Ecological site R083AY020TX
Sand Hills

Last updated: 9/19/2023
Accessed: 05/01/2024

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.

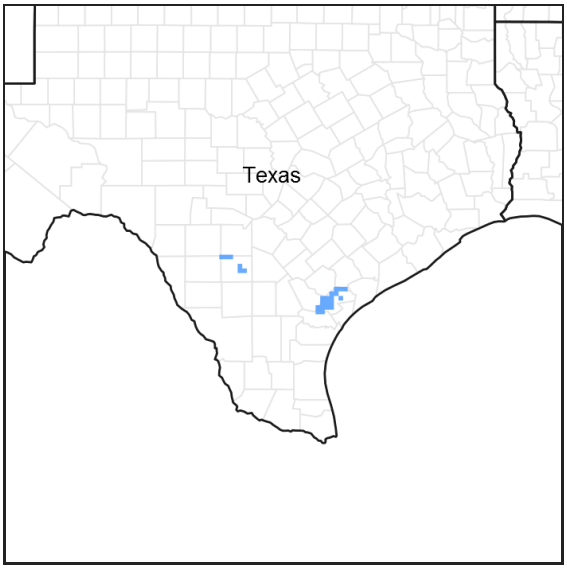


Figure 1. Mapped extent

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): 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

Sites are very deep sands with little horizon development. Active dunes can form without vegetation to hold the soil in place.

Associated sites

R083AY022TX	**Loamy Sand**
R083AY023TX	**Sandy Loam**

Similar sites

R083EY020TX	**Sand Hills**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Quercus virginiana*
Herbaceous	(1) *Schizachyrium littorale* (2) *Heteropogon contortus*

Physiographic features

These soils are on nearly level to gently sloping. Slope ranges from 0 to 5 percent on sand dunes associated with river systems. This area is comprised of inland, dissected coastal plains.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Dune
Runoff class	Negligible
Elevation	200–1,000 ft
Slope	0–5%
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)	223-251 days
Freeze-free period (characteristic range)	263-365 days
Precipitation total (characteristic range)	25-32 in
Frost-free period (actual range)	208-263 days
Freeze-free period (actual range)	254-365 days
Precipitation total (actual range)	24-37 in
Frost-free period (average)	235 days
Freeze-free period (average)	314 days
Precipitation total (average)	29 in

Climate stations used

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

Influencing water features

Runoff is negligible or very low due to the sandy surface texture. Drainage is somewhat excessive.

Wetland description

N/A

Soil features

The soils are very deep, somewhat excessively drained, rapidly permeable that formed in deep eolian sand deposits of Holocene age. The only soil series correlated to the site is Falfurrias. The taxonomic classification is a mixed, hyperthermic Typic Ustipsamments.

Table 4. Representative soil features

Parent material	(1) Eolian deposits–sedimentary rock
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Somewhat excessively drained
Permeability class	Rapid
Soil depth	80 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	3 in
Calcium carbonate equivalent (0-40in)	0–5%

Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	5.1–8.4
Subsurface fragment volume <=3" (Depth not specified)	0–2%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

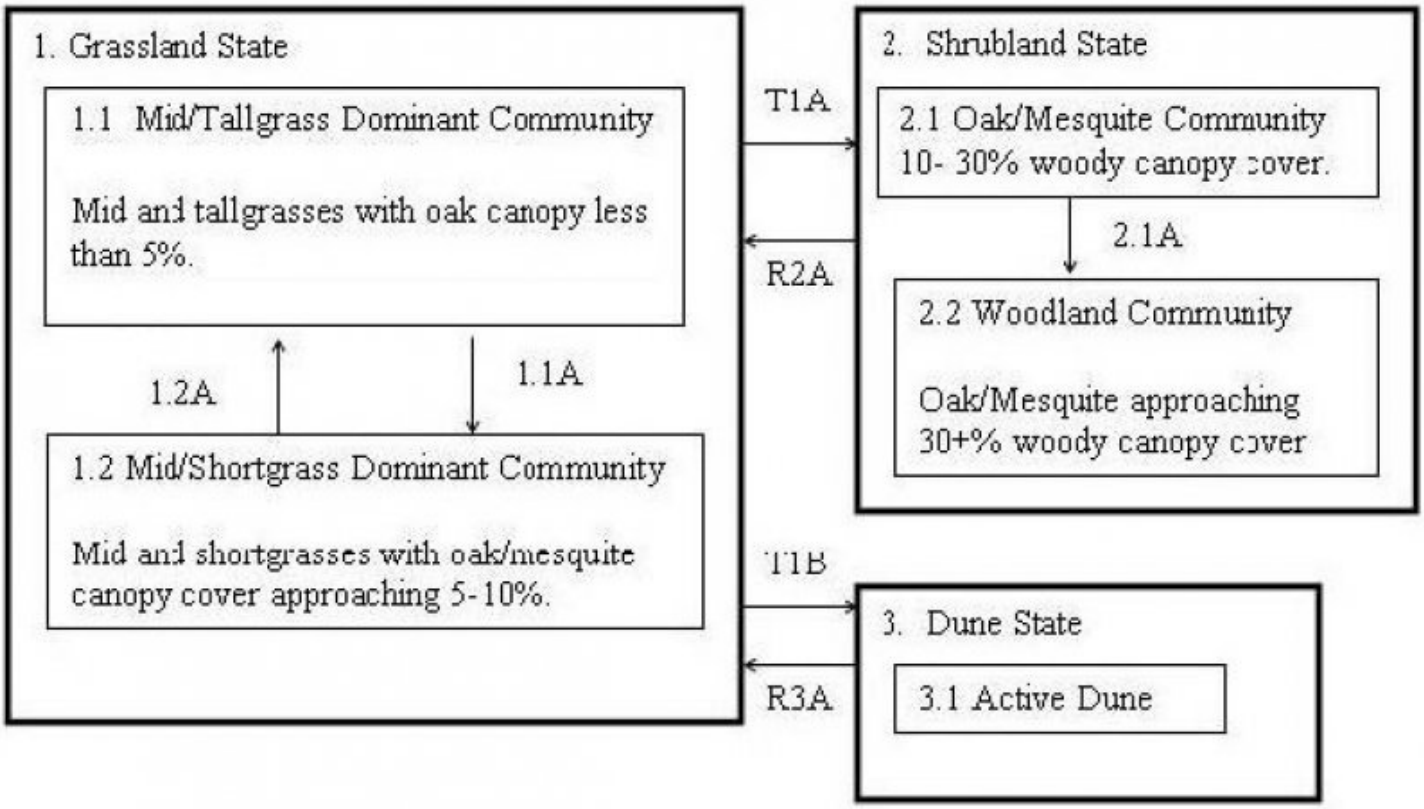
The Northern Rio Grande Plain MLRA was a disturbance-maintained system. Prior to European settlement (pre-1825), fire and grazing were the two primary forms of disturbance. Grazing by large herbivores included antelope, deer, and small herds of bison. The infrequent but intense, short-duration grazing by these species suppressed woody species and invigorated herbaceous species. The herbaceous savannah species adapted to fire and grazing disturbances by maintaining belowground tissues. Wright and Bailey (1982) report that there are no reliable records of fire frequency for the Rio Grande Plains because there are no trees to carry fire scars from which to estimate fire frequency. Because savannah grassland is typically of level or rolling topography, a natural fire frequency of three to seven years seems reasonable for this site.

Precipitation patterns are highly variable. Long-term droughts, occurring three to four times per century, cause shifts in species composition by causing die-off of seedlings, less drought-tolerant species, and some woody species. Droughts also reduce biomass production and create open space, which is colonized by opportunistic species when precipitation increases. Wet periods allow midgrasses to increase in dominance.

Historical accounts prior to 1800 identify grazing by herds of wild horses, followed by heavy grazing by sheep and cattle as settlement progressed. Grazing on early ranches changed natural graze-rest cycles to continuous grazing and stocking rates exceeded the carrying capacity. These shifts in grazing intensity and the removal of rest from the system reduced plant vigor for the most palatable species, which on this site were mid-grasses and palatable forbs. Shortgrasses and less palatable forbs began to dominate the site. This shift resulted in lower fuel loads, which reduced fire frequency and intensity. The reduction in fires resulted in an increase in size and density of woody species.

Today, primarily beef cattle graze rangeland and pastureland. However, horse numbers are increasing rapidly on small acreage properties in the region. There are some areas where dairy cattle, poultry, goats, and sheep are locally important. Whitetail deer, wild turkey, bobwhite quail, and dove are the major wildlife species, and hunting leases are a major source of income for many landowners in this area. Introduced pasture has been established on many acres of old cropland and in areas with deeper soils. Buffelgrass is the most common introduced plant on the site and to a lesser extent bermudagrass, guineagrass (*Urochloa maxima*), and kleingrass, which are more commonly used for hay. Cropland is found in the valleys, bottomlands, and deeper upland soils. Wheat (Triticum spp.), oats Avena spp.), forage and grain sorghum (Sorghum spp.), cotton (Gossypium spp.), and corn (*Zea mays*) are major crops in the region.

State and transition model



Legend

1.1A Heavy Continuous Grazing, No Fire
1.2A Prescribed Grazing, Prescribed Burning
T1A Heavy Continuous Grazing, No Brush Management, No Fire
R2A Prescribed Grazing, Brush Management, Prescribed Burning
2.1A Heavy Continuous Grazing, No Brush Management, Brush Invasion, No Fire
T1B Heavy Continuous Grazing, Dune Formation
R3A Prescribed Grazing, Dune stabilization

Figure 8. STM

State 1
Grassland

Dominant plant species

- live oak (*Quercus virginiana*), tree
- shore little bluestem (*Schizachyrium littorale*), grass
- gulfdune paspalum (*Paspalum monostachyum*), grass

Community 1.1
Mid/Tallgrass Dominant

The reference plant community for the site is open grassland composed of mid and tallgrasses with scattered live oaks. Live oaks shades less than five percent of the site. Seacoast bluestem and gulfdune paspalum dominate the site, with gulfdune paspalum giving way to Pan American balsamscale as distance increases from the coast. Pan American balsamscale, thin paspalum, and arrow feather threeawn dominant drier sites away from the coast. Recurrent fire was a natural process that maintained the plant community. A prescribed burning program with fire every two to three years and proper grazing management are required to maintain the open grassland community.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	850	1750	2600
Forb	100	150	250
Shrub/Vine	50	100	150
Tree	0	0	0
Total	**1000**	**2000**	**3000**

Figure 10. Plant community growth curve (percent production by month). TX8513, Mid/Tallgrass Community. Mid and tallgrasses dominate the site with few forbs and shrubs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	15	5	10	15	10	5	5

Community 1.2
Mid/Shortgrass Dominant

Heavy grazing creates opportunity for a change in plant community composition from an open grassland with scattered live oaks to a mid and shortgrass community. Drought hastens the process. This community is dominated by Pan American balsamscale and shortgrasses including arrow feather threeawn, sandbur, fringed signalgrass, red lovegrass, camphor daisy, partridge pea, and crotons. Seacoast bluestem is present, but is greatly reduced in cover compared to the 1.1 Mid/Tallgrass Dominant Community. Bare ground increases under heavy grazing. Live oak and mesquite are more prominent in this community. As long as there is enough grass to burn, this community can be maintained with periodic fires and some selective brush management. However, as mesquite and oak approach 10 to 30 percent canopy, a threshold is reached, and prescribed grazing alone will not control the brush.

Table 6. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	790	1600	2350
Forb	100	150	300
Tree	60	120	200
Shrub/Vine	50	100	150
Total	**1000**	**1970**	**3000**

Figure 12. Plant community growth curve (percent production by month). TX8514, Mid/Shortgrass Parkland Community. Mid and shortgrasses dominate while oak mottes and density of mesquite are expanded..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	15	5	10	15	10	5	5

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing and re-introduction of fire will transition the community back to the 1.1 Mid/Tallgrass Dominant Community.

State 2
Shrubland

Dominant plant species

- oak (*Quercus*), tree

- mesquite (*Prosopis*), shrub

Community 2.1
Oak/Mesquite

Heavy grazing and lack of fire caused the transition from the Grassland State to a state in which oaks and mesquite dominate. Arrow feather threeawn, sandbur, fringed signalgrass, red lovegrass; and forbs are the dominant herbaceous plants. Seacoast bluestem and Pan American balsamscale occur only in scattered patches. Considerable bare ground is present. Brush management will be necessary to recover to the Grassland State (1). Any investment in brush management should be done with skill due to the fragile nature of the dunes. Proper grazing management helps to extend the life of the practice. The prudent use of fire can be used to arrest brush encroachment. Without brush management, this 10 to 30 percent cover will develop into the 2.2 Woodland Community.

Table 7. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	440	1000	1600
Shrub/Vine	130	315	500
Tree	130	315	500
Forb	100	250	400
Total	**800**	**1880**	**3000**

Figure 14. Plant community growth curve (percent production by month). TX8506, Shrubland Community, 10-30% canopy. Expansion and coalescence of live oak mottes, and establishment of mesquite and associated woody species while grass species decline..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Community 2.2
Woodland

As lack of brush management, heavy grazing, and absence of fire continues, live oak mottes may expand and coalesce resulting in greater than 30 percent woody canopy cover. Much of the live oak may be a low-growing thicket. Likewise, mesquite may increase with an understory of subordinate shrubs such as granjeno, brasil, and lime pricklyash. Seacoast bluestem and other midgrasses are virtually absent. Arrow feather threeawn, sandbur, fringed signalgrass, red lovegrass, and forbs are the dominant herbaceous plants.

Table 8. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	300	700	1100
Tree	240	600	900
Shrub/Vine	160	380	600
Forb	100	250	400
Total	**800**	**1930**	**3000**

Figure 16. Plant community growth curve (percent production by month). TX8507, Woodland Community, 30+% canopy. Woody canopy is greater than 30%..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	5	10	18	15	5	9	15	9	5	5

Pathway 2.2A
Community 2.2 to 2.1

Brush management is required to reduce the woody canopy less than 30 percent. Care is required because the sandy soils have a tendency to form dunes.

State 3
Dune

Community 3.1
Active Dune

Continued heavy grazing of the Grassland State results in the formation of active sand dunes. Severe climate events, such as hurricanes, can also trigger dune formation. Vegetation is absent from the dune itself. Active dunes migrate with the prevailing wind from southeast to northwest. Stabilized dunes undergo a successional progression with snake cotton (Froelichia spp.), sunflowers (Helianthus spp.), and croton. Once stabilization has been achieved, heavy grazing will erase any gains and precipitate reformation of an active dune. Rest and implementation of proper grazing management are required to allow plants to establish and stabilize active dunes, but the process may take several years. Cutting, mulching, and lightly incorporating native hay near a sand dune is an effective method of stabilizing dunes.

Table 9. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Tree	330	550	750
Forb	80	150	250
Grass/Grasslike	80	150	250
Shrub/Vine	80	150	250
Total	**570**	**1000**	**1500**

Figure 18. Plant community growth curve (percent production by month). TX8516, Active Dune Community. Dunes are active and migrate with the wind. Vegetation are absent from the active dunes. Surrounding areas will have low successional grasses and forbs..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	10	20	15	5	10	15	10	5	5

Transition T1A
State 1 to 2

With continued heavy grazing and no fire, the site will transition to the Shrubland State. The shrubs and brush exceed a 10 percent canopy cover and the herbaceous understory is greatly reduced.

Transition T1B
State 1 to 3

If the site is grazed heavy enough without rest, the site can transition the Dune State. Without herbaceous cover, bare ground increases and active dunes can form, moving across the landscape.

Restoration pathway R2A
State 2 to 1

Brush management, prescribed grazing, and the return of fire can restore the plant community to the Grassland State. Care should be taken to minimally disturb the soils, due to their ability to form active dunes.

Restoration pathway R3A
State 3 to 1

Stabilization of dunes is required to restore the Grassland State. Stabilization can occur naturally by first colonization of first successional herbaceous species or active restoration by cutting, mulching, and lightly incorporating native hay.

Additional community tables

Table 10. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Grass/Grasslike					
1	**Tallgrasses**			750–1600	
	shore little bluestem	SCLI11	*Schizachyrium littorale*	500–1500	–
	switchgrass	PAVI2	*Panicum virgatum*	100–1000	–
	gulfdune paspalum	PAMO4	*Paspalum monostachyum*	500	–
2	**Tallgrasses**			0–300	
	big bluestem	ANGE	*Andropogon gerardii*	0–300	–
	Indiangrass	SONU2	*Sorghastrum nutans*	0–300	–
3	**Midgrasses**			100–300	
	tanglehead	HECO10	*Heteropogon contortus*	100–250	–
	brownseed paspalum	PAPL3	*Paspalum plicatulum*	100–250	–
	crinkleawn grass	TRACH2	*Trachypogon*	100–250	–
4	**Midgrasses**			200–400	
	crabgrass	DIGIT2	*Digitaria*	100–200	–
	balsamscale grass	ELION	*Elionurus*	100–200	–
	knotgrass	PADI6	*Paspalum distichum*	100–200	–
	thin paspalum	PASE5	*Paspalum setaceum*	100–200	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	50–100	–
Forb					
5	**Forbs**			25–100	
	bundleflower	DESMA	*Desmanthus*	25–75	–
	coastal indigo	INMI	*Indigofera miniata*	25–75	–
	dotted blazing star	LIPU	*Liatris punctata*	25–75	–
	sensitive plant	MIMOS	*Mimosa*	25–75	–
	yellow puff	NELU2	*Neptunia lutea*	25–75	–
	American snoutbean	RHAM	*Rhynchosia americana*	25–75	–
6	**Forbs**			0–50	
	Forb, annual	2FA	*Forb, annual*	0–50	–
Shrub/Vine					
7	**Shrubs**			75–125	
	live oak	QUVI	*Quercus virginiana*	75–200	–
8	**Shrubs**			0–25	
	spiny hackberry	CEEH	*Celtis ehrenbergiana*	0–1	–
	snakewood	CONDA	*Condalia*	0–1	–
	pricklypear	OPUNT	*Opuntia*	0–1	–
	mesquite	PROSO	*Prosopis*	0–1	–

Animal community

Cattle and many species of wildlife make extensive use of this ecological site. White-tailed deer may be found scattered across the prairie, and are found in heavier concentrations where woody cover exists. Feral hogs (Sus scrofa) are present and, at times, become abundant. Coyotes (Canis latrans) are abundant, and probably have replaced the red wolf (Canis rufus) in this mammalian predator niche. Rodent populations rise during drier periods and fall during periods of inundation. Geese (family Anatidae) and sandhill cranes (Grus canadensis) abound during

winter. Many species of avian predators including northern harriers (Circus cyaneus), red-tailed hawks (Buteo jamaicensis), kestrels (Falco sparverius), white-tailed kites (Elanus leucurus), and, occasionally, swallow-tailed kites (Elanoides forficatus). Many species of grassland birds use the ecological site, including blue grosbeaks (Guiraca caerulea), dickcissels (Spiza americana), eastern meadowlarks (Sturnella magna), and several sparrows, including Cassin's sparrow (Aimophila cassinii), vesper sparrow (Pooecetes gramineus), lark sparrow (Chondestes grammacus), savannah sparrow (Passerculus sandwichensis), grasshopper sparrow (Ammodramus savannarum), and Le Conte's sparrow (Ammodramus leconteii).

Hydrological functions

Water infiltration is rapid in the fine sands of the site. Therefore, runoff and soil erosion from water are seldom problematic.

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.

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Approval

Bryan Christensen, 9/19/2023

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)	Vivian Garcia, Zone RMS, NRCS, Corpus Christi, Texas
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Date	01/12/2010
Approved by	Bryan Christensen
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.

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:** Due to the sandy properties of the soil, severe soil erosion by wind can occur.

7. **Amount of litter movement (describe size and distance expected to travel):** Under normal rainfall, little litter movement should be expected; however, litter of all sizes may move long distances.

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

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0 to 3 inches, very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; common fine roots; slightly acid; clear smooth boundary.

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 well drained soils, deep with level to gently sloping (0 to 5 percent) which produces negligible runoff and water erosion.

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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):** No evidence of compaction.

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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: Forbs > Shrubs

    Additional: Forbs make up 5 percent species composition while shrubs make up 5 percent.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Perennial grasses will naturally exhibit a minor amount (less than 5%) of senescence and some mortality every year.

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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 to 3,500 pounds per acre.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Mesquite and bur grass are the primary invaders. Other invaders include guineagrass, King Ranch bluestem, lotebush, pricklypear, yucca, spiny hackberry, brasil, and live oak.

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17. **Perennial plant reproductive capability:** All perennial species should be capable of reproducing every year unless disrupted by extended drought, overgrazing, wildfire, insect damage, or other events occuring immediately prior to, or during the reproductive phase.
