Ecological site R087AY001TX
Gravelly

Last updated: 9/21/2023
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.

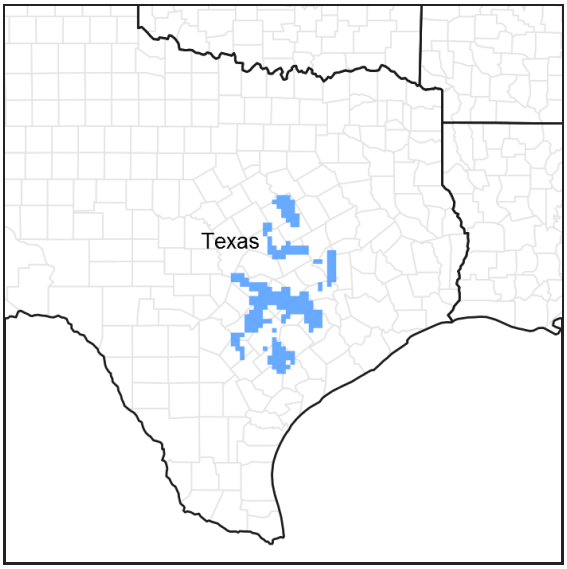


Figure 1. Mapped extent

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): 087A–Texas Claypan Area, Southern Part

This area is entirely in south-central Texas. It makes up about 10,535 square miles (27,295 square kilometers). The towns of Bastrop, Bryan, Centerville, College Station, Ennis, Fairfield, Franklin, Giddings, Gonzales, Groesbeck, La Grange, Madisonville, and Rockdale are in this MLRA. Interstate 45 crosses the northern part of the area, and Interstate 10 crosses the southern part. A number of State Parks are located throughout this area. The parks are commonly associated with reservoirs.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 87A

Ecological site concept

This ecological site is characterized by gravelly soils. Gravels are located in the surface and/or subsurface of the soil. This affects plant growth by restricting where roots can grow, and ultimately limiting the productivity of the site.

Associated sites

R087AY003TX	**Claypan Savannah** Claypan Savannah
R087AY006TX	**Sandy** Sandy

Similar sites

R087AY003TX	**Claypan Savannah** Claypan Savannah

Table 1. Dominant plant species

Tree	(1) *Quercus stellata* (2) *Quercus marilandica*
Shrub	(1) *Ilex vomitoria* (2) *Callicarpa americana*
Herbaceous	(1) *Schizachyrium scoparium* (2) *Sorghastrum nutans*

Physiographic features

The topography of this site is nearly level to steep. Some soils may have a perched water table as high as 30 inches. Water tables are typically highest in the late winter and early spring, or during times of heavy precipitation events.

Table 2. Representative physiographic features

Landforms	(1) Plains > Ridge (2) Plains > Stream terrace
Runoff class	Medium to very high
Flooding frequency	None
Ponding frequency	None
Elevation	200–750 ft
Slope	0–20%
Water table depth	30–80 in
Aspect	Aspect is not a significant factor

Climatic features

The climate for MLRA 87A is humid subtropical and is characterized by hot summers, especially in July and August, and relatively mild winters. The summer months have little variation in day-to-day weather except for occasional thunderstorms that dissipate the afternoon heat. The moderate temperatures in spring and fall are characterized by long periods of mild days and cool nights. The average annual precipitation in this area is 41 inches. Most of the rainfall occurs in spring and fall. The freeze-free period averages about 276 days and the frost-free period 241 days.

Table 3. Representative climatic features

Frost-free period (average)	241 days
Freeze-free period (average)	276 days
Precipitation total (average)	41 in

Climate stations used

- (1) SMITHVILLE [USC00418415], Smithville, TX
- (2) FAIRFIELD 3W [USC00413047], Fairfield, TX
- (3) BARDWELL DAM [USC00410518], Ennis, TX
- (4) CROCKETT [USC00412114], Crockett, TX
- (5) GONZALES 1N [USC00413622], Gonzales, TX
- (6) MADISONVILLE [USC00415477], Madisonville, TX
- (7) SOMERVILLE DAM [USC00418446], Somerville, TX
- (8) FRANKLIN [USC00413321], Franklin, TX
- (9) COLLEGE STN [USW00003904], College Station, TX
- (10) BELLVILLE 6NNE [USC00410655], Bellville, TX
- (11) ELGIN [USC00412820], Elgin, TX
- (12) LA GRANGE [USC00414903], La Grange, TX

Influencing water features

The site has a high perched water table after periods of heavy rainfall.

Wetland description

Wetlands are not associated with this site.

Soil features

These are moderately deep to very deep, gravelly, loamy and clayey soils. The dominant characteristic is the gravel in the profile. Soils of this site have profiles in which a large percent and volume is gravel. Although the soils take in water readily, the gravel content limits moisture and fertility storage capacity. The site is somewhat droughty when compared to loamy soils without the gravel. The gravel layer becomes slightly cemented when dry and restricts root growth. The site responds to light showers more favorably than do heavier soils. When range and soil condition deteriorates, surface crusting, slow infiltration, and runoff are common. It is very important to maintain a protective cover of vegetation and plant residue on the site. Many areas of these soils have been surface mined for gravel, thus reducing their vegetative potential even further. Most soil series are also correlated to another ecological site, but these series have a gravel in their mapunit names. The soils correlated include: ABurlewash, Carmine, Ellen, Fett, Goldmire, Gredge, Hornsby, Rek, Riesel, Satin, Silvern, Stein, Straber, Tabor, Travis, Tremona, and Vernia.

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and shale (2) Alluvium–metamorphic and sedimentary rock
Surface texture	(1) Gravelly fine sandy loam (2) Gravelly loamy fine sand
Family particle size	(1) Loamy
Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow to moderately slow
Soil depth	25–80 in
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0–25%
Available water capacity (0-40in)	1–6 in
Calcium carbonate equivalent (0-40in)	0–2%
Electrical conductivity (0-40in)	0–4 mmhos/cm

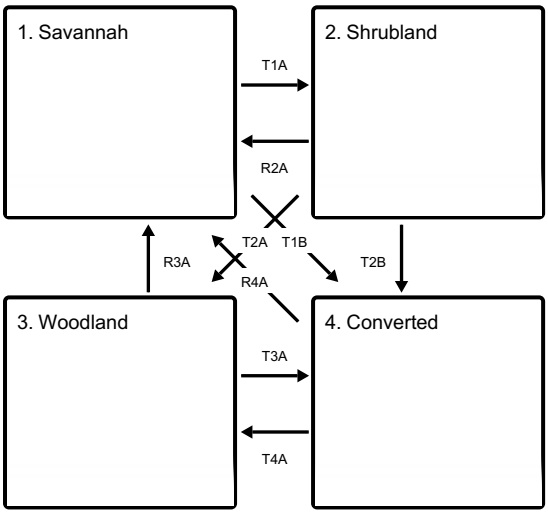
Sodium adsorption ratio (0-40in)	0–5
Soil reaction (1:1 water) (0-40in)	4.5–7.8
Subsurface fragment volume <=3" (Depth not specified)	0–45%
Subsurface fragment volume >3" (Depth not specified)	0–10%

Ecological dynamics

The gravelly site evolved and was maintained by the grazing and herding effects of native wild large ungulates, periodic fires, and climatic fluctuations. Conversion of this site to cropland and the subsequent abandonment of cropping removed the natural native vegetation, organic matter and fertility, and allowed woody species to dominate the site. Continuous grazing by domestic livestock and the suppression of fire on non-cropland sites removes little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), Engelmann's daisy (*Engelmannia peristenia*), yellow neptunia (*Neptunia lutea*), and gayfeather (*Liatris punctata*). Less productive perennial and annual grasses, forbs, vines, and shrubs will replace these plants. With continued continuous grazing, no brush management, and the absence of periodic fires, a community dominated by blackjack oak (*Quercus marilandica*), yaupon (*Ilex vomitoria*), post oak (*Quercus stellata*), winged elm (*Ulmus alata*), and eastern red cedar (*Juniperus virginiana*) will replace the savannah. These woody species often form dense canopies that limit herbaceous productivity due to shading and moisture utilization.

State and transition model

Ecosystem states



T1A - Heavy continuous grazing, no brush management, abandonment

T1B - Brush management, crop cultivation, pasture planting

R2A - Brush management, prescribed grazing, prescribed burning

T2A - Heavy continuous grazing, no brush management, abandonment

T2B - Brush management, crop cultivation, pasture planting

R3A - Brush management, range planting, prescribed grazing

T3A - Brush management, crop cultivation, pasture planting

R4A - Range planting, prescribed grazing, prescribed burning

T4A - Heavy continuous grazing, no brush management, abandonment

State 1 submodel, plant communities

1.1. Tallgrass/Oak Savannah

State 2 submodel, plant communities

2.1. Oak Scrub/Shrubland

State 3 submodel, plant communities

3.1. Post Oak/Blackjack Oak Woodland

State 4 submodel, plant communities

4.1. Converted Land

State 1
Savannah

One community exists in the Savannah State, the 1.1 Tallgrass/Oak Savannah Community. The State is dominated by warm season perennial grasses and the overstory canopy cover is less than 20 percent.

Community 1.1
Tallgrass/Oak Savannah

The characteristic plant community of this site is the reference plant community. This site is an open savannah of blackjack oak and post oak trees that shade 15 to 20 percent of the ground. The herbaceous component is tall and midgrasses and is dominated by little bluestem, which usually makes up 50 to 60 percent of the total annual yield. Indiangrass, brownseed paspalum (*Paspalum plicatulum*), purpletop tridens (*Tridens flavus*), switchgrass, tall dropseed (*Sporobolus compositus*), and thin paspalum (*Paspalum setaceum*) also occur. Cool-season forage plants are scarce on this site. A variety of shrubs, vines, and forbs occur in this community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	2000	2800	3600
Tree	250	350	450
Shrub/Vine	125	175	225
Forb	125	175	225
Total	**2500**	**3500**	**4500**

State 2
Shrubland

One community exists in the Shrubland State, the 2.1 Oak Scrub/Shrubland Community. The herbaceous production is not as great compared to the Savannah State, and overstory canopy has increased between 20 and 50 percent.

Community 2.1
Oak Scrub/Shrubland

This plant community is a transitional community between Savannah and Woodland States. It develops in the absence of fire or mechanical or chemical brush management treatments. It is usually the result of either abandonment following cropping or yearly continuous grazing. Trees and shrubs begin to encroach onto pastureland or replace the grassland component of the Savannah State. In addition to the naturally occurring oaks, other woody species such as eastern persimmon (*Diospyros virginiana*), winged elm, and eastern red cedar increase in density and canopy coverage (20 to 50 percent). Remnants of little bluestem and Indiangrass may still occur but the herbaceous component of the community becomes dominated by lesser producing grasses and forbs. Initially, species such as brownseed paspalum, tall dropseed, and fall witchgrass (*Digitaria cognata*) replace the taller grasses. As the site continues to transition, the plants which increase or invade on the site include sandbur (Cenchrus spp.), red lovegrass (*Eragrostis secundiflora*), Yankeeweed (*Eupatorium compositifolium*), bullnettle (*Cnidoscolus texanus*), croton (Croton spp.), snake cotton (*Froelichia gracilis*), prickly pear (Opuntia spp.), queen's delight (*Stillingia texana*), beebalm (Monarda spp.), and baccharis (Baccharis spp.). Prescribed burning on a three to five year interval in conjunction with prescribed grazing may be a viable option for returning this site to a Tallgrass/Oak Savannah Community provided woody canopy cover is less than 50 percent and adequate herbaceous fine fuel still exists. When this threshold is exceeded, mechanical or chemical brush control becomes necessary to move back towards the Savannah State.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	800	1120	1440
Shrub/Vine	600	840	1080
Tree	400	560	720
Forb	400	560	720
Total	**2200**	**3080**	**3960**

State 3
Woodland

One community exists in the Woodland State, the Post Oak/Blackjack Oak Woodland Community. The site is characterized by little herbaceous production. The overstory canopy is over 50 percent and shrubs also limit light to the surface.

Community 3.1
Post Oak/Blackjack Oak Woodland

This plant community is a closed overstory (50 to 80 percent) woodland dominated by post oak, blackjack oak, winged elm, and eastern red cedar. Understory shrubs and sub-shrubs include yaupon, farkleberry (*Vaccinium arboreum*), possumhaw (*Ilex decidua*), and American beautyberry (*Callicarpa americana*). Woody vines also occur and include poison ivy (toxicodendron radicans), grape (Vitis spp.), greenbriar (Smilax spp.), and peppervine (Ampelopsis arborea). A herbaceous understory is almost nonexistent but shade-tolerant species including longleaf woodoats (*Chasmanthium sessiliflorum*), cedar sedge (*Carex planostachys*), ironweed (*Vernonia baldwinii*), and goldenrod (Solidago spp.) may occur in small amounts. Prescribed fire may be used to convert this site back to the Tallgrass/Oak Savannah Community but will generally take many consecutive years of burning due to light fine fuel loads. Chemical brush control on a large scale is usually not a treatment option on this site due to the herbicide resistance of yaupon; however, individual plant treatment with herbicides on small acreage is a viable option. Mechanical treatment of this site, along with seeding, is the most viable option for reversion back to a Savannah State, although the economic viability of this option is questionable.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	875	1225	1575
Shrub/Vine	500	700	900
Grass/Grasslike	200	280	360
Forb	60	90	120
Total	**1635**	**2295**	**2955**

State 4
Converted

The Converted Land State contains one community, the 4.1 Converted Land Community. The state is characterized by the land manager farming crops or planted grasses.

Community 4.1
Converted Land

Conversion of this site to cropland occurred from the middle 1800's to the early 1900's. Some remains in cropland today, typically cotton (Gossypium spp.), corn (*Zea mays*), sorghum (Sorghum spp.), and soybeans (*Glycine max*). Ditching, land leveling, and levee construction has significantly changed the topography and hydrology on many acres of this site. While restoration of this site to a semblance of the reference plant community is possible with seeding and prescribed grazing, complete restoration of the reference community in a reasonable time is very unlikely. Following crop production, this site is often planted to native or introduced grasses and legumes for livestock grazing or hay production. Typical species planted include improved Bermudagrass varieties, bahiagrass, switchgrass, dallisgrass, kleingrass (*Panicum coloratum*), old world bluestems (Bothriochloa spp.), annual ryegrass (Lolium multiflorum), and white clover. Many of the introduced species (bahiagrass, Bermudagrass, and dallisgrass) are invasive-moving by wind, water, and animals. Once established, they are extremely difficult to remove and will hinder the reestablishment of native species. The establishment and maintenance of these species requires cultivation, fertilization, weed control, and prescribed grazing management.

Transition T1A
State 1 to 2

The Savannah State will transition to the Shrubland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 20 percent and grasses shift composition to more shade-tolerant species.

Transition T1B
State 1 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R2A
State 2 to 1

Restoration back to the Savannah State requires brush management, prescribed grazing and/or prescribed fire. Mechanical or chemical controls can be used to remove the woody overstory species and shrubs. Prescribed grazing may require destocking and/or deferment.

Restoration pathway T2A
State 2 to 3

The Shrubland State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Restoration pathway T2B
State 2 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R3A
State 3 to 1

Restoration back to the Savannah State requires substantial energy inputs. Brush management and prescribed grazing will be need to shift the community back to the reference state. Mechanical or chemical controls can be used to remove the woody overstory species back below 20 percent. Prescribed grazing may require destocking and/or deferment to manage the understory grasses back to those found in the reference community. Fire may be an option, but only if adequate amounts of fine fuel exist in the understory.

Transition T3A
State 3 to 4

The transition to the Converted State occurs when the site is plowed for planting crops or pasture. The driver for the transition is the land manager's decision to farm the site.

Restoration pathway R4A
State 4 to 1

The restoration to State 1 can occur when the land manager ceases agronomic practices. Range planting of native species found in the reference community will be required to bring back a similar community as the State 1 plant composition. The extent of previous soil disturbances will determine how much seedbed preparation will be needed, as well as the ability to be restored. Proper grazing and brush management will be required to ensure success.

Transition T4A
State 4 to 3

The Converted Land State will transition to the Woodland State when continued heavy grazing pressure, no brush management, and/or field abandonment continues. The transition is evident when woody species canopy cover exceeds 50 percent and grasses shift composition to more shade-tolerant species.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrass**			1375–2475	
	little bluestem	SCSC	*Schizachyrium scoparium*	1375–2475	–
2	**Tall/Midgrasses**			375–675	
	big bluestem	ANGE	*Andropogon gerardii*	375–675	–
	longleaf woodoats	CHSE2	*Chasmanthium sessiliflorum*	375–675	–
	beaked panicgrass	PAAN	*Panicum anceps*	375–675	–

	switchgrass	PAVI2	*Panicum virgatum*	375–675	–
	Indiangrass	SONU2	*Sorghastrum nutans*	375–675	–
	composite dropseed	SPCOC2	*Sporobolus compositus var. compositus*	375–675	–
	purpletop tridens	TRFL2	*Tridens flavus*	375–675	–
3	**Mid/Shortgrasses**			250–450	
	arrowfeather threeawn	ARPU8	*Aristida purpurascens*	250–450	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	250–450	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	250–450	–
	cedar sedge	CAPL3	*Carex planostachys*	250–450	–
	cylinder jointtail grass	COCY	*Coelorachis cylindrica*	250–450	–
	fall witchgrass	DICO6	*Digitaria cognata*	250–450	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	250–450	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	250–450	–
	purple lovegrass	ERSP	*Eragrostis spectabilis*	250–450	–
	Hall's panicgrass	PAHA	*Panicum hallii*	250–450	–
	brownseed paspalum	PAPL3	*Paspalum plicatulum*	250–450	–
	thin paspalum	PASE5	*Paspalum setaceum*	250–450	–
Forb					
4	**Forbs**			125–225	
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	125–225	–
	Virginia dayflower	COVI3	*Commelina virginica*	125–225	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	125–225	–
	ticktrefoil	DESMO	*Desmodium*	125–225	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	125–225	–
	coastal indigo	INMI	*Indigofera miniata*	125–225	–
	lespedeza	LESPE	*Lespedeza*	125–225	–
	littleleaf sensitive-briar	MIMI22	*Mimosa microphylla*	125–225	–
	yellow puff	NELU2	*Neptunia lutea*	125–225	–
	prairie snoutbean	RHLA5	*Rhynchosia latifolia*	125–225	–
	fuzzybean	STROP	*Strophostyles*	125–225	–
Shrub/Vine					
5	**Shrubs/Vines**			125–225	
	coralberry	SYOR	*Symphoricarpos orbiculatus*	125–225	–
	farkleberry	VAAR	*Vaccinium arboreum*	125–225	–
	muscadine	VIRO3	*Vitis rotundifolia*	125–225	–
	American beautyberry	CAAM2	*Callicarpa americana*	125–225	–
	parsley hawthorn	CRMA5	*Crataegus marshallii*	125–225	–
	yaupon	ILVO	*Ilex vomitoria*	125–225	–
	winged sumac	RHCO	*Rhus copallinum*	125–225	–
	southern dewberry	RUTR	*Rubus trivialis*	125–225	–
	cat greenbrier	SMGL	*Smilax glauca*	125–225	–

Tree					
6	**Trees**			250–450	
	blackjack oak	QUMA3	*Quercus marilandica*	250–450	–
	post oak	QUST	*Quercus stellata*	250–450	–
	winged elm	ULAL	*Ulmus alata*	250–450	–

Animal community

The historic savannah provided habitat to bison, deer, turkey, migratory birds and large predators such as wolves, coyotes, mountain lions, and black bear. White-tailed deer, turkey, coyotes, bobcats, and resident and migratory birds find suitable habitat in these savannahs today. Domestic livestock and exotic ungulates are the dominant grazers and browsers of this site. As the savannah transitions through the various vegetative states towards woodlands, the quality of the habitat may improve for some species and decline for others. Management must be applied to maintain a vegetative state in optimum habitat quality for the desired animal species.

Hydrological functions

Peak rainfall periods occur in May and June from frontal passage thunderstorms and in September and October from tropical systems as well as frontal passages. Rainfall amounts may be high (three to five inches per event) and events may be intense. The site is subject to erosion where adequate herbaceous cover is not maintained and on heavy use areas such as roads and livestock trails. Gullies following livestock trails to water are common on this site where continuous grazing is practiced and adequate herbaceous cover is not maintained. Extended periods (60 days) of little to no rainfall during the growing season are common. The hydrology of this site may be manipulated through management to yield higher runoff volumes or greater infiltration to groundwater. Management for less herbaceous cover will favor higher surface runoff while dense herbaceous cover and litter will favor ground water recharge. Potential pollution from sediment, pesticides, and both organic and inorganic fertilizers should always be considered when managing for higher volumes of surface runoff.

Recreational uses

Hunting, camping, bird watching, equestrian, and photography are common activities.

Wood products

Oaks are used for firewood. Hickory and mesquite are used for barbecue wood. Yaupon is used for landscaping.

Other products

Gravel is mined from this site. Fruit from dewberries, grapes, and plums are harvested.

Inventory data references

These site descriptions were developed as part a Provisional Ecological Site project using historic soil survey manuscripts, available site descriptions, and low intensity field traverse sampling. Future work to validate the information is needed. This will include field activities to collect low, medium, and high-intensity sampling, soil correlations, and analysis of that data. A final field review, peer review, quality control, and quality assurance review of the will be needed to produce the final document.

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Contributors

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Approval

Bryan Christensen, 9/21/2023

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)	Mike Stellbauer, David Polk, and Bill Deauman
Contact for lead author	Mike Stellbauer, Zone RMS, NRCS, Bryan, Texas
Date	05/18/2005
Approved by	Bryan Christensen
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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2. **Presence of water flow patterns:** Some water flow patterns may be present on this site due to landscape position and slopes.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes are uncommon for this site when occupied by the reference community.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Expect no more than 25 percent bare ground randomly distributed in small patches.

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5. **Number of gullies and erosion associated with gullies:** Some gullies associated with animal trails may be present. Head and side slopes should be stable and covered with vegetation.

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

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7. **Amount of litter movement (describe size and distance expected to travel):** This site has slowly permeable sub-soils. On sloping sites, small to medium-sized litter will move short distances with intense storms.

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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):** Soil surface is resistant to erosion. Soil Stability class range is expected to be 3 to 5.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** The soil surface structure is less than 10 inches thick with colors from brown fine sandy loam to dark yellowish brown fine sandy loam and generally subangular blocky structures. SOM is 0.5 to 1.0 percent.

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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, along with adequate litter and little bare ground, provides for maximum infiltration and little runoff under normal rainfall events.

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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 tallgrasses >>

Sub-dominant: Warm-season midgrasses >

Other: Trees > Shrubs/Vines > Forbs

Additional:

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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.

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 2,500 pounds per acre for below average moisture years to 4,500 pounds per acre for above average moisture years.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Potential invasive species include bahiagrass, Bermudagrass, mesquite, eastern persimmon, eastern red cedar, post oak, winged elm, and yaupon.

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