# Ecological site R078BY070TX
# Clayey Bottomland 19-26" PZ

Last updated: 9/15/2023
Accessed: 04/25/2024

## 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.

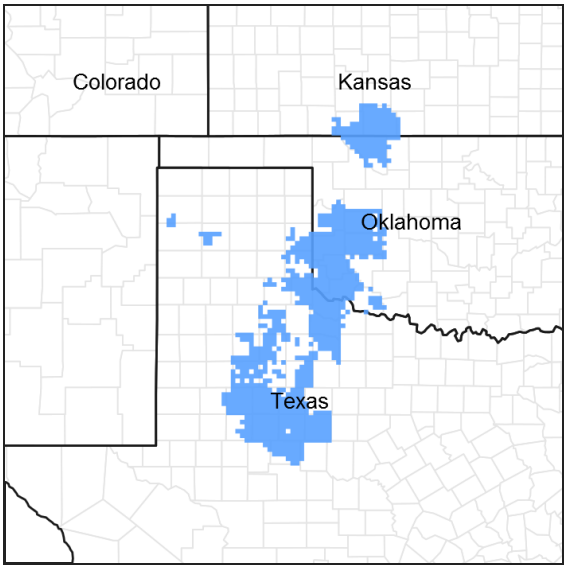



**Figure 1. Mapped extent**

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): 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 deep clay soils on floodplains. The reference vegetation consists of midgrasses and shortgrasses with few forbs and very few woody species. Due to the nature of the heavy clay soils, these areas may

be very sensitive to drought conditions. Abusive grazing practices may lead to a change in the plant community. Mesquite is a common woody invader on these sites.

## Associated sites

| | |
|---|---|
| R078BY079TX | **Loamy 19-26" PZ**<br>Located upslope from site. |

## Similar sites

| | |
|---|---|
| R078BY080TX | **Loamy Bottomland 19-26" PZ**<br>Similar physiographic position and both received overflow water from streams during flooding and from upslope sites. However, the loamy bottomland is a coarser textured soil with higher infiltration rates. |
| R078BY074TX | **Draw 19-26" PZ**<br>Generally upslope from the floodplain sites. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | Not specified |
| Herbaceous | (1) *Pleuraphis mutica*<br>(2) *Bouteloua curtipendula* |

## Physiographic features

Clayey bottomland soils are located on nearly level flood plains of major streams of the Western Rolling Red Plains MLRA (78B). Overflows occur once or twice a year to once every 20 years. Runoff is high. Slopes range from 0 to 2 percent. Elevation ranges from 1000 to 2900 feet.

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) River valley > Flood plain |
| Runoff class | High |
| Flooding duration | Very brief (4 to 48 hours) to brief (2 to 7 days) |
| Flooding frequency | Rare to occasional |
| Ponding frequency | None |
| Elevation | 1,000–2,900 ft |
| Slope | 0–2% |
| Water table depth | 72 in |
| 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 November. 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) | 187-191 days |
| Freeze-free period (characteristic range) | 203-219 days |
| Precipitation total (characteristic range) | 23-24 in |
| Frost-free period (actual range) | 183-191 days |
| Freeze-free period (actual range) | 202-223 days |
| Precipitation total (actual range) | 22-25 in |
| Frost-free period (average) | 189 days |
| Freeze-free period (average) | 211 days |
| Precipitation total (average) | 23 in |

## Climate stations used

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

## Influencing water features

This site is adjacent to streams that are occasionally flooded. Runoff from adjacent uplands also may flow across these sites.

## Wetland description

NA

## Soil features

Clayey bottomland soils consist of very deep, well-drained, very slowly permeable soils that formed in calcareous clayey alluvium. The soils are formed in clayey sediments several feet thick that are primarily derived from clayey soils formed in Permian or Triassic red beds. Water enters the soil profile rapidly when the soil is dry and cracked, but water movement into the soil profile is very slow after cracks are sealed.

Major Soil Taxonomic Units correlated to this site include: Belk clay, Duke silty clay, Mangum clay, Mangum silty clay loam, Clairemont silty clay loam, and Beckman clay.

**Table 4. Representative soil features**

| | |
|---|---|
| Parent material | (1) Alluvium–shale and siltstone |
| Surface texture | (1) Clay<br>(2) Silty clay |
| Family particle size | (1) Clayey |
| Drainage class | Well drained |
| Permeability class | Very slow |
| Soil depth | 72 in |
| Surface fragment cover <=3" | 0% |

| | |
|---|---|
| Surface fragment cover >3" | 0% |
| Available water capacity (0-40in) | 2–9 in |
| Calcium carbonate equivalent (0-40in) | 0–15% |
| Electrical conductivity (0-40in) | 0–8 mmhos/cm |
| Sodium adsorption ratio (0-40in) | 0–20 |
| Soil reaction (1:1 water) (0-40in) | 7.4–8.4 |
| Subsurface fragment volume <=3" (Depth not specified) | 0–12% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

The Clayey Bottomland Ecological Site in the MLRA 78B occurs on nearly level flood plains along drainage ways and streams. Meandering channels of major streams and small tributaries cut the site. Small depressions, apparently from old channels, occur throughout. The soils are fertile and flooding occurs, but the fine soil texture often restricts plant growth.

The reference plant community is a fire influenced shortgrass and midgrass prairie with a few scattered shrubs and trees along the drainage ways. The site evolved under frequent fire and periodic heavy grazing by bison, pronghorn antelope and deer. It is postulated that fires occurred at seven to 12 year intervals in this region (Frost 1998) prior to settlement. The frequent wildfires and clayey soils kept woody plants and forbs at very low levels. The fires likely were more influential in shaping the reference plant community into an open Midgrass/Shortgrass Community (1.1) than intermittent grazing by bison and pronghorns and periodic droughts.

Midgrasses, such as tobosa (*Pleuraphis mutica*), sideoats grama (*Bouteloua curtipendula*), vine mesquite (*Panicum obtusum*) and shortgrasses, such as buffalograss (*Bouteloua dactyloides*) and curly mesquite (*Hilaria belangeri*), dominate the Midgrass/Shortgrass Community (1.1) making up approximately 75 percent of the total herbage production. Trees, such as hackberry (Celtis spp.), bumelia (Sideroxylon spp.) and willow (Salix spp.), may grow along the drainage ways. Smartweed (Polygonum spp.) and sedges (Carex spp.) occupied the wetter depressions. Periodic fires favor grasses, especially tobosa, over woody plants and forbs. Very few scattered lotebush (*Ziziphus obtusifolia*), wolfberry (*Lycium berlandieri*), ephedra (Ephedra spp.) and other shrubs may be present.

The Midgrass/Shortgrass Community (1.1) was relatively stable and resilient within the climate, soil and fire regime until European settlement in the 1800s. The mid-1800’s brought elimination of the bison herd, removal of the American Indian and a large increase of domestic livestock. The development of the windmill and barbed wire fencing during the 1880s promoted overgrazing throughout the region. As overstocking by domesticated livestock continued, there was a reduction of palatable grasses and forbs and an increase in tobosa and buffalograss and other shortgrasses. Total herbage production declined as the grazing resistant midgrasses, shortgrasses and forbs began replacing the more palatable midgrasses and forbs. Tobosa and buffalograss are major increasers under grazing. Under abusive grazing, there is a decline in vegetative ground cover, mulch and soil organic matter.

The shift in composition of the plant cover and decline in soil properties favors woody plant encroachment. This, along with the reduction in intensity and frequency of fires, allows invasion of species from adjacent sites or the increase of more grazing resistant endemic species.

Under the above scenario, the reference community may transition into a Tobosa/Shortgrass Community (1.2). In this plant community, grasses, primarily tobosa, dominate but the encroaching woody species contribute an increasing amount to the total annual production. Occasionally saline conditions occur, resulting in increased amounts of alkali sacaton (*Sporobolus airoides*) and inland saltgrass (*Distichlis spicata*). Salt cedar (*Tamarix ramosissima*) can become invasive on this site.

When the Tobosa/Shortgrass Community (1.2) is grazed excessively and fire is excluded, the site may proceed toward woody plant dominance. Preferred species are replaced with less preferred species. Primary increasing woody species are mesquite (*Prosopis glandulosa*) and pricklypear (Opuntia and Cylindropuntia spp.). Tobosa, buffalograss and other unpalatable or more grazing resistant grasses increase and palatable forbs and midgrasses decrease. As grass cover declines, litter and soil organic matter decline. Bare ground, erosion and other desertification processes increase. The microclimate in the grassland areas becomes more arid. When the woody plant component reaches approximately 15% percent canopy, grazing management strategies, such as rest from grazing, generally will not restore the grassland community. A combination of proper grazing and prescribed burning should be successful in maintaining the grass dominant community. Without these management practices, the woody plants will continue increasing in density and size. In the absence of fire and the presence of continuous overgrazing, ecological succession forces drive the plant community toward a shrubland state. The next community type in this process is a shrubland, the Tobosa/Shortgrass/Mixed-Brush Community (2.1), where woody plants begin to dominate.

Mesquite dominates the woody cover of the Tobosa/Shortgrass/Mixed-Brush Community (2.1). Pricklypear and lotebush are representative understory shrubs. The grass component is a mixture of midgrasses, shortgrasses and low quality forbs, initially, with tobosa characteristically the dominant species. With continued livestock overgrazing, tobosa and buffalograss are gradually replaced by less palatable species such as threeawns (Aristida spp.) and inland saltgrass. Cool-season grasses such as Texas wintergrass (*Nassella leucotricha*) and annual bromes (Bromus spp.) also increase. During this stage, the transition to shrubland can be reversed by mechanical and/or chemical brush control methods and prescribed grazing management that provides fine fuel loadings necessary for prescribed burning at five to seven year intervals. Prescribed burning generally does not kill mesquite once plants reach >2 years of age, but fire can suppress mesquite of any age if the fire can cause top kill. Prescribed burning systems have been developed to aid in enhancing and utilizing this vegetation type.

If overgrazing continues and brush control practices are not applied, the woody canopy will increase in size and density until a woody plant dominated community develops. Dominance occurs at about 35 to 40 percent canopy cover. At this threshold, the grassland component will not produce enough fine fuel for fires to effectively suppress the woody plants. At this point, the site completes the transition into a new plant community type, the Mesquite/Mixed-Brush/ Shortgrass Community (2.2).

The Mesquite/Mixed-brush/Shortgrass Community (2.2) is dominated by mesquite and mixed-brush to the exclusion of most herbaceous species except tobosa and annuals in the woody plant interspaces. Once canopy cover exceeds 40 to 50 percent woody plants, forage production is very limited except in wet periods when annuals provide extra forage. Shortgrasses and cool-season grasses and forbs are in a weakened condition due to shading and competition from the woody plants. Mesquite and understory brush continue to increase in size and density regardless of grazing management.

When livestock overgrazing is continuous, tobosa and buffalograss decline and less palatable species such as threeawns, whorled dropseed and annual weeds increase. Large areas of bare ground may appear between woody plants. Desertification, including erosion, continues in the interspaces until maximum ground cover by woody species is approached. The microclimate becomes drier as interception losses increase with shrub cover. Once shrub cover reaches potential, the hydrologic processes, energy flow and nutrient cycling stabilize under the woody vegetation environment. The Mesquite/Tobosa/ Annuals Community (2.2) is low quality range for livestock and only fair quality deer habitat providing mainly cover and low quality browse.

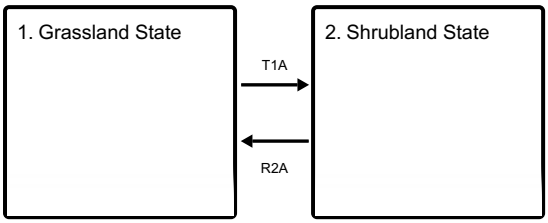
Major expense and energy are required to restore the Mesquite/Tobosa/Annuals Community back to a grassland plant community state. An integrated approach is required. Mechanical or herbicidal treatments such as dozing, individual plant treatments (IPT), herbicide spraying and range planting followed by grazing deferment, prescribed grazing and prescribed burning, are essential for the site to return to near the postulated historic climax community. Revegetation of site in this stage is very difficult to accomplish because of soil characteristics. The brushy species, namely mesquite, are hard to control with herbicides on this site. Re-invasion occurs due to the residual seed bank. Mechanical control such as grubbing or root plowing can destroy the perennial grass cover and more often than not, annuals or broom snakeweed prevails for two or three years, even with reseeding. The restoration process may take several years of repeated treatments. Therefore, maintaining the site in at least the Tobosa/Shortgrass-Mesquite/Mixed–Brush (2.1) stage, or better, the Tobosa/Shortgrass (1.2) stage, through proper stocking and brush management, including the use of prescribed burning, is recommended.

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.

The following State and Transitions Diagram graphically depicts the ecological dynamics, transition pathways and vegetation states described above.

## State and transition model

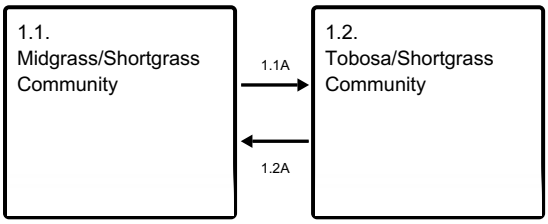
**Ecosystem states**



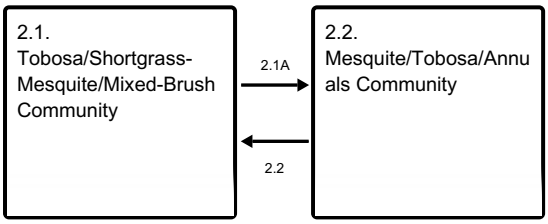

**T1A** - Absence of disturbance and natural regeneration over time, may be coupled with excessive grazing pressure

**R2A** - Reintroduction of historic disturbance regimes, may be coupled with rangeland seeding

**State 1 submodel, plant communities**




**State 2 submodel, plant communities**




## State 1
## Grassland State

The Midgrass/Shortgrass Community (1.1) is an open prairie dominated by mid and shortgrasses. Trees such as hackberry, bumelia and willow grow along the drainage ways. Smartweed and low growing sedges may be found in the common small depressions. Tobosa is the dominant grass with sideoats grama, vine mesquite, and cane or silver bluestem as the dominant midgrasses. Buffalograss and curly mesquite are common shortgrasses. Forbs included mallow, verbena, greenthread and annual forbs. Shrubs are scarce and mesquite may also be present but kept as scattered multi-stemmed shrubs by repeated wildfires. The Tobosa/Shortgrass Community (1.2) is a tobosa-dominated grassland community being encroached by woody species that previously have been held at low densities by repeated fires and competition from a vigorous grass component. Saline conditions may occur, resulting in increased amounts of alkali sacaton and inland saltgrass. Salt cedar can become invasive on this site. Woody species, including pricklypear and mesquite, increased in density because continuous heavy grazing by livestock reduced grass cover, exposed soil and reduced fine fuel necessary for effective fires.

### Dominant plant species

- tobosagrass (*Pleuraphis mutica*), grass
- sideoats grama (*Bouteloua curtipendula*), grass

## Community 1.1

## Midgrass/Shortgrass Community

**Figure 8. 1.1 Midgrass/Shortgrass Community**

The Midgrass/Shortgrass Community (1.1) is the interpretative or "reference" plant community for the Clayey Bottomland Ecological Site in MLRA 78B. It is an open prairie dominated by mid and shortgrasses. Trees such as hackberry, bumelia and willow grow along the drainage ways. The plant community provides good ground cover and protection from erosion during infrequent flooding events. Smartweed and low growing sedges may be found in the common small depressions. Tobosa is the dominant grass with sideoats grama, vine mesquite, and cane (*Bothriochloa barbinodis*) or silver bluestem (*Bothriochloa laguroides*) as the dominant midgrasses. Buffalograss and curly mesquite are common shortgrasses with lesser amounts of white tridens (*Tridens albescens*), fall witchgrass (*Digitaria cognata*), blue grama (*Bouteloua gracilis*), plains bristlegrass ( *Setaria vulpiseta*) and Hall's panicum (*Panicum hallii*). Texas wintergrass, wildrye (Elymus spp.) and western wheatgrass (*Pascopyrum smithii*) are important parts of the cool-season grass component. Forbs included mallow (Abutilon spp.), verbena (Verbena spp.), greenthread (Thelesperma spp.) and annual forbs. Shrubs are scarce but probably included fire resistant species such as wolfberry, ephedra and lotebush. Mesquite may also be present but kept as scattered multi-stemmed shrubs by repeated wildfires. (See plant community composition table below for complete listing of probable species.) The Midgrass/ Shortgrass Community (1.1) produces as much as 2,000 to 3,500 pounds herbage in good moisture years and as little as 1000 pounds in dry years, being limited by tight, droughty soils. Grasses and forbs contribute up to 95 percent of the total annual production. The midgrasses aide in the infiltration of rainfall into the very slowly permeable soil and reduced runoff to an insignificant amount. Litter and organic matter buildup is limited by the dry climate and low herbage production. The Midgrass/Shortgrass Community (1.1) furnishes good forage for grass eating type animals such as bison, pronghorn antelope, horses and cattle. The reference plant community can be maintained with proper stocking, prescribed grazing and frequent prescribed burning. Stocking rates must consider the kind of livestock and balance their numbers with current annual forage production and competition from other herbivores. With livestock overgrazing, decrease in intensity and frequency of fires and no brush management, this plant community transitions slowly into a Tobosa/Shortgrass Community (1.2).

**Table 5. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 1800 | 2475 | 3150 |
| Forb | 100 | 137 | 175 |
| Shrub/Vine | 80 | 110 | 140 |
| Tree | 20 | 28 | 35 |
| Microbiotic Crusts | 0 | 0 | 0 |
| **Total** | **2000** | **2750** | **3500** |

**Figure 10. Plant community growth curve (percent production by month). TX2049, shortgrass, shrubs & forbs community. warm- and cool-season forbs, shrubs and shortgrasses..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 3 | 8 | 16 | 25 | 5 | 5 | 10 | 16 | 8 | 3 |

## Community 1.2
## Tobosa/Shortgrass Community

**Figure 11. 1.2 Tobosa/Shortgrass Community**

The Tobosa/Shortgrass Community (1.2) is a tobosa-dominated grassland community being encroached by woody species that previously have been held at low densities by repeated fires and competition from a vigorous grass component. Saline conditions may occur, resulting in increased amounts of alkali sacaton and inland saltgrass. Salt cedar can become invasive on this site. Woody species, including pricklypear and mesquite, increased in density because continuous heavy grazing by livestock reduced grass cover, exposed soil and reduced fine fuel necessary for effective fires. Selective grazing by livestock and deer and the differential response of plants to defoliation causes changes in composition of the Midgrass/Shortgrass Community (1.1). The more palatable midgrasses and forbs are being replaced by less palatable or more grazing tolerant species. Tobosa and buffalograss increase while alkali sacaton, vine mesquite, and the feathery bluestems persist in this vegetation type. Texas wintergrass may increase on some areas, especially in and around woody plants, in response to shading. Most of the perennial forbs found in the reference community remain in this plant community, although in lesser amounts. The encroaching woody species are generally less than four feet tall and subject to control by prescribed burning enhanced by proper stocking and grazing management. The woody canopy varies between five and fifteen percent depending on length and severity of grazing, timing and frequency of fires and seed availability of invading species. Typically, mesquite and/or or pricklypear were early and persistent increasers. Lotebush, bumelia and wolfberry are also increasers. Annual primary production is reduced slightly relative to the reference, ranging from 1,500 to 3,000 pounds per acre depending on precipitation amounts and soil conditions. Grasses remain the dominant producers of forage. Heavy continuous grazing reduces plant cover, litter and mulch and increases bare ground exposing the soil to some erosion. There could be some mulch and litter movement during flooding but due to gentle slopes, little soil movement takes place in this vegetation stage. The changes in species composition are small initially, but unless proper grazing and periodic burning occur, the invading species continue to increase in size and density. Once the woody plants become dense enough (>15 %) to suppress grass growth and/or big enough (> 4 feet) to resist fire damage, a threshold in ecological succession is crossed. This threshold occurs when the fine fuel load provided by grasses is too low to control brush effectively with fire. When this occurs the Tobosa/Shortgrass Community (1.2) has regressed into the Tobosa/Shortgrass-Mesquite/Mixed-Brush Community (2.1). In that plant community, normal range management practices, such as proper stocking and prescribed grazing, 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 | 1275 | 1913 | 2550 |
| Forb | 75 | 113 | 150 |
| Tree | 75 | 113 | 150 |
| Shrub/Vine | 75 | 113 | 150 |
| Microbiotic Crusts | 0 | 0 | 0 |
| **Total** | **1500** | **2252** | **3000** |

**Figure 13. 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 |

## Pathway 1.1A
## Community 1.1 to 1.2

**Midgrass/Shortgrass Community**

**Tobosa/Shortgrass Community**

With heavy continuous grazing pressure, no fires, and brush invasion, the Mid/Shortgrass Community shifts to the Tobosa/Shortgrass Community.

## Pathway 1.2A
## Community 1.2 to 1.1

**Tobosa/Shortgrass Community**

**Midgrass/Shortgrass Community**

With the application of conservation practices such as Prescribed Grazing and Prescribed Burning, the Tobosa/Shortgrass Community can be able to revert back to the Mid/Shortgrass Community.

### Conservation practices

| |
|---|
| Prescribed Burning |
| Prescribed Grazing |

## State 2
## Shrubland State

The Tobosa/Shortgrass-Mesquite/Mixed-Brush Community (2.1) presents fifteen to forty percent woody plant cover dominated by mesquite with a tobosa/shortgrass understory. The diversity of the grassland component declines while woody plants and unpalatable forbs increase. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is mesquite as the dominant overstory with pricklypear, wolfberry, lotebush, ephedra and broomweed as common understory shrubs. Willows, hackberry and mesquite increase along

the stream. Tobosa dominates the herbaceous layer in the interspaces between trees and shrubs. Tobosa remains dominant, but as regression progresses under heavy grazing pressure, tobosa gives way to buffalograss and other less palatable shortgrasses and forbs. The Mesquite/Tobosa/Annuals Community (2.2) is a mesquite-dominated shrubland. Remnants of the reference grassland vegetation, mostly tobosa, shortgrasses, shade tolerant forbs and annuals, occupy the shrub interspaces. The typical woody plant cover is mesquite as the dominant woody species with pricklypear, tasajillo, lotebush and wolfberry common understory shrubs. Tobosa remains dominant in the herbaceous layer initially, but with heavy continuous grazing gives way to buffalograss and other less palatable shortgrasses, such as whorled dropseed, white tridens and weedy annuals. Because of grazing pressure and competition for nutrients and water from the woody plants, the grassland component shows lack of plant vigor and productivity.

**Dominant plant species**

- mesquite (*Prosopis*), shrub
- tobosagrass (*Pleuraphis mutica*), grass

## Community 2.1
## Tobosa/Shortgrass-Mesquite/Mixed-Brush Community

**Figure 14. 2.1 Tobosa/Shortgrass-Mesquite/Mixed-Brush**

The Tobosa/Shortgrass-Mesquite/Mixed-Brush Community (2.1) presents fifteen to forty percent woody plant cover dominated by mesquite with a tobosa/shortgrass understory. This community is the result of selective grazing by livestock, suppression of fire and the differential response of plants to defoliation. The diversity of the grassland component declines while woody plants and unpalatable forbs increase. All, but the more palatable woody species, have increased in size and density. The typical woody plant cover is mesquite as the dominant overstory with pricklypear, wolfberry, lotebush, ephedra and broomweed as common understory shrubs. Willows, hackberry and mesquite increase along the stream. Tobosa dominates the herbaceous layer in the interspaces between trees and shrubs. Remnants of reference community grasses and forbs and less palatable species such as alkali sacaton, threeawns, silver bluestem, white tridens, fall witchgrass, inland saltgrass and ragweeds (*Ambrosia psilostachya*) occur in the woody plant interspaces. Tobosa remains dominant, but as regression progresses under heavy grazing pressure, tobosa gives way to buffalograss and other less palatable shortgrasses and forbs. Mallow, verbena, greenthread and prairie coneflower (*Ratibida columnifera*) are commonly found in this community. Cool-season grasses, such as Texas wintergrass, Canada wildrye (*Elymus canadensis*) and western wheatgrass, can be found under and around woody plants where shading occurs. Annual herbage production ranges from approximately 1,000 to 2,000 pounds per acre, depending on precipitation events, flooding events and dry cycles. Annual herbage production is less than in the Tobosa/Shortgrass Community (1.2) due to decline in soil structure and organic matter. Herbage production is balanced between the grassland component and woody species. As the grassland component declines, more soil is exposed to crusting and wind erosion. During the middle and end of this plant community phase, considerable soil becomes exposed. Water erosion is not a serious problem because of shallow slopes on the site, but wind erosion can be rather high in bare spots created in depressions. Higher interception loss of water by the increasing woody canopy combined with evaporation losses reduces the effectiveness of rainfall. Litter, soil organic matter and structure decline in the interspaces reducing water infiltration but hydrologic conditions improve under the woody plant cover. When the woody plant cover reaches 35 to 40 percent and the herbaceous component contributes less than 50 percent of the herbage production, the Tobosa/Shortgrass-Mixed-

Brush Community transitions into a Mesquite/Tobosa/Annuals Community (2.2).

**Table 7. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Grass/Grasslike | 500 | 750 | 1000 |
| Shrub/Vine | 250 | 375 | 500 |
| Tree | 150 | 225 | 300 |
| Forb | 100 | 150 | 200 |
| Microbiotic Crusts | 0 | 0 | 0 |
| **Total** | **1000** | **1500** | **2000** |

**Figure 16. Plant community growth curve (percent production by month). TX2053, Midgrass\Shrub Plant Community. Midgrass-Shrub plant community with summer growth plus increasing cool season component..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 8 | 9 | 18 | 22 | 8 | 6 | 12 | 8 | 4 | 2 |

## Community 2.2
## Mesquite/Tobosa/Annuals Community

**Figure 17. 2.2 Mesquite/Tobosa/Annuals Community**

The Mesquite/Tobosa/Annuals Community (2.2) is a mesquite-dominated shrubland. Remnants of the reference grassland vegetation, mostly tobosa, shortgrasses, shade tolerant forbs and annuals, occupy the shrub interspaces. This community is the result of long-term overgrazing by livestock and wildlife, absence of natural fires and the differential response of plants to defoliation. The typical woody plant cover is mesquite as the dominant woody species with pricklypear, tasajillo (*Cylindropuntia leptocaulis*), lotebush and wolfberry common understory shrubs. Tobosa remains dominant in the herbaceous layer initially, but with heavy continuous grazing gives way to buffalograss and other less palatable shortgrasses, such as whorled dropseed (*Sporobolus pyramidatus*), white tridens and weedy annuals. Croton (Croton spp.), western ragweed, gaura (Gaura spp.), curlycup gumweed (*Grindelia squarrosa*), broomweed (Amphiachryis spp.) and asters (Aster spp.) are common forbs. Cool-season grasses such as Texas wintergrass 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 lack of plant vigor and productivity. As the grassland component declines, more soil is exposed to crusting and wind erosion, especially in depressions. During the beginning and middle of this plant community stage, considerable soil becomes exposed. High interception losses by the increasing woody canopy combined with evaporation losses can reduce the effectiveness of rainfall. Litter, soil organic matter and structure decline in the interspaces reducing water infiltration in the interspaces, but hydrologic conditions improve under the woody plant cover. Annual primary production is approximately 2,000 to 3,000 pounds per acre, primarily by the mesquite, pricklypear and other mixed-brush component. As this plant community nears maturity, the herbaceous component contributes less than 30 percent of the production. Browsing animals such as deer can find fair quality food if deer browsing has not been excessive.

Forage quantity and quality for cattle in this plant community are low. Livestock stocking decisions should consider the forage species composition, quantity of available forage and rangeland health in making stocking rate decisions. Unless brush management and effective grazing management are applied, the transition toward dense shrubland will continue until the plant community stabilizes. Restoration and conservation practices for the Mesquite/Tobosa/Annuals community (2.2) for livestock or deer production include: (a) brush management to remove undesirable brush species, (b) range planting of native species to return vegetation back to near climax and (c) establish prescribed grazing and prescribed fire and other conservation practices to maintain the health of the desired plant community. Caution should be applied in choosing brush control and seeding methods. Broadcast herbicides are often ineffective, or prohibited, and mechanical treatments that expose soil leave the site open to infestation of weeds that can persist for several years.

**Table 8. Annual production by plant type**

| Plant Type | Low (Lb/Acre) | Representative Value (Lb/Acre) | High (Lb/Acre) |
|---|---|---|---|
| Shrub/Vine | 900 | 1125 | 1350 |
| Grass/Grasslike | 500 | 625 | 750 |
| Tree | 500 | 625 | 750 |
| Forb | 100 | 125 | 150 |
| Microbiotic Crusts | 0 | 0 | 0 |
| **Total** | **2000** | **2500** | **3000** |

**Figure 19. Plant community growth curve (percent production by month). TX2035, Shrub Dominated Community. Shrubs dominant with only a few grasses remaining..**

| Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 4 | 16 | 30 | 25 | 5 | 5 | 6 | 4 | 2 | 1 |

## Pathway 2.1A
## Community 2.1 to 2.2

**Tobosa/Shortgrass-Mesquite/Mixed-Brush Community**

**Mesquite/Tobosa/Annuals Community**

When Heavy Continuous Grazing and absence of fire, the Tobosa/Shortgrass-Mesquite/Mixed-Brush Community will shift to the Mesquite/Tobosa/Annuals Community.

## Pathway 2.2
## Community 2.2 to 2.1

**Mesquite/Tobosa/Annuals Community**

**Tobosa/Shortgrass-Mesquite/Mixed-Brush Community**

With the use of conservation practices such as Brush Management, Range Planting, Prescribed Grazing, and Prescribed Burning, the Mesquite/Tobosa/Annuals Community can be shifted back to the Tobosa/Shortgrass-Mesquite/Mixed-Brush Community.

**Conservation practices**

| |
|---|
| Brush Management |
| Prescribed Burning |
| Prescribed Grazing |
| Range Planting |

## Transition T1A
## State 1 to 2

The Grassland State will transition into the Shrubland State if heavy continuous grazing and no fires continue to occur.

## Restoration pathway R2A
## State 2 to 1

With the application of conservation practices including Prescribed Grazing, Brush Management, Prescribed Burning, and Range Planting, the Tobosa/Shortgrass-Mesquite/Mixed-Brush Community can be restored 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** | | | 540–945 | |
| | tobosagrass | PLMU3 | *Pleuraphis mutica* | 540–945 | – |
| 2 | **Midgrasses** | | | 540–945 | |
| | sideoats grama | BOCU | *Bouteloua curtipendula* | 270–473 | – |
| | vine mesquite | PAOB | *Panicum obtusum* | 270–473 | – |
| 3 | **Shortgrasses** | | | 270–473 | |
| | buffalograss | BODA2 | *Bouteloua dactyloides* | 135–237 | – |
| | blue grama | BOGR2 | *Bouteloua gracilis* | 135–237 | – |
| 4 | **Warm-season grasses** | | | 270–473 | |
| | threeawn | ARIST | *Aristida* | 0–473 | – |
| | silver beardgrass | BOLAT | *Bothriochloa laguroides ssp. torreyana* | 0–473 | – |
| | fall witchgrass | DICO6 | *Digitaria cognata* | 0–473 | – |
| | Hall's panicgrass | PAHA | *Panicum hallii* | 0–473 | – |
| | large-spike bristlegrass | SEMA5 | *Setaria macrostachya* | 0–473 | – |
| | alkali sacaton | SPAI | *Sporobolus airoides* | 0–473 | – |
| | sand dropseed | SPCR | *Sporobolus cryptandrus* | 0–473 | – |
| | white tridens | TRAL2 | *Tridens albescens* | 0–473 | – |
| 5 | **Cool-season grasses** | | | 90–158 | |
| | Canada wildrye | ELCA4 | *Elymus canadensis* | 0–158 | – |
| | Texas wintergrass | NALE3 | *Nassella leucotricha* | 0–158 | – |
| | western wheatgrass | PASM | *Pascopyrum smithii* | 0–158 | – |
| 6 | **Grass-likes** | | | 0–20 | |

| | | | | | |
|---|---|---|---|---|---|
| | sedge | CAREX | *Carex* | 0–20 | – |
| **Forb** | | | | | |
| 7 | **Forbs** | | | 100–175 | |
| | Texas Indian mallow | ABFR3 | *Abutilon fruticosum* | 0–175 | – |
| | Cuman ragweed | AMPS | *Ambrosia psilostachya* | 0–175 | – |
| | aster | ASTER | *Aster* | 0–175 | – |
| | croton | CROTO | *Croton* | 0–175 | – |
| | blanketflower | GAILL | *Gaillardia* | 0–175 | – |
| | beeblossom | GAURA | *Gaura* | 0–175 | – |
| | rushpea | HOFFM | *Hoffmannseggia* | 0–175 | – |
| | rush skeletonplant | LYJU | *Lygodesmia juncea* | 0–175 | – |
| | knotweed | POLYG4 | *Polygonum* | 0–175 | – |
| | Texas nightshade | SOTR2 | *Solanum triquetrum* | 0–175 | – |
| | vervain | VERBE | *Verbena* | 0–175 | – |
| **Shrub/Vine** | | | | | |
| 8 | **Shrubs** | | | 80–140 | |
| | jointfir | EPHED | *Ephedra* | 0–140 | – |
| | desert-thorn | LYCIU | *Lycium* | 0–140 | – |
| | lotebush | ZIOBO | *Ziziphus obtusifolia var. obtusifolia* | 0–140 | – |
| **Tree** | | | | | |
| 9 | **Trees** | | | 20–35 | |
| | hackberry | CELTI | *Celtis* | 0–35 | – |
| | mesquite | PROSO | *Prosopis* | 0–35 | – |
| | willow | SALIX | *Salix* | 0–35 | – |
| | gum bully | SILAO | *Sideroxylon lanuginosum ssp. oblongifolium* | 0–35 | – |

## Animal community

Many types of grassland prairie wildlife used the Clayey Bottomland Ecological Site. Insects, reptiles, birds and mammals frequent the site, either as their base habitat or from the adjacent sites. Small mammals include many kinds of rodents, rabbits, raccoon, skunk, opossum and armadillo. Predators include coyote, red fox, gray fox, and bobcat. Game birds, songbirds, and birds of prey were indigenous or frequent users. Most are still plentiful. Bison and pronghorn antelope are no longer present. White-tailed deer and prong-horned antelope utilize the site in its various states. Deer, pronghorns and quail particularly favor the habitat provided by the Tobosa/Shortgrass Plant Community (1.2).

The site is suitable for production of livestock, including cattle, sheep and goats. The presence of predators has, however, reduced the use of the site for sheep and goat production. The reference community (1.1) is very suited to primary grass eaters such as bison and cattle. As retrogression occurs and woody plants invade, it becomes better habitat for deer and other wildlife because of the browse and cool-season grasses. 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 wildlife population management, the late Mesquite/Tobosa/Annuals Community (2.2) will have little to offer as habitat except cover.

## Hydrological functions

The Clayey Bottomland Ecological Site is a well-drained, very slowly permeable bottomland on nearly level flood

plains. It may receive water from surrounding soils and the site may be covered with by water during flooding events. Flooding occurs once or twice a year to once in 20 years. Soil moisture holding capacity is high and percolation is slow. The soil generally cracks to great depth when dry, allowing rapid water intake when rainfall occurs on dry soil. The deep soils, with moderate to good water holding capacity, are conducive to high herbage production during above average moisture years but restrictive to growth during normal or dry periods.

Under reference condition, the grassland vegetation intercepts and utilizes much of the incoming rainfall in the soil solum. Litter and soil movement is slight. Standing plant cover, duff and organic matter decrease as the Midgrass/Shortgrass Community (1.1) transitions to the Tobosa/Shortgrass Community (1.2). These processes continue in the interstitial spaces in the Tobosa/Shortgrass-Mesquite/Mixed-brush Community (2.1) and the Mesquite/Tobosa/Annuals Community (2.2). Once the shrubland matures, the hydrologic and ecological processes, nutrient cycling and energy flow stabilize within the woody plant canopy. Evaporation and interception losses are higher, however, resulting in less moisture reaching the soil. Essentially no water passes through the soil solum to underground water.

## Recreational uses

The Clayey Bottomland site, in conjunction with surrounding sites, is well suited for many outdoor recreational uses including recreational hunting, hiking, camping, equestrian and bird watching. This site along with adjacent upland sites provides diverse scenic beauty and many opportunities for recreation and hunting.

## Wood products

Mesquite is sometimes used for posts and charcoal. It is also used for furniture and specialty products.

## Other products

Jams and jellies are made from many fruit bearing species, such as algerita. Seeds are harvested from many plants for commercial sale. Grasses and forbs may be harvested by the dried-plant industry for sale in dried flower arrangements. Honeybees are utilized to harvest honey from the many flowering plants, such as mesquite.

## Other information

None.

## Inventory data references

Information presented has been derived from the revised Clayey Bottomland Range Site PE 25-36, literature, limited NRCS clipping data (417s), field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster.

## 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. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20
3. 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.
4. USDA/NRCS Soil Survey Manuals for Scurry, Mitchell and Borden Counties.
5. Plant symbols, common names and scientific names according to USDA/NRCS Texas Plant List (Unpublished)
6. 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.
7. Hamilton W. and Darrell Ueckert. 2005. Rangeland Woody Plant Control--Past, Present, and Future.Ch 1 in: Brush Management-Past, Present, and Future. Texas A & M University Press. Pp.3-16.

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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) | 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:** None to slight.

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2. **Presence of water flow patterns:** None to slight.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-25% bare ground.

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5. **Number of gullies and erosion associated with gullies:** None to slight.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** None to slight.

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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):** Resistance to surface erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Medium angular blocky surface; very hard; firm; sticky; few grass roots; medium SOM.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Basal cover and density with small interspaces should make rainfall impact minimal. This site has well drained soils, very slow permeability, and available water holding capacity is high. The soil-plant moisture relationship is fair.

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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.

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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 shortgrasses >

    Other: COol-season midgrasses = Forbs = Shrubs/Vines = Trees

    Additional:

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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.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,000 to 3,500 pounds per acre.

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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 and lotebush can be invasive.

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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.

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