USDA icon **Natural Resources Conservation Service**

Ecological site R078CY094TX
Clayey Bottomland
23-30" PZ

Last updated: 9/15/2023
Accessed: 09/16/2026

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): 078C–Central Rolling Red Plains, Eastern Part

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

LRU notes

NA

Classification relationships

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

Ecological site concept

These sites occur on clayey alluvial soils on floodplains. In the reference state, the vegetation is dominated by native midgrasses and forbs, with some scattered woody species. This vegetation type is the product of historical fire and grazing events. If fire is removed from the system, woody species may encroach and begin to dominate ecological processes. Due to the nature of the clay soils, these sites are often less productive than other bottomland sites, especially during long dry periods.

Associated sites

R078CY112TX	**Red Clay (South) 23-30" PZ** Shallow Clay is often adjacent and uphill and has much lower production and fewer woody species.

Similar sites

R078CY103TX	**Loamy Bottomland 23-31" PZ** Loamy Bottomland is found on similar physiographic position. However the Loamy Bottomland is moderately more productive due to the soil differences.
R078CY068OK	**Sandy Bottomland** Sandy Bottomland is found on similar physiographic position, but with sandy soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

The Clayey Bottomland 23” – 30” PZ was formed in calcareous clayey alluvium several feet thick washed largely from clayey soil formed in Permian or Triassic red beds. These soils are on nearly level flood plains of major streams that overflow about once or twice a year to once every 20 years of the Central Rolling Red Plains – Eastern Part (MLRA-78). Slopes range from 0 to 1 percent. Elevation ranges from 1000 to 2500 feet.

Table 2. Representative physiographic features

Landforms	(1) River valley > Flood plain (2) River valley > Draw (3) River valley > Valley
Runoff class	Medium to high
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	Rare to frequent
Ponding frequency	None
Elevation	310 – 760 m
Slope	0 %
Water table depth	80 – 190 cm
Aspect	Aspect is not a significant factor

Climatic features

The Central Rolling Red Plains – Eastern Part (MLRA 78C) lies within the subtropical sub-humid climate regime. Winters are typically dry while summers are hot and sub-humid. This regime is characterized by rapid changes in temperature; marked extremes, both daily and annual; and rather erratic rainfall.

This region lies in the path of polar air masses that move down from the north during the winter. With the passage of cold fronts during the fall and winter, abrupt temperature drops sometimes occur. While the area is subject to a wide range of temperature, winters are

generally mild. The summers are characterized by low humidity and good wind movements.

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

Normal rainfall averages 23 to 30 inches a year but distribution of rainfall patterns are so erratic that long dry periods are common. The majority of the rainfall occurs as showers, rather than general rain events between March and November. Dry periods of three to four weeks can be expected during this time as well. Even if these dry conditions occur, complete crop failures seldom results.

Table 3 Representative climatic features

Frost-free period (characteristic range)	150-200 days
Freeze-free period (characteristic range)	180-220 days
Precipitation total (characteristic range)	690-710 mm
Frost-free period (actual range)	140-200 days
Freeze-free period (actual range)	180-220 days
Precipitation total (actual range)	660-740 mm
Frost-free period (average)	180 days
Freeze-free period (average)	200 days
Precipitation total (average)	690 mm

- (1) FREEDOM [USC00343358], Freedom, OK
- (2) TALOGA [USC00348708], Taloga, OK
- (3) CLINTON SHERMAN AP [USW00003932], Dill City, OK
- (4) VERNON [USC00419346], Vernon, TX
- (5) ANSON 3ESE [USC00410268], Anson, TX

Influencing water features

None.

Wetland description

NA

Soil features

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

soil mapping.

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

Representative soil components for this site include:
Mangum, Duke, and Hayfork

These soils are very deep, well drained and very slowly permeable. Runoff is high. Water enters the soil rapidly when the soil is dry and has cracks, but after the cracks are closed water movement into the soil is very slow.

Table 4. Representative soil features

Parent material	(1) Alluvium – claystone
Surface texture	(1) Clay (2) Silty clay
Family particle size	(1) Clayey
Drainage class	Moderately well drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	180 – 200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	8.13 – 20.07 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	0 – 20 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10

Soil reaction (1:1 water) (0-101.6cm)	7.9 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	Not specified
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The information contained in the State and Transition Diagram (STD) and the Ecological Site Description was developed using archeological and historical data, professional experience, and scientific studies. The information presented is representative of a very complex set of plant communities. Not all scenarios or plants are included. Key indicator plants, animals and ecological processes are described to inform land management decisions.
The Clayey Bottomland Ecological Site occupies narrow bands of well drained soils on nearly level flood plains of rivers and streams. The site is inundated once or twice a year. Small depressions, apparently from old channels, occur throughout. The soils are fertile, but the fine soil texture often restricts plant growth.
The reference plant community is a fire induced midgrass and shortgrass prairie with a few scattered shrubs and trees along the drainage ways. This is considered the reference plant community for the Clay Bottomland ecological site. This plant community evolved under frequent fire and periodic heavy grazing by bison, pronghorn antelope and deer. It is postulated that fires occurred as often as four to six-year intervals in this region (Frost 1998) prior to European settlement. The frequent fires favored grasses over woody plants and forbs. The fires likely were more influential in shaping the plant community into an open Mixed-Grass Prairie Plant Community (1.1) than grazing by bison and pronghorns and periodic droughts.

Midgrasses, such as tobosa , alkali sacaton, sideoats grama and vine-mesquite and shortgrasses, such as buffalograss and blue grama, characterized the Mixed-Grass Prairie Plant Community (1.1). Texas wintergrass and western wheatgrass were also common. Tobosa was often dominant in the western, or drier side, of the MLRA and absent east of the 25-inch rainfall line. Smartweed and sedges occupied the wetter depressions and alkali sacaton the areas with excessive salt accumulation. Trees, such as hackberry, American elm, bumelia, western soapberry and a very few shrubs and vines were scattered along the drainages.

The Mixed-Grass Prairie 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. Overstocking by domesticated livestock induced a reduction of palatable grasses and forbs. Total herbage production declined as the grazing resistant shortgrasses and forbs began replacing the midgrasses and climax forbs. Tobosa and buffalograss were major increasers under grazing. There was a concomitant decline in vegetative ground cover, mulch and soil organic matter.
The shift in composition of the plant cover and decline in soil properties favored woody plant encroachment. This, along with the reduction in intensity and frequency of fires, allowed invasion of species from adjacent sites or the increase of more grazing resistant endemic species. Under the above scenario, the reference plant community transitioned into a Shortgrass Community (1.2). In this plant community grasses dominate but the encroaching woody species contribute an increasing amount to the total annual production.
If the Shortgrass Community (1.2) is continuously overgrazed and fire is excluded the transition toward woody plant dominance continues. The primary encroaching woody species are mesquite and pricklypear. Salt cedar can also become invasive on this site. Tobosa (in the west), buffalograss and other unpalatable or more grazing resistant grasses increase and palatable forbs and midgrasses continue to decline. Grass cover, litter and soil organic matter decline as 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 reverse the transition to shrubland. A combination of proper grazing and prescribed burning should be successful in maintaining the grass dominant community, however. With continued livestock grazing and no brush management the Shortgrass Community (1.2) will transition into a Shortgrass/Mixed-Brush Community (2.1), where woody plants dominate.

Mesquite dominates the woody cover of the Shortgrass/Mixed-Brush Community (2.1). Pricklypear and lotebush are characteristic understory shrubs. American elm and hackberry trees increase in size, but are infrequent. The grass component is a mixture of midgrasses, shortgrasses and low quality forbs, initially. Tobosa is typically the dominant grass west of the 25-inch precipitation line while buffalograss dominates to the east. With continued livestock overgrazing, tobosa and buffalograss are gradually replaced by less palatable species such as threeawn and meadow dropseed. Cool-season grasses such as Texas wintergrass and Japanese brome 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 four- to six-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 dense woody plant dominant community develops. Dominance occurs at about 30 to 35 percent woody plant 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 Mixed-Brush/Shortgrass/Annuals Community (2.2).

The Mixed-Brush/Shortgrass/Annuals Community (2.2) is dominated by mesquite and mixed-brush to the exclusion of most climax herbaceous species except tobosa, Texas wintergrass, buffalograss and annuals in the woody plant interspaces. Once canopy cover exceeds 35 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 present but sparse due to shading and competition from the woody plants. Japanese brome is often a persistent cool-season annual, especially during wet periods. Mesquite and understory brush continue to increase in size and density regardless of grazing management. Large areas of bare ground may appear between woody plants where small depressions occur. Desertification, including erosion, continues in the interspaces until maximum ground cover by woody species is approached. Once shrub cover reaches potential, the hydrologic processes, energy flow and nutrient cycling stabilize under the woody vegetation environment.

Major expense and energy are required to restore the Mixed-Brush/Shortgrass/Annuals Community (2.2) back to a grassland plant community state. Restoration of site in this stage is very difficult to accomplish because of soil characteristics. 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. 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 Shortgrass/Mixed–Brush (2.1) stage, or better, the Shortgrass Community (1.2) stage, through proper stocking and brush management, including the use of prescribed burning, is recommended.
The following State and Transition Model graphically depicts the ecological dynamics described. This model is not a precise model but a generalization of the different plant communities that can exist on a site and how community change occurs.

State and Transition Diagram:
A State and Transition Diagram for the Clay Bottomland (R078CY094TX) site is depicted below. Thorough descriptions of each state, transition, and pathway follow the model. Experts base this model on available experimental research, field observations, professional consensus, and interpretations. It is likely to change as knowledge increases.
Plant communities will differ across the MLRA because of the natural variability in weather, soils, and aspect. The Reference Plant Community is not necessarily the management goal; other vegetative states may be desired plant communities as long as the Range Health assessments are in the moderate and above category.

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

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

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

State and transition model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Midgrasses**			196-605	
	tobosagrass	PLMU3	*Pleuraphis mutica*	0-560	–
	alkali sacaton	SPAI	*Sporobolus airoides*	78-196	–
2	**Midgrasses**			196-908	
	cane bluestem	BOBA3	*Bothriochloa barbinodis*	28-112	–

	sideoats grama	BOCU	*Bouteloua curtipendula*	28-112	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	28-112	–
	Arizona cottontop	DICA8	*Digitaria californica*	28-112	–
	vine mesquite	PAOB	*Panicum obtusum*	28-112	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	28-112	–
	Drummond's dropseed	SPCOD3	*Sporobolus compositus var. drummondii*	28-112	–
	white tridens	TRAL2	*Tridens albescens*	28-112	–
3	**Shortgrasses**			275-1059	
	buffalograss	BODA2	*Bouteloua dactyloides*	123-560	–
	blue grama	BOGR2	*Bouteloua gracilis*	123-560	–
4	**Shortgrasses**			22-78	
	purple threeawn	ARPU9	*Aristida purpurea*	6-22	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	6-22	–
	tumblegrass	SCPA	*Schedonnardus paniculatus*	6-22	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6-22	–
5	**Cool-season grasses**			22-78	
	Texas wintergrass	NALE3	*Nassella leucotricha*	11-39	–
	western wheatgrass	PASM	*Pascopyrum smithii*	11-39	–
	sedge	CAREX	*Carex*	0-11	–
Forb					
6	**Forbs**			22-78	
	Indian rushpea	HOGL2	*Hoffmannseggia glauca*	0-56	–
	trailing krameria	KRLA	*Krameria lanceolata*	0-56	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	0-56	–
	knotweed	POLYG4	*Polygonum*	0-56	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	0-56	–
	vervain	VERBE	*Verbena*	0-56	–
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0-34	–
	prairie spiderwort	TROC	*Tradescantia occidentalis*	0-34	–
	Drummond's onion	ALDR	*Allium drummondii*	0-28	–
Shrub/Vine					
7	**Shrubs/Vines**			0-11	
	Christmas cactus	CYLE8	*Cylindropuntia leptocaulis*	0-11	–
	pricklypear	OPUNT	*Opuntia*	0-11	–
	lotebush	ZIOB	*Ziziphus obtusifolia*	0-11	–

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 wildlife used the Clayey Bottomland Ecological Site. Being associated with flood plains and water courses, it probably received concentrated animal use at times. Bison often utilized the site heavily during migrations prior to European settlement. Grassland 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, jackrabbit, cottontail rabbit, raccoon, skunk, opossum and armadillo. Predators include coyote, fox and bobcat. 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 deer utilize the Clayey Bottomland site in its various states. Deer, turkey and quail particularly favor the habitat provided by the Shortgrass/Mixed-brush (2.1) plant community.

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. When moist the soil is very slowly permeable, however. 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. Essentially no water passes through the soil profile to underground water. Under reference condition, the grassland vegetation probably intercepted and utilized much of the incoming rainfall in the soil profile. Litter and soil movement was slight. Standing plant cover, duff and organic matter decrease as the Mixed-Grass Prairie Community (1.1) transitions to the Shortgrass Community (1.2). These processes continue in the spaces between woody plants in the Shortgrass/Mixed-brush Community (2.1) and the Mixed-brush/Shortgrass/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.

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 fruit bearing species. 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 Clayey Bottomland 30-40 RSD (8-16-79), an undated NRCS draft Ecological Site Description for Clayey Bottomland PE 31-44, 78C, literature, personal experience, field observations and personal contacts with range-trained personnel. Photos by: J.L. Schuster --taken on Waggoner Ranch, Baylor County, TX. Special thanks to the following for assistance and guidance with development of this ESD: Reggie Quiett and Cody Bauman NRCS Vernon, TX, Mark Moseley NRCS, San Antonio, Texas and Justin Clary NRCS Temple, Texas. Reviewers: Steve Glasgow, GLS, NRCS, Stillwater, OK Lem Creswell, RMS, NRCS, Weatherford, TX Reggie Quiett, RMS, NRCS, Vernon, TX Greg Scott, RSS, NRCS, Stillwater, OK

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. Brown, J.K. and J.K. Smith (Editors). 2000. Wildland fire in Ecosystems; effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden. UT: U.S.D.A., Forest Service, Rocky Mtn. Sta. 257p.
3. Frost, C. C. 1998. Pre-settlement fire frequency regions of the United States: A first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20
4. Milchunas, D.G. 2006. Responses of Plant Communities to grazing in the southwestern United States. USDA-Forest Service. Rocky

Mtn. Sta. GTR. 169
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 Knox, Baylor and Haskell 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.
9. 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.

Contributors

Joe J. McEntire
Joseph Schuster, Range & Wildlife Habitat Consultants, Bryan, Texas
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)	Lem Creswell, Zone RMS, NRCS, Weatherford, Texas
Contact for lead author	817-596-2865
Date	12/20/2007
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

2. **Presence of water flow patterns:** Water flow patterns are common and follow old stream meanders. Deposition or erosion is uncommon for normal rainfall but may occur during intense rainfall events.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes would have been uncommon for this site when occupied by the natural HCPC.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect no more than 20% bare ground randomly distributed throughout.

5. **Number of gullies and erosion associated with gullies:** This is a flood plain with occasional out of bank flow. Some gullies may be present on side drains into perennial and intermittent streams. Gullies should be vegetated and stable.

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

7. **Amount of litter movement (describe size and distance expected to travel):** This is a flood plain with occasional out of bank flow. Under normal rainfall, little litter movement should be expected, however, litter of all sizes may move long distances depending on obstructions under intense storm events.

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Soil surface is resistant to erosion. Stability class range is expected to be 5 to 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0 to 48 " thick with colors from brown to dark reddish brown clay with generally subangular blocky structure. SOM is approximately 1 to 6%. See Soil survey for specific soil.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** The savannah of trees, shrubs, vines, grasses, and forbs with adequate litter and little bare ground provides for maximum infiltration and little runoff under normal rainfall events.

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

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 grasses > Forbs > Trees

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence): There should be little mortality or decadence for any functional group.**

---

14. **Average percent litter cover (%) and depth (in): 30 to 40% litter cover and 1-3" litter depth. Dominant litter is herbaceous.**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production): 700 to 2700 lbs/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: Honey mesquite, pricklypear, lotebush, annual broomweed**

---

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