USDA Natural Resources Conservation Service

Ecological site R150BY552TX Tidal Flat

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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.

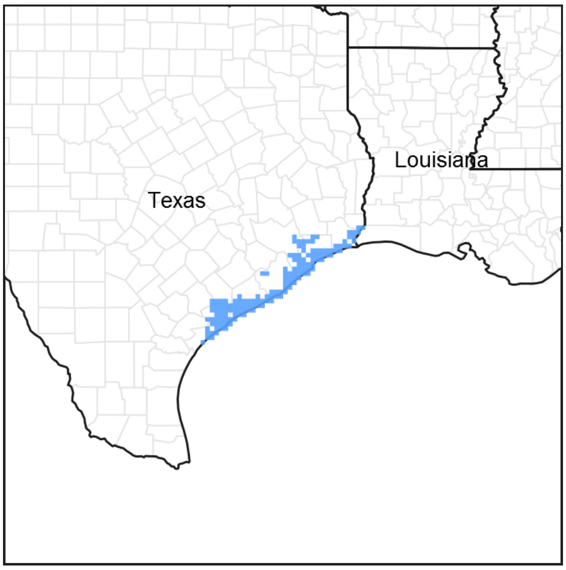


Figure 1. Mapped extent

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): 150B–Gulf Coast Saline Prairies

MLRA 150B is in the West Gulf Coastal Plain Section of the Coastal Plain Province of the Atlantic Plain and entirely in Texas. It makes up about 3,420 square miles. It is characterized by nearly level to gently sloping coastal lowland plains dissected by rivers and streams that flow toward the Gulf of Mexico. Barrier islands and coastal beaches are included. The lowest parts of the area are covered by high tides, and the rest are periodically covered by storm tides. Parts of the area have been worked by wind, and the sandy areas have gently undulating to irregular topography because of low mounds or dunes. Broad, shallow flood plains are along streams flowing into the bays. Elevation generally ranges from sea level to about 10 feet, but it is as much as 25 feet on some of the dunes. Local relief is mainly less than 3 feet. The towns of Groves, Texas City, Galveston, Lake Jackson, and Freeport are in the northern half of this area. The towns of South Padre Island, Loyola Beach, Corpus Christi, and Port Lavaca are in the southern half. Interstate 37 terminates in Corpus Christi, and Interstate 45 terminates in Galveston.

Classification relationships

USDA-Natural Resources Conservation Service, 2006.
-Major Land Resource Area (MLRA) 150B

Ecological site concept

Tidal Flats are areas adjacent to the bay where marshes ebb and flow with water as a result of tide phases.

Associated sites

R150BY651TX	**Salt Flat** Slightly higher elevation and less productive.
R150BY530TX	**Northern Coastal Sand** Slightly higher elevation and less frequent flooding.
R150BY648TX	**Southern Coastal Sand** Higher elevation and less flooding.
R150BY728TX	**Subaqueous Grassflat** This site is permanently submersed.
R150BY550TX	**Northern Salt Marsh** This site is in a slightly higher position and not greatly influenced by tidal activity.

Similar sites

R150BY651TX	**Salt Flat** Slightly higher in elevation and much less productive.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Forb, perennial*
Herbaceous	(1) *Spartina alterniflora*

Physiographic features

The sites are found on broad, concave linear depressions on barrier islands and/or coastal plains. More commonly, these areas are referred to as tidal areas adjacent to bays and bayous. They are permanently saturated to the surface with seawater. This site is covered by 2 to 12 inches of water by daily normal high tides. Sediments are redeposited/scoured during seasonal storm events. Slopes range from 0 to 0.5 percent with the elevation ranging from 0 to 10 feet.

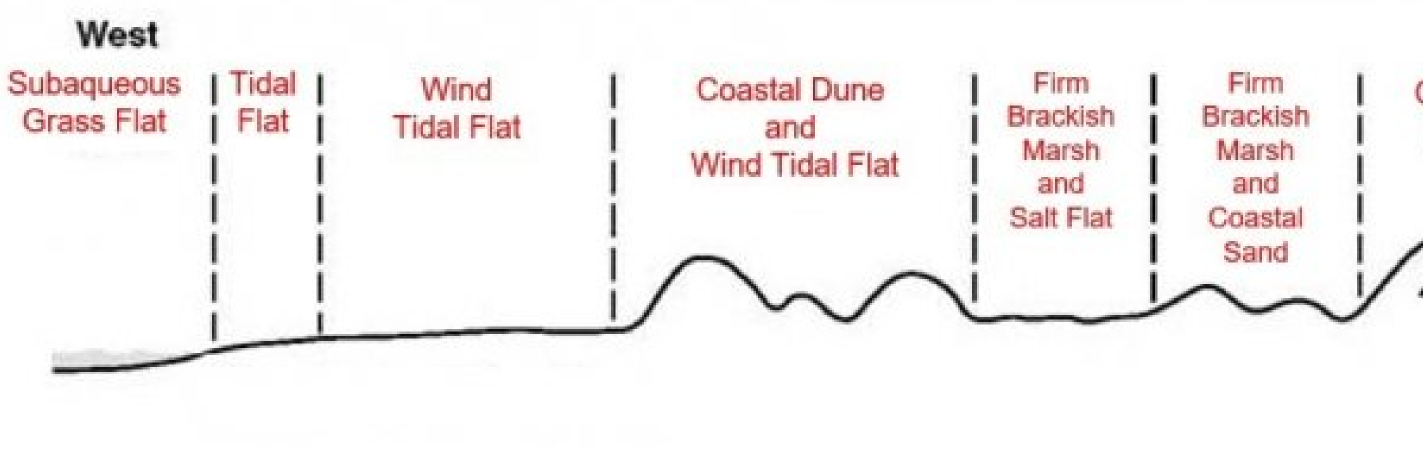


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) Barrier island > Tidal flat (2) Barrier island > Wind-tidal flat (3) Delta plain > Tidal marsh
Runoff class	Negligible to high
Flooding duration	Long (7 to 30 days) to very long (more than 30 days)
Flooding frequency	Frequent to very frequent
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to occasional
Elevation	0–3 m
Slope	0–1%
Ponding depth	30 cm
Water table depth	0–15 cm
Aspect	Aspect is not a significant factor

Climatic features

The climate is predominately maritime, controlled by the warm and very moist air masses from the Gulf of Mexico. The climate along the upper coast of the barrier islands is subtropical subhumid and the climate on the lower coast of Padre Island is subtropical semiarid (due to high evaporation rates that exceed precipitation). Almost constant sea breezes moderate the summer heat along the coast. Winters are generally warm and are occasionally interrupted by incursions of cool air from the north. Spring is mild and damaging wind and rain may occur during spring and summer months. Tropical cyclones or hurricanes can occur with wind speeds of greater than 74 mph and have the potential to cause flooding from torrential rainstorms. Despite the threat of tropical storms, the storms are rare. Throughout the year, the prevailing winds are from the southeast to south-southeast.

The average annual precipitation is 45 to 57 inches in the northeastern half of this area, 26 inches at the extreme southern tip of the area, and 30 to 45 inches in the rest of the area. Precipitation is abundant in spring and fall in the southwestern part of the area and is evenly distributed throughout the year in the northeastern part. Rainfall typically occurs as moderate-intensity, tropical storms that produce large amounts of rain during the winter. The average annual temperature is 68 to 74 degrees F. The freeze-free period averages 340 days and ranges from 315 to 365 days.

Table 3. Representative climatic features

Frost-free period (characteristic range)	260-365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	889-1,245 mm
Frost-free period (actual range)	238-365 days
Freeze-free period (actual range)	279-365 days
Precipitation total (actual range)	838-1,295 mm
Frost-free period (average)	314 days
Freeze-free period (average)	349 days
Precipitation total (average)	1,041 mm

Climate stations used

- (1) CORPUS CHRISTI NAS [USW00012926], Corpus Christi, TX
- (2) GALVESTON [USW00012944], Galveston, TX
- (3) PADRE IS NS [USC00416739], Padre Island Ntl Seashor, TX
- (4) ROCKPORT [USC00417704], Rockport, TX

- (5) ROCKPORT ARANSAS CO AP [USW00012972], Rockport, TX
- (6) ARANSAS WR [USC00410305], Tivoli, TX
- (7) PORT O'CONNOR [USC00417186], Port O Connor, TX
- (8) PALACIOS MUNI AP [USW00012935], Palacios, TX
- (9) MATAGORDA NO 2 [USC00415659], Matagorda, TX
- (10) FREEPORT 2 NW [USC00413340], Freeport, TX
- (11) ANGLETON BRAZORIA AP [USW00012976], Angleton, TX
- (12) GALVESTON SCHOLES FLD [USW00012923], Galveston, TX

Influencing water features

These soils are permanently saturated with seawater. Most areas are inundated daily with 2 to 12 inches of water by daily high tides.

Wetland description

Somewhat poorly, poorly, and very poorly drained sites are hydric. Moderately well drained sites are non-hydric but have small areas of hydric soils. Onsite investigation needed to determine local conditions.

Soil features

The soils are very deep and very poorly drained that formed in saline loamy alluvium or eolian coastal deposits. The soils have very slow permeability, strong salinity, and strong sodicity with a neutral through moderately alkaline soil reaction. Soils exhibit halic soil properties along with a peraquic moisture regime. An organic mat of decomposing plant material can be found 1 to 8 inches thick on the surface. Soils correlated to this site include: Bayucos, Follet, Freeport, Tatlum, and Tracosa.

Table 4. Representative soil features

Parent material	(1) Eolian deposits–igneous, metamorphic and sedimentary rock (2) Alluvium–igneous, metamorphic and sedimentary rock (3) Fluviomarine deposits–igneous, metamorphic and sedimentary rock
Surface texture	(1) Clay (2) Clay loam (3) Fine sandy loam
Family particle size	(1) Loamy (2) Clayey
Drainage class	Poorly drained to very poorly drained
Permeability class	Very slow
Soil depth	203 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-152.4cm)	2.54–10.16 cm
Calcium carbonate equivalent (0-152.4cm)	0–10%
Electrical conductivity (0-25.4cm)	2–24 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	20–65
Soil reaction (1:1 water) (0-152.4cm)	6.6–8.4
Subsurface fragment volume <=3" (25.4-152.4cm)	0–10%

Subsurface fragment volume >3" (25.4-152.4cm)	0–2%

Ecological dynamics

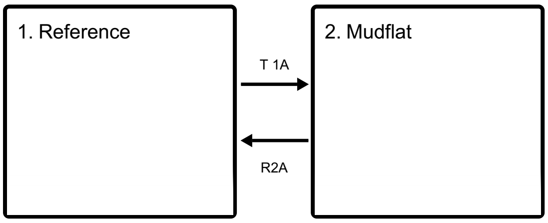
The Texas coastline is composed of barrier islands, peninsulas, bays, estuaries, and natural or man-made passes. The process of erosion and accretion constantly reshapes these mobile environments. Hurricane activity can significantly change the environment. Tidal Flats occur adjacent to saline bays and bayous in areas subject to tidal inundation which lay between the high and the low water marks. Average water depth at high tide is between 2 and 12 inches while at low tides there is no inundation.

Smooth cordgrass (*Spartina alterniflora*) dominates the reference plant community. This grass is specifically adapted because it is salt tolerant, absorbs wave energy, screens suspended solids from intertidal waters, and uptakes available nutrients from the sediment. Increaser plants in this community are inland saltgrass (*Distichlis spicata*), turtleweed (*Batis maritima*.), marshhay cordgrass (*Spartina patens*), maritime saltwort (Salicornia spp.), and saltmarsh bulrush (Scirpus robustus). Widgeongrass (Ruppia maritime) may occupy some of the open water adjacent to the tidal flats. If water levels decline for extend periods, glassworts, inland saltgrass, saltworts, and some sea-ox-eye (*Borrichia frutescens*) invade. The general cause of water level decline is subsidence, which may be natural, or more commonly, man-made.

Under heavy grazing pressure, smooth cordgrass stands will usually thin out. Although smooth cordgrass is recognized as an important forage species for livestock producers along the Central Gulf Coast, access for cattle is often a problem. Even if the ground is firm, cattle will seldom venture out unless tides are low. Cattle prefer eating smooth cordgrass following rains, which wash the salt crystals from the leaves.

State and transition model

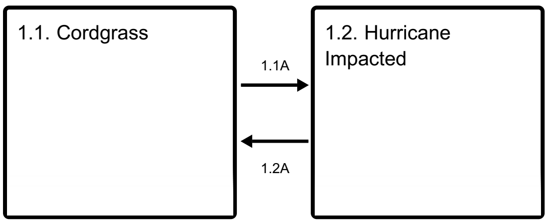
Ecosystem states



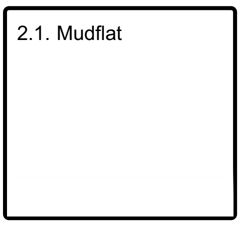
T 1A - Extreme disturbance event coupled with excessive grazing pressure

R2A - Absence of disturbance, reintroduction of native species and natural regeneration over time

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Reference

The Reference state is considered to be representative of the range of variation under pre-Euro settlement conditions. Historically the tidal flats were subject to the erosion and accretion and tidal inundation.

Dominant plant species

- smooth cordgrass (*Spartina alterniflora*), grass

Community 1.1
Cordgrass

Smooth cordgrass dominates this community. Smooth cordgrass is adapted to high salinity soils with tidal inundation, wave action, and occasional burial. Average depth of water at high tide ranges from 2 to 12 inches and salinity varies from 12 to 50 parts per thousand, though rainfall may lower salinity. Subdominant grass species include marshhay cordgrass and inland saltgrass (*Distichlis spicata*). Salt-tolerant forbs such as glassworts and saltworts (Salicornia spp and Batis spp.) may occupy interspaces between cordgrass bunches. This is a highly resilient community and well adapted to storm impacts. Typical recovery time from tropical storms and mild hurricanes is about a year. The site is relatively grazing tolerant due to the low palatability of mature cordgrass. Lack of grazing combined with high resiliency has resulted in many remnant reference sites. Burning is an option to remove rank vegetation, increase palatability, and diversity of plants.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	7454	13310	19167
Forb	392	701	1009
Shrub/Vine	–	–	–
Tree	–	–	–
Total	**7846**	**14011**	**20176**

Figure 10. Plant community growth curve (percent production by month). TX7751, Midgrass Prairie Community. Open grassland plain composed of mid-grasses with seacoast bluestem and gulfdune paspalum dominate the site..

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	20	15	10	10	15	6	4	0

Community 1.2
Hurricane Impacted

The Hurricane-Impacted Community (1.2) is characterized by vegetation that has been burned, killed or stunted, due to storm-driven flooding and by high winds laden with coastal water. Vegetation may be buried under thick sediment deposits left by storm surges. Some areas are scoured and devoid of vegetation and may temporarily suffer complete vegetative loss. The intensity of a hurricane plays a large role in the prevailing dominant plant community. Due to its ability to survive these impacts, large areas may be a near monoculture of cordgrass. The Hurricane-Impacted Community (1.2) can shift to the Mudflat Community (2.1) if there is repeated disturbance such as another hurricane or overgrazing, creating more plant burial and/or removal. Overall vegetative production will vary greatly in this community depending on the amount of plant survival and depth of sediment burial.

Pathway 1.1A
Community 1.1 to 1.2

The reference community is highly resilient however, a hurricane can drive this transition by burying vegetation under high amounts of sediment and debris.

Pathway 1.2A

Community 1.2 to 1.1

Vegetation in this community may have a slow response time depending on the amount of sediment deposited. Areas that received minimal sediment disposition will recover to reference conditions (1.1) in 1 to 3 years. However, an area that received large amounts of sediment will have a slower recovery. The driver for this transition is proper management and time.

State 2
Mudflat

This state is the result of severe disturbance and is characterized by sparse vegetation and extensive bare ground.

Community 2.1
Mudflat

At its most extreme, The Mudflat Community (2.1) is devoid of vegetation. Although in most cases, some remnant plants occupy the site. The number and composition of these remnant plants depend on the cause of degradation, duration, and degree of flooding, salinity, or burial. These plants are frequently early successional species (pioneer species) adapted to disturbed areas. The Mudflat Community (2.1) often occurs in a shifting mosaic among all communities in all the states. It can also occur in large areas if the vegetation community is removed through mechanical or chemical treatment. It can be found along waterways where ship wakes create continual disturbance. Cordgrass reproduces vegetatively. The rate of recovery to the Cordgrass State (1) will be determined by the density and vigor of remnant plants. If revegetating from adjacent sites, the size of the mudflat determines how long it will take to revegetate the entire mudflat. If the mudflat is isolated from vegetated areas, it will be difficult to return to the Cordgrass Community (1.1) due to the dependence of cordgrass on vegetative reproduction. Reseeding is generally not feasible due to lack of a seed source and difficulty of seedling establishment. Planting of vegetative materials can assist in accelerating the recovery process but may not be feasible over large areas. Rest from further disturbance may be the only reasonable approach to recovery, but this may require several years or decades and be determined by weather instead of management.

Transition T 1A
State 1 to 2

Excessive disturbance of the Cordgrass Community (1.1) or Hurricane-Impacted Community (1.2) will shift to the Mudflat Community (2.1). Mechanical disturbance or improper grazing management that removes the existing protective vegetation can cause severe soil erosion and/or deposition.

Restoration pathway R2A
State 2 to 1

With time and protection from disturbance, the Mudflat Community (2.1) can recover and return to the Hurricane-Impacted Community (1.2) and eventually the Cordgrass Community (1.1). Remnant cordgrass plants are necessary for this restoration pathway to occur. The drivers for this restoration pathway are time between disturbances and proper grazing management.

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Grasses**			7061–18158	
	smooth cordgrass	SPAL	*Spartina alterniflora*	7061–18158	–
	saltmeadow cordgrass	SPPA	*Spartina patens*	560–4483	–
	saltgrass	DISP	*Distichlis spicata*	560–4483	–
	seashore paspalum	PAVA	*Paspalum vaginatum*	560–3363	–
2	**Rushes**			392–1009	
	needlegrass rush	JURO	*Juncus roemerianus*	112–560	–
	California bulrush	SCCA11	*Schoenoplectus californicus*	112–560	–
Forb					
3	**Forbs**			392–1009	
	Virginia glasswort	SADE10	*Salicornia depressa*	392–1009	–
	perennial saltmarsh aster	SYTE6	*Symphyotrichum tenuifolium*	56–560	–
	dwarf saltwort	SABI	*Salicornia bigelovii*	56–560	–

Animal community

The animal communities of the Coastal Prairie communities are influenced by fresh and salt water inundations. Cattle and many species of wildlife make extensive use of the site. White-tailed deer may be found scattered across the prairie and are found in heavier concentrations where woody cover exists. Feral hogs are present and at times become abundant. Coyotes are abundant and fill the mammalian predator niche. Rodent populations rise during drier periods and fall during periods of inundation. Alligators are locally abundant and make frequent use of the marshes depending on salt concentrations in the marshes.

The region is a major flyway for waterfowl and migrating birds. Hundreds of thousands of ducks, geese, and sandhill cranes abound during winter. Whooping cranes are an important endangered species that occur in the area, especially near Aransas National Wildlife Refuge. Northern harriers are common predatory birds seen patrolling marshes. Curlews, plovers, sandpipers, and willets are shorebirds that make use of the tidal areas. Seagulls and terns are plentiful throughout the year trolling the shores as well. Further inland, rails, gallinules, and moorhens make use of the brackish marshes.

Hydrological functions

Infiltration into the soils of this site is slow due to the high water table. However, because of the level terrain and proximity to the Gulf of Mexico, this site may be inundated periodically. Runoff and erosion from water are seldom a problem in the Cordgrass Community (1.1). In the Hurricane-Impacted (1.2) and Mudflat Communities (2.1) hydrology functions differently due to the increased runoff, especially shortly after the hurricane. The site has sparse vegetation and the soil is loose due to recent disturbance. Therefore, short rills caused by flowing water may form.

Recreational uses

Bird watching is common as the site occurs along a popular migratory path for birds.

Inventory data references

Information presented was derived from the Range Site Description, NRCS clipping data, literature, field observations, and personal contacts with range-trained personnel.

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Contributors

Jack Alexander, Synergy Resource Solutions, Inc., Belgrade, MT

Dr. Fred Smeins, Texas A&M University, College Station, TX

Approval

Bryan Christensen, 9/22/2023

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Technical Reviewers and Contributors:
Shanna Dunn, RSS, NRCS, Corpus Christi, TX
Jason Hohlt, RMS, NRCS, Kingsville, TX
Mark Moseley, RMS, NRCS, Boerne, TX
Tim Reinke, RMS, NRCS, Victoria, TX
Mike Stellbauer, RMS, NRCS, Bryan, TX

Site Development and Testing Plan:

Future work, as described in a Project Plan, to validate the information in this Provisional Ecological Site Description is needed. This will include field activities to collect low, medium and high-intensity sampling, soil correlations, and analysis of that data. Annual field reviews should be done by soil scientists and vegetation specialists. A final field review, peer review, quality control, and quality assurance reviews of the ESD will be needed to produce the final document. Annual reviews of the Project Plan are to be conducted by the Ecological Site Technical Team.

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Mike Stellbauer, Zone RMS, NRCS, Bryan, TX
Contact for lead author	979-846-4814
Date	04/24/2009
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:** They are permanently saturated to the surface with seawater. These soils are covered by 2 to 12 inches of water by daily high tides. Water is 1 to 2 inches deep on the surface, even during low tides.

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): Less than 20 percent bare ground randomly distributed throughout, although it is constantly fluctuating due to tidal waves and storms.

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

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

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7. **Amount of litter movement (describe size and distance expected to travel):** High amounts of litter are expected to be removed based upon the storm intensity.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** Stability class ranges 4 to 6 at surface. Soil surface is resistant to erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** 0 to 4 inches; gray (10YR 5/1) clay loam, massive; flows easily between fingers and leaves small residue in hand when squeezed; slightly sticky; common fine and medium roots; strongly saline; slightly alkaline; clear smooth boundary. SOM is 1 to 2%.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Native vegetation is dominated by smooth cordgrass. Other plants include saltwort and glasswort species. If the site has adequate litter and little bare ground, it will provide maximum infiltration and little runoff under normal rainfall events.

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

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

    Dominant: Warm-season tallgrasses >>

    Sub-dominant:

    Other: Warm-season midgrasses > Forbs Shrubs annual grasses

    Additional:

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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.

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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):** 7,000 to 18,000 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:** Salt cedar and huisache.

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