Ecological site R083AY024TX
Tight Sandy Loam

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 Tight Sandy Loam ecological sites typically have fine sandy loam and very fine sandy loam surface textures. Tight refers to the sandy clay or clay subsoil that begins about 10 inches below the surface.

Associated sites

R083AY002TX	**Shallow Ridge**
R083AY019TX	**Gray Sandy Loam**
R083AY003TX	**Gravelly Ridge**
R083AY005TX	**Shallow**
R083AY008TX	**Salty Prairie**
R083AY010TX	**Vega**

R083AY016TX	**Saline Clay Loam**
R083AY017TX	**Blackland**
R083AY021TX	**Sandy**
R083AY022TX	**Loamy Sand**
R083AY023TX	**Sandy Loam**

Similar sites

R083CY024TX	**Tight Sandy Loam**
R083DY024TX	**Tight Sandy Loam**
R083EY024TX	**Tight Sandy Loam**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Aloysia gratissima* (2) *Celtis ehrenbergiana*
Herbaceous	(1) *Pappophorum bicolor* (2) *Schizachyrium scoparium*

Physiographic features

These nearly level to gently sloping soils are on broad stream terraces, ridges and interfluves of the Coastal Prairie. These soils were formed in loamy and clayey sediments of the Pleistocene and Pliocene ages. Slopes range from 0 to 5 percent but are mainly less than 3 percent. 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 > Stream terrace (2) Coastal plain > Ridge (3) Coastal plain > Interfluve
Runoff class	Negligible to high
Elevation	20 – 310 m
Slope	0 – 10 %
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) CARRIZO SPRINGS 3W [USC00411486], Carrizo Springs, TX
- (2) CUERO [USC00412173], Cuero, TX
- (3) HONDO [USC00414254], Hondo, TX
- (4) KARNES CITY 2N [USC00414696], Karnes City, TX
- (5) MATHIS 4 SSW [USC00415661], Mathis, TX
- (6) NIXON [USC00416368], Stockdale, TX
- (7) UVALDE 3 SW [USC00419268], Uvalde, TX
- (8) BEEVILLE 5 NE [USC00410639], Beeville, TX
- (9) GOLIAD [USC00413618], Goliad, TX
- (10) LYTLE 3W [USC00415454], Natalia, TX
- (11) HONDO MUNI AP [USW00012962], Hondo, TX
- (12) CHEAPSIDE [USC00411671], Gonzales, TX
- (13) DILLEY [USC00412458], Dilley, TX
- (14) FLORESVILLE [USC00413201], Floresville, TX
- (15) PLEASANTON [USC00417111], Pleasanton, TX
- (16) CHARLOTTE 5 NNW [USC00411663], Charlotte, TX
- (17) CROSS [USC00412125], Tilden, TX
- (18) FOWLERTON [USC00413299], Fowlerton, TX
- (19) PEARSALL [USC00416879], Pearsall, TX
- (20) POTEET [USC00417215], Poteet, TX
- (21) TILDEN 4 SSE [USC00419031], Tilden, TX
- (22) CALLIHAM [USC00411337], Calliham, TX

Influencing water features

Water enters the surface rapidly but perches on top of the argillic for brief periods.

Wetland description

N/A

Soil features

The soils of this site are moderately deep to very deep, moderately well to well drained, moderately slowly to very slowly permeable, and strongly acid to slightly alkaline. A typical pedon will exhibit an ochric epipedon, an argillic horizon beginning at 10 inches and depth to secondary carbonates ranging from 28 to 40 inches. The texture of the top of the argillic is sandy clay or clay. Some pedons may include elevated levels of sodium in the argillic. Soil series correlated to this site include: Ander, Batesville, Bryde, Czar, Floresville, Gillett, Griter, Miguel, Papalote, and Webb.

Table 4. Representative soil features

Parent material	(1) Residuum – sedimentary rock (2) Alluvium – sedimentary rock
Surface texture	(1) Fine sandy loam (2) Very fine sandy loam (3) Sandy clay loam
Family particle size	(1) Fine (2) Fine-loamy
Drainage class	Moderately well drained to well drained

Permeability class	Very slow to moderately slow
Soil depth	50 – 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 – 10 %
Electrical conductivity (0-101.6cm)	0 – 10 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0 – 10
Soil reaction (1:1 water) (0-101.6cm)	5.1 – 8.4
Subsurface fragment volume <=3" (Depth not specified)	0 – 10 %
Subsurface fragment volume >3" (Depth not specified)	Not specified

Ecological dynamics

The Tight Sandy Loam ecological site of the Northern Rio Grande Plain MLRA was a fire-influenced Midgrass Plant Community, interspersed with occasional perennial forbs and woody species. Improper grazing management will result in a reduction of midgrass dominance and an increase in composition of shortgrasses, unpalatable forbs, and woody species. Lack of brush control will result in shift in composition until shrubs dominate and reach a near closed canopy shrubland.

The climate experienced by this site is highly variable, particularly with respect to annual rainfall and winter temperatures. Part of this variation reflects the influence of infrequent, large rainfall events associated with tropical storms or hurricanes that inflate annual rainfall means. Because much of the water delivered in such events is lost as runoff, the site is drier than mean annual rainfall data would suggest. In addition, drought is a common occurrence. Freezing temperatures occur in many winters, but frosts are usually mild and of short duration. However, infrequent bouts of severe frost do occur. The effects on vegetation are not well documented, but observations

indicate woody plants such as spiny hackberry (Celtis pallida) and lime pricklyash/colima (Zanthoxylum fagara) may experience substantial top-kill. Although hard freezes and severe drought may occur relatively infrequently, their effects may influence vegetation composition and productivity in ensuing years and magnify the effects of grazing and fire.

Climatic variation and topographic variability interact to influence vegetation responses to disturbances such as fire and grazing. Plants of the reference plant community evolved with and are generally well adapted to grazing and fire. Prior to European settlement, fires would likely have been frequent (approximately every 3 to 10 years) (Scifres and Hamilton 1993). These fires would have resulted from lightening during the hot, dry summer months or were set by Native Americans during other times of the year for various purposes. The fires promoted grasses while making it difficult for woody plants to achieve dominance. During the Pleistocene, significant populations of large-bodied grazers and browsers existed. Most of these went extinct, so that by the Holocene (about 10,000 years ago), only bison (Bos bison), white-tailed deer (Odocoileus virginianus), and antelope (Antilocarpa americana) remained. Archeological evidence indicates that bison occurred in the region, but there is also evidence of centuries of absence (Dillehay 1974). In addition, their numbers may have varied seasonally as herds migrated. When present, bison may have grazed certain areas heavily and then moved on. Activities of other native herbivores (termites, cutter ants, soil nematodes, kangaroo rats) also influenced vegetation productivity and dynamics. Presently, sites are largely grazed by cattle, sheep, and goats.

Accounts of earlier explorers and settlers suggest the Rio Grande Plains was likely a mosaic of grassland, savannah, shrubland, and woodland. Historical photographs show the nature of the vegetation structure then, as now, likely varied from place to place depending on topography, soil properties, and time since the last major disturbances. Grasses dominating Tight Sandy Loam uplands at the time of European settlement likely include little bluestem (Schizachyrium scoparium), false Rhodesgrass (Chloris crinita), multiflowered Rhodesgrass (Chloris pluriflora), Arizona cottontop (Digitaria californica), plains bristlegrass (Setaria macrostachya), and pink pappusgrass (Pappophorum bicolor). The composition and productivity of grass communities would have varied with annual rainfall, soil depth and the extent of argillic horizon development.

Grazing and fire are two factors that critically influence the relative abundance of grasses and woody plants through time. By the early 1800’s cattle and sheep numbers appear to have been quite high in the Rio Grande Plains, resulting in heavy, year-round grazing (Lehman 1969). The resulting reduction in abundance of late seral grasses lead to a decline in soil organic matter, a reduction in fire frequency/intensity (due to lack of fine fuels) and a shift from midgrass (e.g., multiflowered Chloris) domination to shortgrass (e.g., hooded windmillgrass (Chloris cucullata) and threeawn (Aristida spp.))/forb (e.g., orange zexmenia (Zexmenia hispida) and croton (Croton spp.) domination. These changes would have favored woody plants, most of which are unpalatable to livestock, and enabled them to establish and attain dominance. This would be especially true for leguminous shrubs such as mesquite, whose seeds are widely spread by livestock. This reduction of midgrasses and expansion of shortgrasses, along with concurrent suppression of fire, allowed woody plants to proliferate and eventually dominate the site. With their domination, they now captured the sunlight first and replaced the shortgrasses and remnant midgrasses. This indicates the site has crossed the threshold to the Shrubland State with a canopy of brush in excess of 20 percent.

The shift from grass to woody plant domination became the impetus for brush management practices. By the 1950’s, large-scale mechanized clearing was common and by the 1970’s, aerial herbicide applications were widespread. However, by the 1980’s it was clear that brush management practices were often treating symptoms rather than underlying problems and having undesirable environmental consequences, including adverse effects on wildlife populations (Fulbright and Beasom 1987). Sites cleared of brush regenerated rapidly and often formed thickets that were denser and of lower diversity than the original stands. This realization, coupled with the fact that brush management treatments were typically short-lived (owing to woody plant regeneration via sprouting or seeds), lead to the development of Integrated Brush Management Systems (IBMS) (Scifres et.al. 1985). The IBMS approach takes a holistic, large-scale, long-term, whole-firm, ecosystem-based approach to brush management and recognizes multiple-use options for rangeland resources. Shrublands developing on former grasslands have other potential socioeconomic values that should be considered when contemplating brush management. These include alternate classes of livestock, lease hunting, white-tailed deer (Odocoileus virginianus), exotic game ranching, and ecotourism.

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	**Warm-season midgrasses**			1345-3699	
	pink pappusgrass	PABI2	*Pappophorum bicolor*	841-2018	–
	little bluestem	SCSCS	*Schizachyrium scoparium var. scoparium*	841-2018	–
	large-spike bristlegrass	SEMA5	*Setaria macrostachya*	841-2018	–

	plains bristlegrass	SEVU2	*Setaria vulpiseta*	841-2018	–
	false Rhodes grass	TRCR9	*Trichloris crinita*	841-2018	–
	multiflower false Rhodes grass	TRPL3	*Trichloris pluriflora*	841-2018	–
	southwestern bristlegrass	SESC2	*Setaria scheelei*	560-1681	–
	silver beardgrass	BOLAT	*Bothriochloa laguroides ssp. torreyana*	560-1681	–
	Arizona cottontop	DICA8	*Digitaria californica*	560-1681	–
	plains lovegrass	ERIN	*Eragrostis intermedia*	673-1681	–
	tanglehead	HECO10	*Heteropogon contortus*	560-1681	–
	big sandbur	CEMY	*Cenchrus myosuroides*	448-1121	–
2	**Warm-season shortgrasses**			224-841	
	threeawn	ARIST	*Aristida*	196-448	–
	buffalograss	BODA2	*Bouteloua dactyloides*	196-448	–
	slender grama	BORE2	*Bouteloua repens*	196-448	–
	red grama	BOTR2	*Bouteloua trifida*	196-448	–
	hooded windmill grass	CHCU2	*Chloris cucullata*	196-448	–
	fall witchgrass	DICO6	*Digitaria cognata*	196-448	–
	curly-mesquite	HIBE	*Hilaria belangeri*	196-448	–
	Hall's panicgrass	PAHA	*Panicum hallii*	196-448	–
3	**Cool-season grasses**			56-280	
	Texas wintergrass	NALE3	*Nassella leucotricha*	56-280	–
4	**Grasslikes**			0-112	
	sedge	CAREX	*Carex*	39-95	–
Forb					
4	**Forbs**			112-280	
	Forb, annual	2FA	*Forb, annual*	84-224	–
	Cuman ragweed	AMPS	*Ambrosia psilostachya*	84-224	–
	white sagebrush	ARLUM2	*Artemisia ludoviciana ssp. mexicana*	84-224	–
	croton	CROTO	*Croton*	84-224	–
	bundleflower	DESMA	*Desmanthus*	84-224	–
	Engelmann's daisy	ENPE4	*Engelmannia peristenia*	84-224	–
	sensitive plant	MIMOS	*Mimosa*	84-224	–
	awnless bushsunflower	SICA7	*Simsia calva*	84-224	–
Shrub/Vine					
5	**Shrubs/Vines**			112-280	
	whitebrush	ALGR2	*Aloysia gratissima*	84-224	–
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	84-224	–
	snakewood	CONDA	*Condalia*	84-224	–
	Texan hogplum	COTE6	*Colubrina texensis*	84-224	–
	vine jointfir	EPPE	*Ephedra pedunculata*	84-224	–
	Texas lignum-vitae	GUAN	*Guaiacum angustifolium*	84-224	–
	pricklypear	OPUNT	*Opuntia*	84-224	–
	mesquite	PROSO	*Prosopis*	84-224	–
	oak	QUERC	*Quercus*	84-224	–
	desert yaupon	SCCU4	*Schaefferia cuneifolia*	84-224	–
	gum bully	SILAL3	*Sideroxylon lanuginosum ssp. lanuginosum*	56-168	–
	western soapberry	SASAD	*Sapindus saponaria var. drummondii*	56-168	–

	algerita	MATR3	*Mahonia trifoliolata*	56-168	–
	Texas kidneywood	EYTE	*Eysenhardtia texana*	56-168	–
	Texas persimmon	DITE3	*Diospyros texana*	56-168	–
	blackbrush acacia	ACRI	*Acacia rigidula*	56-168	–

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. Shrubland State (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

The Midgrass Community (1.1) water cycle functions well with good infiltration and deep percolation of rainfall. The water cycle functions best in the Midgrass Community (1.1) and degrades as the vegetation community declines. Rapid rainfall infiltration, high soil organic matter, and good soil structure and good porosity accompany high bunchgrass cover. Surface runoff quality will be high and erosion and sedimentation rates will be low. High rates of infiltration will allow water to move below the rooting zone during periods of heavy rainfall. Due to the accumulation of clay in the B-horizon, root growth and water movement is restricted from downward movement. This physical characteristic makes this site more drought prone that other sites, such as a similar Sandy Loam site. Overall, this site would have less available water in the soil profile, therefore reducing plant biomass production when compared to a similar Sandy Loam site. A shift to the Shortgrass Community (1.2) means reduced plant and litter cover, which impairs the water cycle. Infiltration will decrease and runoff will increase due to reduced ground cover, rainfall splash, soil capping, reduced organic matter, and poor structure. With a combination of a sparse ground cover and intensive rainfall, this site can contribute to an increased frequency and severity of flooding within a watershed. As soil erosion is accelerated the quality of surface runoff is poor and sedimentation increases. Domination of the site by woody species

further degrades the water cycle in the Shrubland State (2). Interception of rainfall by tree canopies increases, which reduces the amount reaching the surface for availability to understory plants. Increased stem flow, due to the funneling effect of the canopy, increases soil moisture at the base of trees, especially on mesquite. Increases in woody canopy create declines in grass cover, which creates similar impacts as those described for improper grazing above. Return of the Shrubland State (2) to the Midgrass Community (1.1) through brush management and good grazing management can help improve hydrologic function of the site.

Recreational uses

Recreational uses include recreational hunting, hiking, camping, equestrian, and bird watching.

Wood products

Mesquite and some oak are used for posts, firewood, charcoal, and other specialty wood products.

Other products

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

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.

Contributors

Gary Harris, MSSL, NRCS, Robstown, Texas

Approval

Bryan Christensen, 9/19/2023

Acknowledgments

Reviewers: Jason Hohlt, RMS, NRCS, Kingsville, Texas Shanna Dunn, RSS, NRCS, Corpus Christi, Texas Tim Reinke, RMS, NRCS, Victoria, Texas Justin Clary, RMS, NRCS, Temple, Texas Mark Moseley, RMS, NRCS, Boerne, 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)	Vivian Garcia, Zone RMS, NRCS, Corpus Christi, Texas
Contact for lead author	361-241-0609
Date	05/14/2009
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:** None, except following extremely high intensity storms when short flow patterns may appear.

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

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 0 to 5 percent bare ground. Small and non-connected areas.

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):** Minimal and short under normal rainfall intensity.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Ten inches thick, brown (7.5YR 5/4) fine sandy loam; weak, fine, medium subangular blocky and granular structure; hard, friable; neutral. Soil organic matter is 0 to 3 percent.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** High canopy, basal cover and density with small interspaces should make rainfall impact negligible. This site has deep, well drained soils with level to gently sloping (0 to 3 percent slopes) which produces negligible runoff and erosion.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

Dominant: Warm-season midgrasses >

Sub-dominant: Warm-season shortgrasses > Warm-season tallgrasses >

Other: Forbs > Shrubs/Vines > Trees.

Additional: Forbs make up five percent of species composition, shrubs and trees compose up to five percent species composition.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** **Grasses due to their growth habit will exhibit some mortality and decadence, though very slight.**

---

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

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **2,000 to 4,800 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 and cacti, bermudagrass, thistle, Old World bluestem, and buffelgrass.**

---

17. **Perennial plant reproductive capability:** **All species should be capable of reproducing except for periods of prolonged drought conditions, heavy natural herbivory and fires.**
