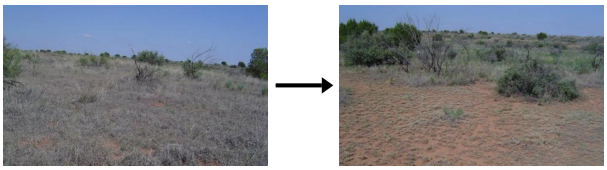
Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	112	224	448
Grass/Grasslike	56	112	224
Tree	34	67	135
Forb	22	45	90
Microbiotic Crusts	–	–	–
Total	**224**	**448**	**897**

Figure 19. Plant community growth curve (percent production by month). TX2025, mesquite/prickly pear/shortgrass community. mesquite/pricklypear/shortgrass.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2	4	10	27	27	10	3	9	4	2	1

Pathway 2.1A
Community 2.1 to 2.2



Shortgrass/Mixed-brush Community

Mixed-brush/Shortgrass/Annuals Community

With heavy continuous grazing and no fire, 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 Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning conservation practices, the Mixed-brush/Shortgrass/Annuals Community can be shifted back to the Shortgrass/Mixed-brush Community.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Transition T1A
State 1 to 2

With heavy continuous grazing and no fires, the Grassland State will transition into the Shrubland State.

Restoration pathway R2A
State 2 to 1

With Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning conservation practices, the Shortgrass/Mixed-brush Community can revert back to the Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Prescribed Grazing
Range Planting

Restoration pathway R2B
State 2 to 1

With the implementation of various conservation practices such as Reclamation, Prescribed Grazing, Brush Management, Range Planting, and Prescribed Burning, the Mixed-brush/Shortgrass/Annuals Community can be restored to the Grassland State.

Conservation practices

Brush Management
Prescribed Burning
Range Planting
Prescribed Grazing

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					
1	**Midgrass**			179–538	
	sideoats grama	BOCU	*Bouteloua curtipendula*	179–538	–
2	**Shortgrasses**			90–269	
	buffalograss	BODA2	*Bouteloua dactyloides*	0–269	–
	blue grama	BOGR2	*Bouteloua gracilis*	0–269	–
	curly-mesquite	HIBE	*Hilaria belangeri*	0–269	–
3	**Midgrasses**			90–269	
	silver beardgrass	BOLAT	*Bothriochloa laguroides* ssp.	0–269	

	silver beardgrass	BOLA1	*Bothriochloa laguroides ssp. torreyana*	0–269	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0–269	–
4	**Midgrasses**			45–135	
	plains lovegrass	ERIN	*Eragrostis intermedia*	0–135	–
	vine mesquite	PAOB	*Panicum obtusum*	0–135	–
	bristlegrass	SETAR	*Setaria*	0–135	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	0–135	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	0–135	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–135	–
5	**Shortgrasses**			18–54	
	threeawn	ARIST	*Aristida*	0–54	–
	hairy grama	BOHI2	*Bouteloua hirsuta*	0–54	–
	tumble windmill grass	CHVE2	*Chloris verticillata*	0–54	–
	fall witchgrass	DICO6	*Digitaria cognata*	0–54	–
	ear muhly	MUAR	*Muhlenbergia arenacea*	0–54	–
	slim tridens	TRMU	*Tridens muticus*	0–54	–
	slim tridens	TRMUE	*Tridens muticus var. elongatus*	0–54	–
Forb					
6	**Forbs**			22–67	
	Indian mallow	ABUTI	*Abutilon*	0–67	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0–67	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	0–67	–
	yellow sundrops	CASE12	*Calylophus serrulatus*	0–67	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	0–67	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–67	–
	hoary false goldenaster	HECA8	*Heterotheca canescens*	0–67	–
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0–67	–
	trailing krameria	KRLA	*Krameria lanceolata*	0–67	–
	dotted blazing star	LIPU	*Liatris punctata*	0–67	–
	catclaw mimosa	MIACB	*Mimosa aculeaticarpa var. biuncifera*	0–67	–
	slimflower scurfpea	PSTE5	*Psoralidium tenuiflorum*	0–67	–
	globemallow	SPHAE	*Sphaeralcea*	0–67	–
	Rocky Mountain zinnia	ZIGR	*Zinnia grandiflora*	0–67	–
Shrub/Vine					
7	**Shrubs/Vines**			4–13	
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–13	–
	snakewood	CONDA	*Condalia*	0–13	–
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0–13	–
	jointfir	EPHED	*Ephedra*	0–13	–
	desert-thorn	LYCIU	*Lycium*	0–13	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–13	–

	lotebush	ZIOB	*Ziziphus obtusifolia*	0–13	–
Tree					
8	**Trees**			0–1	
	netleaf hackberry	CELAR	*Celtis laevigata var. reticulata*	0–1	–
	juniper	JUNIP	*Juniperus*	0–1	–
	mesquite	PROSO	*Prosopis*	0–1	–

Animal community

Many types of wildlife used the Very Shallow Clay Ecological Site. Grassland insects, reptiles, birds and mammals frequented the site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, jackrabbit, cottontail rabbit, raccoon, skunk, opossum and armadillo. Predators include coyote, red fox, gray fox, bobcat and occasionally mountain lion. Game birds, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison and pronghorn antelope, however, are no longer present. White-tailed and Mule deer utilize the site in its various states. Deer, turkey and quail particularly favor the habitat provided by the Shortgrass/Midgrass/Shrub Community (1.2) and Shortgrass/Mixed-brush Community (2.1). Deer, turkey, quail and dove hunting is an important sport, or commercial enterprise, providing considerable income to land owners.

The site is suitable for production of livestock, primarily cattle. In climax it was very suited to primary grass eaters such as cattle. As retrogression occurs and woody plants invade it becomes better habitat for goats, deer and other wildlife because of the browse. Livestock should be stocked in proportion to the available grass, forb and browse forage, keeping deer competition for forbs and browse in mind. If the animal numbers are not kept in balance with herbage and browse production through grazing management and good wildlife population management, the late Mixed-brush Shortgrass/Annuals phase will have little to offer as habitat except cover.

Hydrological functions

The Very Shallow Clay Ecological Site is a well-drained, very shallow upland with poor plant-soil-moisture relationships. Runoff is fast and often erosion prone if vegetative cover is sparse and slopes are steep. Slopes range from gentle to moderately steep; approximately 4 to 24 percent.

Under historic climax condition, the grassland vegetation intercepted and utilized much of the incoming rainfall in the soil solum. Only during extended rains or heavy thunderstorms was there much runoff. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease and surface runoff increases as the Midgrass/Shortgrass Prairie Community (1.1) transitions to the Shortgrass/Midgrass/Shrub Community (1.2). These processes continue in the interstitial spaces in the Shortgrass/Mixed-brush Community (2.1) phase. Evaporation and interception losses are higher, resulting in less moisture reaching the soil. If overgrazing continues, the plant community deteriorates further and desertification processes continue. Biomass production is reduced relative to HCPC and production has shifted from primarily grasses to primarily woody plants. The woody plants compete for moisture with the remaining grasses and forbs further reducing production and ground cover in openings. Decreased litter and more bare ground allow erosion from soils in openings between brushy areas. Once the woody canopy surpasses 50 percent, the hydrological and ecological processes, nutrient cycling and energy flow stabilize within the woody plant canopy and the community functions as a shrubland community.

Recreational uses

The Very Shallow Clay Site is well suited for many outdoor recreational uses including hunting, hiking, camping, equestrian use and bird watching. Deer, turkey, quail and dove hunting is an important sport, or commercial enterprise, providing considerable income to land owners. This site along with adjacent sites provides diverse scenic beauty.

Wood products

None.

Other products

None.

Other information

None.

Inventory data references

Information presented here has been derived from the Very Shallow Clay Range Site, literature, limited NRCS clipping data (417s), field observations and personal contacts with range-trained personnel. Photos by J.L. Schuster and Clint Rollins.

Other references

1. Archer S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. In Ecological implications of livestock herbivory in the West, pp.13-68. Edited by M. Vavra, W. Laycock, R. Pieper, Society for Range Management Publication. , Denver, CO.
2. Archer, Steve and F.E. Smeins.1991. Ecosystem-level Processes, Chapter 5 in: Grazing Management: An Ecological Perspective edited by R. K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
3. Briske, D.D., S.D. Fuhlendorf and F.E. Smeins. 2006. State-and-transition models, thresholds, and range health: A synthesis of ecological concepts and perspectives. J. Rangeland Ecology & Management. 68 (1): 1-10.
4. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20
5. Thurow T.L., 1991. Hydrology and erosion. Chapter 6 in: Grazing Management: An Ecological Perspective Edited by: R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, Oregon.
6. USDA/NRCS Soil Survey Manuals for Donley Counties, Texas.
7. Plant symbols, common names and scientific names according to USDA/NRCS Texas Plant List (Unpublished)
8. Bestelmeyer, B. T., J.R. Brown, K. M. Havsted, R. Alexander, G. Chavez and J. E. Hedrick. 2003. Development and use of state-and-transition models for rangelands. J. Range Management. 56(2): 114-126.

Special thanks to the following NRCS personnel for assistance and guidance with development of this ESD: Clint Rollins and J.R. Bell (retired) Amarillo, Royce Seibman Childress, Justin Clary Temple, Texas

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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)	Stan Bradbury, Zone RMS, NRCS, Lubbock, Texas
Contact for lead author	806-791-0581
Date	09/04/2007
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Slight to moderate.

2. **Presence of water flow patterns:** Slight to moderate.

3. **Number and height of erosional pedestals or terracettes:** Slight to moderate.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 25 to 30% mineral soil; low percentage due to rock fragments scattered throughout the soil profile.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Slight to moderate.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** If the soil surface is left unprotected by vegetation, the sloping soil is highly susceptible to water erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Moderate fine subangular blocky structure; very hard; firm; slightly sticky; plastic; many fine and common medium roots; surface crusting and scalding are severe when vegetation is removed; moderate SOM.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Moderate vegetative cover and percent slopes makes this site susceptible to erosion. Slow to very slow permeability, well drained and poor plant-soil moisture relationships. Badlands are usually associated with this site.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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

    Dominant: Warm-season midgrasses >

    Sub-dominant: Warm-season shortgrasses >

    Other: Forbs > Shrubs/Vines

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Plant community will have minimal mortality and decadence.

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):** 400 to 1,200 pounds per acre.

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

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