Ecological site R078BY070TX
Clayey Bottomland
19-26" PZ

Last updated: 9/15/2023
Accessed: 09/14/2026

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.

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** Located upslope from site.

Similar sites

R078BY080TX	**Loamy Bottomland 19-26" PZ** 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** Generally upslope from the floodplain sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Pleuraphis mutica* (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	310 – 880 m
Slope	0 %
Water table depth	180 cm
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)	190-190 days
Freeze-free period (characteristic range)	200-220 days
Precipitation total (characteristic range)	580-610 mm
Frost-free period (actual range)	180-190 days
Freeze-free period (actual range)	200-220 days
Precipitation total (actual range)	560-640 mm
Frost-free period (average)	190 days
Freeze-free period (average)	210 days
Precipitation total (average)	580 mm

- (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 (2) Silty clay
Family particle size	(1) Clayey
Drainage class	Well drained
Permeability class	Very slow
Soil depth	180 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.08 – 22.86 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 20
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

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

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrass**			605-1059	
	tobosagrass	PLMU3	*Pleuraphis mutica*	605-1059	–
2	**Midgrasses**			605-1059	
	sideoats grama	BOCU	*Bouteloua curtipendula*	303-530	–
	vine mesquite	PAOB	*Panicum obtusum*	303-530	–
3	**Shortgrasses**			303-530	
	buffalograss	BODA2	*Bouteloua dactyloides*	151-266	–
	blue grama	BOGR2	*Bouteloua gracilis*	151-266	–
4	**Warm-season grasses**			303-530	
	threeawn	ARIST	*Aristida*	0-530	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	0-530	–
	fall witchgrass	DICO6	*Digitaria cognata*	0-530	–
	Hall's panicgrass	PAHA	*Panicum hallii*	0-530	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	0-530	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0-530	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0-530	–
	white tridens	TRAL2	*Tridens albescens*	0-530	–
5	**Cool-season grasses**			101-177	
	Canada wildrye	ELCA4	*Elymus canadensis*	0-177	–
	Texas wintergrass	NALE3	*Nassella leucotricha*	0-177	–
	western wheatgrass	PASM	*Pascopyrum smithii*	0-177	–

6	**Grass-likes**			0-22	
	sedge	CAREX	*Carex*	0-22	–
Forb					
7	**Forbs**			112-196	
	Texas Indian mallow	ABFR3	*Abutilon fruticosum*	0-196	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0-196	–
	aster	ASTER	*Aster*	0-196	–
	croton	CROTO	*Croton*	0-196	–
	blanketflower	GAILL	*Gaillardia*	0-196	–
	beeblossom	GAURA	*Gaura*	0-196	–
	rushpea	HOFFM	*Hoffmannseggia*	0-196	–
	rush skeletonplant	LYJU	*Lygodesmia juncea*	0-196	–
	knotweed	POLYG4	*Polygonum*	0-196	–
	Texas nightshade	SOTR2	*Solanum triquetrum*	0-196	–
	vervain	VERBE	*Verbena*	0-196	–
Shrub/Vine					
8	**Shrubs**			90-157	
	jointfir	EPHED	*Ephedra*	0-157	–
	desert-thorn	LYCIU	*Lycium*	0-157	–
	lotebush	ZIOBO	*Ziziphus obtusifolia var. obtusifolia*	0-157	–
Tree					
9	**Trees**			22-39	
	hackberry	CELTI	*Celtis*	0-39	–
	mesquite	PROSO	*Prosopis*	0-39	–
	willow	SALIX	*Salix*	0-39	–
	gum bully	SILAO	*Sideroxylon lanuginosum ssp. oblongifolium*	0-39	–

Table 6. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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

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Additional Reviewers:
Dr. Susan Casby-Horton, Soil Scientist, NRCS, Temple, Texas

Contributors

Dr. Joe Schuster, Range & Wildlife Habitat Consultants, Bryan, Texas
Rhett Johnson, RMS, NRCS, Temple, TX
PES Edits by Tyson Morley, MLRA Soil Scientist, Altus, Oklahoma

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	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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):** **None to slight.**

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.**

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.**

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.**

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

    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): 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.**
