Ecological site R083AY017TX
Blackland

Last updated: 9/19/2023
Accessed: 04/17/2026

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): 083A–Northern Rio Grande Plain

This area is entirely in Texas and south of San Antonio. It makes up about 11,115 square miles (28,805 square kilometers). The towns of Uvalde, Cotulla, and Hondo are in the western part of the area, and Beeville, Goliad, and Kenedy are in the eastern part. The town of Alice is just outside the southern edge of the area. Interstate Highways 35 and 37 cross this area. This area is comprised of inland, dissected coastal plains.

Classification relationships

USDA-Natural Resources Conservation Service, 2006. -Major Land Resource Area (MLRA) 83A

Ecological site concept

The Blackland ecological site shows an intact grass community with small clumped dispersal of woody species. The soils are moderately deep to very deep, richly black in color, and characterized by their shrink-swell nature. The sites are widely distributed across the uplands and terraces throughout the region.

Associated sites

R083AY002TX	Shallow Ridge
R083AY005TX	Shallow
R083AY024TX	Tight Sandy Loam
R083AY016TX	Saline Clay Loam
R083AY019TX	Gray Sandy Loam

Similar sites

R083BY017TX	**Blackland**
R083CY017TX	**Blackland**

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Schizachyrium scoparium* (2) *Sorghastrum nutans*

Physiographic features

The Blackland site was formed by calcareous, clayey residuum. The site features are found as a gilgai effect on the interfluves of the Coastal Plains. Slopes range from 0 to 5 percent, but are mainly less than 1 percent. Runoff rate is slow to high depending upon the slope. Elevation ranges from 200 to 1,000 feet. This area is comprised of inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Interfluve (2) Coastal plain > Ridge
Runoff class	Negligible to very high
Flooding frequency	None
Ponding frequency	None
Elevation	60 – 310 m
Slope	0 %
Aspect	Aspect is not a significant factor

Climatic features

MLRA 83A is subtropical, subhumid on the western boundary and subtropical humid on the eastern boundary. Winters are dry and mild and the summers are hot and humid. Tropical maritime air masses predominate throughout spring, summer, and fall. Modified polar air masses exert considerable influence during winter, creating a continental climate characterized by large variations in temperature. Average precipitation for MLRA 83A is 20 inches on the western boundary and 35 inches on the eastern boundary. Peak rainfall, because of rain showers, occurs late in spring and a secondary peak occurs early in fall. Heavy thunderstorm activities increase in April, May, and June. July is hot and dry with little weather variations. Rainfall increases again in late August and September as tropical

disturbances increase and become more frequent. Tropical air masses from the Gulf of Mexico dominate during the spring, summer, and fall. Prevailing winds are southerly to southeasterly throughout the year except in December when winds are predominately northerly.

Table 3 Representative climatic features

Frost-free period (characteristic range)	220-250 days
Freeze-free period (characteristic range)	260-370 days
Precipitation total (characteristic range)	640-810 mm
Frost-free period (actual range)	210-260 days
Freeze-free period (actual range)	250-370 days
Precipitation total (actual range)	610-940 mm
Frost-free period (average)	240 days
Freeze-free period (average)	310 days
Precipitation total (average)	740 mm

- (1) CHARLOTTE 5 NNW [USC00411663], Charlotte, TX
- (2) PEARSALL [USC00416879], Pearsall, TX
- (3) CHEAPSIDE [USC00411671], Gonzales, TX
- (4) CROSS [USC00412125], Tilden, TX
- (5) FOWLERTON [USC00413299], Fowlerton, TX
- (6) HONDO [USC00414254], Hondo, TX
- (7) NIXON [USC00416368], Stockdale, TX
- (8) POTEET [USC00417215], Poteet, TX
- (9) CARRIZO SPRINGS 3W [USC00411486], Carrizo Springs, TX
- (10) DILLEY [USC00412458], Dilley, TX
- (11) FLORESVILLE [USC00413201], Floresville, TX
- (12) KARNES CITY 2N [USC00414696], Karnes City, TX
- (13) LYTLE 3W [USC00415454], Natalia, TX
- (14) MATHIS 4 SSW [USC00415661], Mathis, TX
- (15) PLEASANTON [USC00417111], Pleasanton, TX
- (16) UVALDE 3 SW [USC00419268], Uvalde, TX
- (17) HONDO MUNI AP [USW00012962], Hondo, TX
- (18) BEEVILLE 5 NE [USC00410639], Beeville, TX
- (19) CUERO [USC00412173], Cuero, TX
- (20) GOLIAD [USC00413618], Goliad, TX
- (21) TILDEN 4 SSE [USC00419031], Tilden, TX
- (22) CALLIHAM [USC00411337], Calliham, TX

Influencing water features

Water enters the soil rapidly when it is dry and cracked, and very slowly when it is wet and sealed. The site does not have a water table near the surface. No ponding or flooding is expected.

Wetland description

N/A

Soil features

This Blackland site consists of very deep, moderately well to well drained, very slowly permeable, slightly acid to moderately alkaline soils. Soils were formed in clayey alluvium or residuum from limestone and shale. Undisturbed areas exhibit a more noticeable gilgai micro-relief. Soil series correlated to this site include: Denhawken, Elmendorf, Eloso, Leemont, Kincheloe, Monteola, Rosenbrock, and Tordia.

Table 4. Representative soil features

Parent material	(1) Residuum – sedimentary rock
Surface texture	(1) Clay (2) Clay loam (3) Sandy clay loam
Family particle size	(1) Fine
Drainage class	Somewhat poorly drained to well drained
Permeability class	Very slow
Soil depth	200 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.16 – 17.78 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	6.6 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The reference state of the Blackland site in MLRA 83A was a stable, tall and midgrass prairie that was in dynamic equilibrium with the ecological forces that formed the site. The ecological drivers which shaped this community included grazing by native wild herbivores, natural and anthropogenic fire, and periodic drought and wet cycles. Bison were the primary large ungulates that grazed the site but companion species included antelope and whitetail deer. The typical bison grazing pattern was short but very intense followed by total deferment from grazing animals until bison herds migrated back into the area (Edward 1836; Tharp 1926). Long deferments allowed the tallgrasses time to recover carbohydrate reserves and produce a seed crop. A fire regime and frequency of three to eight years was likely and was a more important factor in shaping this prairie than was grazing (Lehmann 1965).

The reference state for this site is a true grassland prairie dominated by tall and midgrasses. (Bailey 1905; Edward 1836; Foster 1998; Tharp 1926). Major grass species included little bluestem (Schizachyrium scoparium), yellow Indiangrass (Sorghastrum nutans), Arizona cottontop (Digitaria californica), four-flower trichloris (Trichloris pluriflora), and sideoats grama (Bouteloua curtipendula). Other grasses occurring in smaller amounts included vine mesquite (Panicum obtusum), silver bluestem (Bothriochloa laguroides), and plains bristlegrass (Setaria leucopila). Perennial forbs included sensitivebriar (Mimosa spp.), bundleflower (Desmanthus spp.), snoutbean (Rhynchosia spp.), and gayfeather (Liatris spp.). Little bluestem decreases in amount and is partly replaced in the reference community by cane bluestem (Bothriochloa barbinodis) and four-flower trichloris in the southern and western edges of this site. Annual forbs occurred on this site in relatively high numbers in wet years and following intense grazing events by bison. Woody plants were nearly excluded from this site by competition from grasses and periodic intense fires (Olmsted 1857; Stiles 1906). It should be noted however that some early accounts of this area showed a variable scattering of mesquite (Prosopis glandulosa), liveoak (Quercus virginiana), and hackberry (Celtis spp.) trees across the landscape. This is in keeping with the definition of true prairie which allows some large trees to be present but not enough to be termed savannah. The microhighs and microlows (gilgai micro-relief) on this site contribute to the diverse plant community. The microhighs are slightly drier and the microlows slightly wetter. More wet-tolerant vegetation grows on the lower portions of the site while less wet-tolerant vegetation grows on the slightly higher portions of the site.

With the introduction of wild longhorn cattle in the late 1700’s and domestic cattle in the 1820’s, an era of heavy grazing began. During the Spanish Mission era of the 1600 to 1700’s in the San Antonio, Refugio, and Goliad areas, vast herds of cattle, horses, sheep, and goats were used for meat production for the missions. With no fences, these were vast free-roaming herds, which were not always closely managed. Some portion of these herds took the place of bison in the animal community once the bison herds were eliminated. This heavy grazing was exacerbated with the introduction of barbed wire and windmills in the 1880’s. Excessive grazing reduced or eliminated the tallgrass component of the grassland state, such as yellow Indiangrass and Arizona cottontop and some midgrasses like little bluestem and sideoats grama. As the site deteriorated, species such as silver bluestem, knotroot bristlegrass (Setaria parviflora), shortspike windmillgrass (Chloris subdolichostachya), and other shorter-statured species, such as plains bristlegrass and paspalum species, increased.

As the tall and midgrasses decreased in composition and biomass production decreased, fuel for fires decreased as well, resulting in less frequent and lower intensity fires. Continued overuse of the site by livestock and the cessation of fire allowed woody plants to invade. These woody pioneers included mesquite, huisache (Acacia farnesiana), and eastern baccharis (Baccharis halamifolia). The shrink-swell and soil cracking characteristics of the Blackland soils favor brush species with tolerance for soil movement. There was also an increase in annual weeds and shortgrasses such as western ragweed (Ambrosia psilostachya), annual broomweed (Amphiachyris amoena), threeawn (Aristida spp.), Texas wintergrass (Nassella leucotricha), and whorled dropseed (Sporobolus pyramidatus).

Introduced, invasive grass species are common on this site and will invade deteriorated or overutilized sites. They can also increase following episodic weather conditions which allow them to colonize open spaces. Introduced bluestems such as King Ranch bluestem (Bothriochloa ischaemum), Kleberg bluestem (Dichanthium annualatum), and other Old World bluestems are some of the most common introduced grasses. These plants are highly adapted to this area and are highly productive. However, these invasive plants can become a monoculture and reduce the native vegetation component of a site. The site is still able to function from a production standpoint, but once a herbaceous invasive plant has established or naturalized to a site, controlling it becomes highly unlikely and overall plant diversity might decrease. In those cases where aggressive introduced species have dominated, fires may be more intense than historic fires.

As thresholds from tall/midgrass prairie to tree/shrubland complex are crossed, changes have occurred which impact plant composition, biomass production, litter accumulation, and water infiltration and storage. These changes impact other natural ecological functions such as frequency and intensity of fire. The result has been conversion of this Blackland site from a true prairie to wooded grassland to a tree/shrub complex. In the heavily wooded state, total canopy cover may exceed 100 percent because of varying heights and multiple layers of woody species.

The resulting increase in woody cover signifies that thresholds have been crossed. Once these thresholds are crossed, restoration back to the reference plant community becomes much more difficult and expensive. Even though the reference plant community may be restored through the use of a combination of practices such as mechanical and herbicidal brush management, planned grazing, and fire, this grassland community cannot be maintained without the continuous use of these tools on a frequent basis (Scifres 1975).

State and transition model

Figure 7. STM

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Grass/Grasslike					
1	**Perennial Tall/Midgrasses**			1905-2774	
	little bluestem	SCSC	*Schizachyrium scoparium*	1905-2774	–
	Indiangrass	SONU2	*Sorghastrum nutans*	1905-2774	–
	multiflower false Rhodes grass	TRPL3	*Trichloris pluriflora*	1905-2774	–
2	**Perennial Midgrasses**			639-925	
	Indiangrass	SONU2	*Sorghastrum nutans*	1905-2774	–
	little bluestem	SCSC	*Schizachyrium scoparium*	1905-2774	–
	alkali sacaton	SPAI	*Sporobolus airoides*	0-925	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	639-925	–
	silver beardgrass	BOLA2	*Bothriochloa laguroides*	639-925	–
	Arizona cottontop	DICA8	*Digitaria californica*	639-925	–
	Texas cupgrass	ERSE5	*Eriochloa sericea*	426-616	–
	streambed bristlegrass	SELE6	*Setaria leucopila*	426-616	–
	vine mesquite	PAOB	*Panicum obtusum*	426-616	–
	white tridens	TRAL2	*Tridens albescens*	213-308	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	213-308	–
	pink pappusgrass	PABI2	*Pappophorum bicolor*	213-308	–
3	**Perennial Shortgrasses**			426-616	
	buffalograss	BODA2	*Bouteloua dactyloides*	426-616	–
	curly-mesquite	HIBE	*Hilaria belangeri*	426-616	–
4	**Cool Season Grasses**			426-616	
	Texas wintergrass	NALE3	*Nassella leucotricha*	426-616	–
	Scribner's rosette grass	DIOLS	*Dichanthelium oligosanthes var. scribnerianum*	213-308	–
	Virginia wildrye	ELVI3	*Elymus virginicus*	213-308	–
Forb					

5	**Forbs**			213-308	
	Forb, annual	2FA	*Forb, annual*	213-308	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	213-308	–
	Illinois bundleflower	DEIL	*Desmanthus illinoensis*	213-308	–
	snow on the prairie	EUBI2	*Euphorbia bicolor*	213-308	–
	Maximilian sunflower	HEMA2	*Helianthus maximiliani*	213-308	–
	coastal indigo	INMI	*Indigofera miniata*	213-308	–
	dotted blazing star	LIPU	*Liatris punctata*	213-308	–
	yellow puff	NELU2	*Neptunia lutea*	213-308	–
	fogfruit	PHYLA	*Phyla*	213-308	–
	upright prairie coneflower	RACO3	*Ratibida columnifera*	213-308	–
	American snoutbean	RHAM	*Rhynchosia americana*	213-308	–
	bushsunflower	SIMSI	*Simsia*	213-308	–
	silverleaf nightshade	SOEL	*Solanum elaeagnifolium*	213-308	–
Tree					
6	**Trees/Shrubs**			0-84	
	sweet acacia	ACFA	*Acacia farnesiana*	0-62	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0-62	–
	hackberry	CELTI	*Celtis*	0-62	–
	honey mesquite	PRGLG	*Prosopis glandulosa var. glandulosa*	0-62	–
	live oak	QUVI	*Quercus virginiana*	0-62	–

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 (%)

Table 9. Community 3.1 plant community composition

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

Table 10. Community 3.2 plant community composition

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

Animal community

As a historic tall/midgrass prairie, this site was occupied by bison, antelope, deer, quail, turkey, and dove. This site was also used by many species of grassland songbirds, migratory waterfowl, and coyotes. This site now provides forage for livestock and is still used by quail, dove, migratory waterfowl, grassland birds, coyotes, and deer. Feral hogs (Sus scrofa) can be found on most ecological sites in Texas. Damage caused by feral hogs each year includes, crop damage by rutting up crops, destroyed fences, livestock watering areas, and predation on native wildlife, and ground-nesting birds. Feral hogs have few natural predators, thus allowing their population to grow to high numbers. Wildlife habitat is a complex of many different plant communities and ecological sites across the landscape. Most animals use the landscape differently to find food, shelter, protection, and mates. Working on a conservation plan for the whole property, with a local professional, will help managers make the decisions that allow them to realize their goals for wildlife and livestock. Grassland State (1): This state provides the maximum amount of forage for livestock such as cattle. It is also utilized by deer, quail and other birds as a source of food. When a site is in the reference plant community phase (1.1) it will also be used by some birds for nesting, if other habitat requirements like thermal and escape cover are near. Tree/Shrubland Complex (2): This state can be maintained to meet the habitat requirements of cattle and wildlife. Land managers can find a balance that meets their goals and allows them flexibility to manage for livestock and wildlife. Forbs for deer and birds like quail will be more plentiful in this state. There will also be more trees and shrubs to

provide thermal and escape cover for birds as well as cover for deer. Converted Land State (3): The quality of wildlife habitat this site will produce is extremely variable and is influenced greatly by the timing of rain events. This state is often manipulated to meet landowner goals. If livestock production is the main goal, it can be converted to pastureland. It can also be planted to a mix of grasses and forbs that will benefit both livestock and wildlife. A mix of forbs in the pasture could attract pollinators, birds and other types of wildlife. Food plots can also be planted to provide extra nutrition for deer. This rating system provides general guidance as to animal preference for plant species. It also indicates possible competition between kinds of herbivores for various plants. Grazing preference changes from time to time, especially between seasons, and between animal kinds and classes. Grazing preference does not necessarily reflect the ecological status of the plant within the plant community. For wildlife, plant preferences for food and plant suitability for cover are rated. Refer to habitat guides for a more complete description of a species habitat needs.

Hydrological functions

Peak rainfall periods occur in May and June from thunderstorms and in September and October from tropical systems. Rainfall events may be high (3 to 5 inches per event) and intense. Extended periods (45 to 60 days) of little to no rainfall during the growing season are common. Because of the flat topography of this site, erosion is minimal however, on more sloping aspects (greater than 3 percent), erosion may be very significant. This site provides little water for aquifer recharge because when wet, infiltration is very slow.

Recreational uses

Hunting and photography are common uses.

Wood products

In the Grassland State, no wood products are available. In a Tree/Shrubland Complex State, the site may grow large numbers of large mesquite trees and these are often cut for firewood and barbecue wood.

Other products

Landowners have the opportunity to explore the many facets of ecotourism, and the potential of the natural resources of their property, to create value from their land.

Inventory data references

Information presented was derived from the revised Range Site, literature, limited NRCS clipping data (417s), field observations, and personal contacts with range-trained personnel.

Other references

AgriLife. 2009. Managing Feral Hogs Not a One-shot Endeavor. AgNews, April 23, 2009. http://agnews.tamu.edu/showstory.php?id=903.

Archer, S. 1995. Herbivore mediation of grass-woody plant interactions. Tropical Grasslands, 29:218-235.

Archer, S. 1995. Tree-grass dynamics in a Prosopis-thornscrub savanna parkland: reconstructing the past and predicting the future. Ecoscience, 2:83-99.

Archer, S. 1994. Woody plant encroachment into southwestern grasslands and savannas: rates, patterns and proximate causes. Ecological implications of livestock herbivory in the West, 13-68.

Archer, S. and F. E. Smeins. 1991. Ecosystem-level Processes. In Grazing Management: An Ecological Perspective. Edited by R.K. Heischmidt and J.W. Stuth. Timber Press, Portland, OR.

Baen, J. S. 1997. The growing importance and value implications of recreational hunting leases to agricultural land investors. Journal of Real Estate Research, 14:399-414.

Bailey, V. 1905. North American Fauna No. 25: Biological Survey of Texas. United States Department of Agriculture Biological Survey. Government Printing Office, Washington D. C.

Bestelmeyer, B. T., J.R. Brown, K. M. Havstad, R. Alexander, G. Chavez, and J. E. Herrick. 2003. Development and use of state-and-transition models for rangelands. Journal of Range Management, 56(2):114-126.

Box, T. W. 1960. Herbage production on four range plant communities in South Texas. Journal of Range Management, 13:72-76.

Briske, B B, B. T. Bestelmeyer, T. K. Stringham, and P. L. Shaver. 2008. Recommendations for development of resilience-based State-

and-Transition Models. Rangeland Ecology and Management, 61:359-367.

Brown, J. R. and S. Archer. 1999. Shrub invasion of grassland: recruitment is continuous and not regulated by herbaceous biomass or density. Ecology, 80(7):2385-2396.

Diamond, D. D. and T. E. Fulbright. 1990. Contemporary plant communities of upland grasslands of the Coastal Sand Plain, Texas. Southwestern Naturalist, 35:385-392.

Dillehay T. 1974. Late quaternary bison population changes on the Southern Plains. Plains Anthropologist, 19:180-96.

Edward, D. B. 1836. The history of Texas; or, the immigrants, farmers, and politicians guide to the character, climate, soil and production of that country. Geographically arranged from personal observation and experience. J. A. James and Co., Cincinnati, OH.

Everitt, J. H., D. L. Drawe, and R. I. Leonard. 2002. Trees, Shrubs, and Cacti of South Texas. Texas Tech University Press, Lubbock, TX.

Everitt, J. H., D. L. Drawe, and R. I. Lonard. 1999. Field Guide to the Broad-Leaved Herbaceous Plants of South Texas. Texas Tech University Press. Lubbock, TX.

Foster, J. H. 1917. Pre-settlement fire frequency regions of the United States: a first approximation. Tall Timbers Fire Ecology Conference Proceedings No. 20.

Foster, W. C., ed. 1998. The La Salle Expedition to Texas: The Journal of Henry Joutel, 1684-1687. Texas State Historical Association, Austin, TX.

Frost, C. C. 1995. Presettlement fire regimes in southeastern marshes, peatlands, and swamps. In: Prodeedings, 19th Tall Timbers fire ecology conference, 39-60. Tall Timbers Research Station, Tallahassee, FL.

Fulbright, T. E. and S. L. Beasom. 1987. Long-term effects of mechanical treatment on white-tailed deer browse. Wildlife Society Bulletin, 15:560-564.

Fulbright, T. E., J. A. Ortega-Santos, A. Lozano-Cavazos, and L. E. Ramirez-Yanez. 2006. Establishing vegetation on migrating inland sand dunes in Texas. Rangeland Ecology and Management, 59:549-556.

Fulbright, T. E., D. D. Diamond, J. Rappole, and J. Norwine. The Coastal Sand Plain of Southern Texas. Rangelands, 12:337-340.

Gould, F. W. 1975. The Grasses of Texas. Texas A&M University Press, College Station, TX.

Grace, J. B., L. K. Allain, H. Q. Baldwin, A. G. Billock, W. R. Eddleman, A. M. Given, C. W. Jeske, and R. Moss. 2005. Effects of prescribed fire in the coastal prairies of Texas. USGS Open File Report 2005-1287.

Hamilton, W. and D. Ueckert. 2005. Rangeland Woody Plant Control: Past, Present, and Future. In: Brush Management: Past, Present, and Future, 3-16. Texas A&M University Press. College Station, TX.

Hansmire, J. A., D. L. Drawe, B. B. Wester and C.M. Britton. 1988. Effect of winter burns on forbs and grasses of the Texas Coastal Prairie. The Southwestern Naturalist, 33(3):333-338.

Heitschmidt R. K., Stuth J. W., eds. 1991. Grazing management: an ecological perspective. Timberline Press, Portland, OR.

Inglis, J. M. 1964. A history of vegetation of the Rio Grande Plains. Texas Parks and Wildlife Department Bulletin No. 45, Austin, TX.

Kneuper, C. L., C. B. Scott, and W. E. Pinchak. 2003. Consumption and dispersion of mesquite seeds by ruminants. Journal of Range Management, 56:255-259.

Kramp, B., R. Ansley, and D. Jones. 1998. Effect of prescribed fire on mesquite seedlings. Texas Tech University Research Highlights - Range, Wildlife and Fisheries Management, 29:13.

Le Houerou, H. N. and J. Norwine. 1988. The ecoclimatology of South Texas. In Arid lands: today and tomorrow. Edited by E. E. Whitehead, C. F. Hutchinson, B. N. Timmesman, and R. G. Varady, 417-444. Westview Press, Boulder, CO.

Lehman, V. W. 1965. Fire in the range of Attwater's prairie chicken. Tall Timbers Fire Ecology Conference, 4:127-143.

Lehman, V. W. 1969. Forgotten Legions: Sheep in the Rio Grande Plain of Texas. Texas Western Press, El Paso, TX.

Mann, C. 2004. 1491. New Revelations of the Americas before Columbus. Vintage Books, New York City, NY.

Mapston, M. E. 2009. Feral Hogs in Texas. Rep. Texas Cooperative Extension. 23 Apr. 2009 http://icwdm.org/Publications/pdf/Feral%20Pig/Txferalhogs.pdf

McClendon, T. 1991. Preliminary description of the vegetation of South Texas exclusive of the Coastal Saline Zones. Texas Journal of Science, 43:13-32.

McGinty A., D. N. Ueckert. 2001. The Brush Busters success story. Rangelands, 23:3-8.

McLendon, T. 1991. Preliminary description of the vegetation of south Texas exclusive of coastal saline zones. Texas Journal of Science, 43:13-32.

Norwine, J. 1978. Twentieth-century semiarid climates and climatic fluctuations in Texas and northeastern Mexico. Journal of Arid Environments, 1:313-325.

Norwine, J. and R. Bingham. 1986. Frequency and severity of droughts in South Texas: 1900-1983, 1-17. In Livestock and wildlife management during drought. Edited by R. D. Brown. Caesar Kleberg Wildlife Research Institute, Kingsville, TX.

Olmsted, F. L. 1857. A journey through Texas, or a saddle trip on the Southwest frontier: with a statistical appendix. Dix, Edwards, and co., New York, London.

Prichard, D. 1998. A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lentic Areas. Bureau of Land Management. National Applied Resource Sciences Center, CO.

Rappole, J. H. and G. W. Blacklock. 1994. A field guide: Birds of Texas. Texas A&M University Press, College Station, TX.

Rhyne, M. Z. 1998. Optimization of wildlife and recreation earnings for private landowners. M. S. Thesis, Texas A&M University-Kingsville, Kingsville, TX.

Schindler, J. R. and T. E. Fulbright. 2003. Roller chopping effects on Tamaulipan scrub community composition. Journal of Range Management, 56:585-590.

Schmidley, D. J. 1983. Texas mammals east of the Balcones Fault zone. Texas A&M University Press, College Station, TX.

Scifres C. J., W. T. Hamilton, J. R. Conner, J. M. Inglis, and G. A. Rasmussen. 1985. Integrated Brush Management Systems for South Texas: Development and Implementation. Texas Agricultural Experiment Station, College Station, TX.

Scifres, C. J. and W. T. Hamilton. 1993. Prescribed burning for brushland management: the South Texas example. Texas A&M Press, College Station, TX.

Scifres, C. J. 1975. Systems for improving McCartney rose infested coastal prairie rangeland. Texas Agricultural Experiment Station Bulletin MP 1225.

Smeins, F. E., S. Fuhlendorf, and C. Taylor, Jr. 1997. Environmental and Land Use Changes: A Long Term Perspective. In Juniper Symposium, 1-21. Texas Agricultural Experiment Station.

Smeins, F. E., D. D. Diamond, and W. Hanselka. 1991. Coastal prairie, 269-290. In Ecosystems of the World: Natural Grasslands. Edited by R. T. Coupland. Elsevier Press, Amsterdam, Netherlands.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database.

Snyder, R. A. and C. L. Boss. 2002. Recovery and stability in barrier island plant communities. Journal of Coastal Research, 18:530-536.

Stiles, H. R., ed. 1906. Joutel's journal of La Salle's last voyage, 1686-1687. Joseph McDonough, Albany, NY.

Stringham, T. K., W. C. Krueger, and P. L. Shaver. 2001. State and transition modeling: and ecological process approach. Journal of Range Management, 56(2):106-113.

Texas A&M Research and Extension Center. 2000. Native Plants of South Texas http://uvalde.tamu.edu/herbarium/index.html.

Texas Agriculture Experiment Station. 2007. Benny Simpson's Texas Native Trees http://aggie-horticulture.tamu.edu/ornamentals/natives/.

Texas Parks and Wildlife Department. 2007. List of White-tailed Deer Browse and Ratings. District 8.

Tharp, B. C. 1926. Structure of Texas Vegetation east of the 98th meridian. Bulletin 2606. University of Texas, Austin. TX.

Thurow, T. L. 1991. Hydrology and Erosion. In: Grazing Management: An Ecological Perspective. Edited by R.K. Heitschmidt and J.W. Stuth. Timber Press, Portland, OR.

Urbatsch, L. 2000. Chinese tallow tree (Triadica sebifera (L.) Small. USDA-NRCS Plant Guide.

USDA-NRCS Plant Database. 2018. https://plants.usda.gov/.

Van't Hul, J. T., R. S. Lutz and N. E. Mathews. 1997. Impact of prescribed burning on vegetation and bird abundance on Matagorda Island, Texas. Journal of Range Management, 50:346-360.

Vines, R. A. 1984. Trees of Central Texas. University of Texas Press, Austin, TX.

Wade, D. D., B. L. Brock, P. H. Brose, J. B. Grace, G. A. Hoch, and W. A. Patterson III. 2000. Fire in Eastern ecosystems. In Wildland fire in ecosystems: effects of fire on flora. Edited by. J. K. Brown and J. Kaplers. United States Forest Service, Rocky Mountain Research Station, Ogden, UT.

Weltz, M. A. and W. H. Blackburn. 1995. Water budget for south Texas rangelands. Journal of Range Management, 48:45-52.

Whittaker, R. H., L. E. Gilbert, and J. H. Connell. 1979. Analysis of a two-phase pattern in a mesquite grassland, Texas. Journal of Ecology, 67:935-52.

Wright, B. D., R. K. Lyons, J. C. Cathey, and S. Cooper. 2002. White-tailed deer browse preferences for South Texas and the Edwards Plateau. Texas Cooperative Extension Bulletin B-6130.

Wright, H.A. and A.W. Bailey. 1982. Fire Ecology: United States and Southern Canada. John Wiley & Sons, Inc., Hoboken, NJ.

Approval

Bryan Christensen, 9/19/2023

Acknowledgments

Technical reviewers and contributors include: Jason Hohlt, RMS, NRCS, Kingsville, Texas Tim Reinke, RMS, NRCS, Victoria, Texas Clark Harshbarger, RSS, NRCS, Robstown, Texas Shanna Dunn, RSS, NRCS, Corpus Christi, Texas Harvey Kahlden, Karnes SWCD, Kenedy, Texas Ann Graham, Editor, Temple, Texas

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)	David Hinojosa, RMS, NRCS, Robstown, TX
Contact for lead author	(361) 241-0609
Date	08/08/2011
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:** Few water flow patterns are normal for this site due to landscape position and slopes.

3. **Number and height of erosional pedestals or terracettes:** Pedestals would have been uncommon for this site.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Less than five percent bare ground.

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

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

7. **Amount of litter movement (describe size and distance expected to travel):** Small-to-medium sized litter may move short distances during intense storms.

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 4 to 6.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface struture is 10 to 60 inches thick with colors ranging from black to dark grayish brown with subangular blocky structure. Soil organic matter is one to six percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** A high canopy cover of bunch, rhizomatous, and stoliniferous grasses will help minimize runoff and maximize infiltration. Grasses and forbs should comprise approximately 90 percent of total plant compostion by weight. Trees and shrubs will comprise about 10 percent by weight.

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: Perennial Tall/Midgrasses >> Perennial Midgrasses >>

    Sub-dominant: Perennial Shortgrasses> Forbs > Cool Season grasses>> Trees/Shrubs

    Other:

    Additional:

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **Little apparent mortality or decadence for any functional groups.**

---

14. **Average percent litter cover (%) and depth (in):**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **4,000 to 5,500 pounds per acre.**

---

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

---

17. **Perennial plant reproductive capability:** **All species should be capable of reproducing.**
