USDA Natural Resources Conservation Service

Ecological site R150BY714TX
Coastal Dune

Last updated: 9/22/2023
Accessed: 05/13/2025

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.

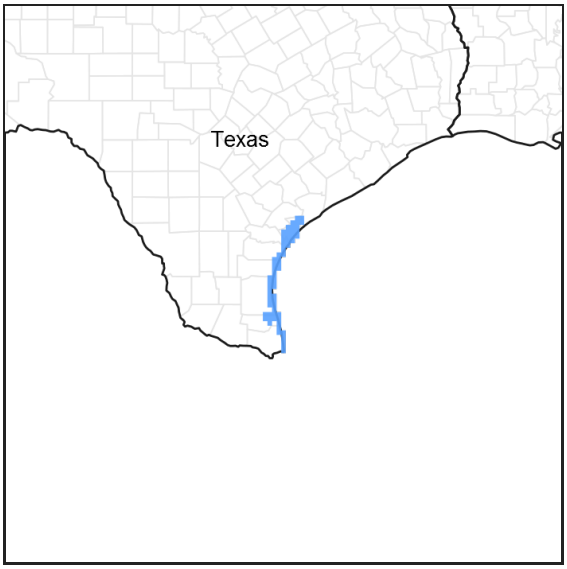


Figure 1. Mapped extent

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

Coastal Dunes are sandy-textured formations adjacent to the ocean or bay. The dunes are dynamic and actively move across the landscape, especially when they are devoid of vegetation.

Associated sites

R150BY530TX	**Northern Coastal Sand** This site is slightly lower and is wetter.
R150BY648TX	**Southern Coastal Sand** This site is found at the foot of the dunes. The site is occurs in areas with mean annual precipitation less than 41 inches.
R150BY650TX	**Low Coastal Sand** This site is found on the barrier flat and is slightly lower on the landscape.

Similar sites

R150BY647TX	**Coastal Ridge** This site is on a similar landform but is loamy.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Panicum amarum* (2) *Uniola paniculata*

Physiographic features

These sites are on undulating to strongly rolling foredunes and stabilized back-island dune fields. These soils are subject to rare flooding by high storm surge from strong tropical storms. Slope ranges from 2 to 12 percent.

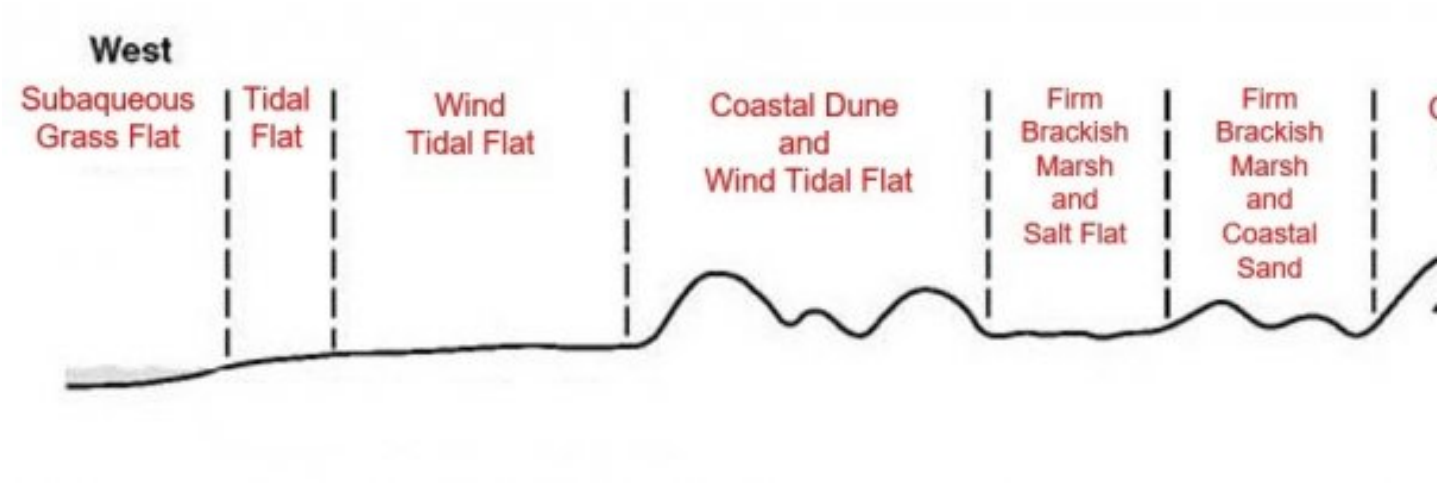


Figure 2.

Table 2. Representative physiographic features

Landforms	(1) Barrier island > Dune field (2) Barrier island > Foredune
Runoff class	Very low to low
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to rare

Ponding frequency	None
Elevation	2–14 m
Slope	2–12%
Water table depth	183–203 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)	365 days
Freeze-free period (characteristic range)	365 days
Precipitation total (characteristic range)	711-838 mm
Frost-free period (actual range)	365 days
Freeze-free period (actual range)	365 days
Precipitation total (actual range)	660-864 mm
Frost-free period (average)	365 days
Freeze-free period (average)	365 days
Precipitation total (average)	762 mm

Climate stations used

- (1) CORPUS CHRISTI NAS [USW00012926], Corpus Christi, TX
- (2) PADRE IS NS [USC00416739], Padre Island Ntl Seashor, TX
- (3) PORT MANSFIELD [USC00417184], Port Mansfield, TX
- (4) PORT ISABEL [USC00417179], Port Isabel, TX

Influencing water features

The soils on this site are somewhat excessively drained. Runoff is very slow and permeability is rapid. The available water capacity is low. The root zone is deep and can easily be penetrated by roots.

Wetland description

These areas have non-hydric soils but some areas have small areas of hydric soils. Onsite investigation needed to determine local conditions.

Soil features

The site consists of very deep, excessively drained, rapidly permeable soils that formed in deep sandy eolian sediments on barrier islands. Runoff is very low. The soil is rarely flooded for very brief periods by high storm surge during strong tropical storms. Soils correlated to this site include: Daggerhill and Greenhill.

Table 4. Representative soil features

Parent material	(1) Eolian sands–igneous, metamorphic and sedimentary rock
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Excessively drained
Permeability class	Very rapid
Soil depth	203 cm
Available water capacity (0-152.4cm)	5.08–12.7 cm
Calcium carbonate equivalent (0-152.4cm)	0–10%
Electrical conductivity (0-152.4cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-152.4cm)	0–8
Soil reaction (1:1 water) (0-152.4cm)	5.1–9

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. Coastal Dunes lie on the bayward side of the beach identified as the foredune ridge in an area identified as the back-island dune field. The landform is made of tall vegetated dunes that run parallel to the Gulf. A combination of natural and man-made factors influence the plants of the island.

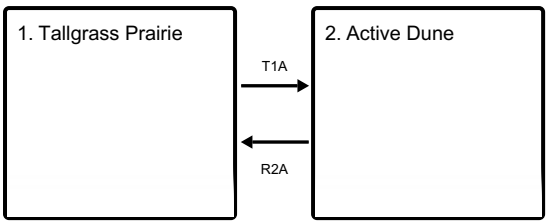
The plant communities are dynamic, and composition may vary dramatically because of differences in annual rainfall, grazing, and fire. The site lies within the regions identified as foredune ridge and back-island dune fields. Extreme climatic variations occur ranging from extended drought to Gulf Coast storm surges. Bare ground may predominate during droughts or following hurricanes while a tallgrass prairie happens under proper management and non-droughty periods. These dunes may be active and have movement following a hurricane and before becoming stabilized with vegetation.

The reference plant community consists of tallgrass prairie with seaoats (*Uniola paniculata*) being the dominant species and bitter panicum (*Panicum amarum*) as a co-dominant. Continual overuse by livestock results in a Midgrass Degraded Prairie Community. This community is the result from the decline of bitter panicum, seacoast bluestem, and gulfdune paspalum. Further degradation of the plant community will result in an Annual Vegetative Community. Severe overgrazing of this community would cause seaoats, bitter panicum, and seacoast bluestem to be virtually absent. Severe overuse results in large amounts of bare ground which will cause the sand to blow. Blowing sand further accelerates community degradation and can result in active sand dune movement.

Besides grazing, hurricanes and tropical depressions can cause the vegetation to dramatically change. Salt-laden winds for extended periods can cause the vegetation to be burned and badly damaged. Storm surges can push thick deposits of sediment onto the dunes and bury the vegetation. After loss of vegetation, the coastal dunes have the capability of becoming active dunes and moving across the landscape. Restoration back to reference conditions depends on continued favorable climatic conditions and the adjacent vegetation’s ability to revegetate. Most often, propagules from the remaining vegetation is how the site recovers.

State and transition model

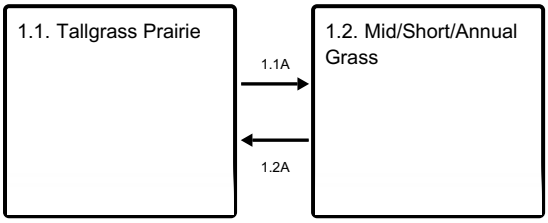
Ecosystem states



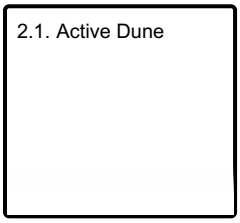
T1A - Loss of vegetative cover

R2A - Natural regeneration over time

State 1 submodel, plant communities



State 2 submodel, plant communities



State 1
Tallgrass Prairie

Dominant plant species

- seaoats (*Uniola paniculata*), grass
- bitter panicgrass (*Panicum amarum*), grass

Community 1.1
Tallgrass Prairie

Figure 9. 1.1 Tallgrass Prairie Community

The reference plant community consists of a tallgrass prairie with seaoats (*Uniola paniculata*) being the dominant

species and bitter panicum (*Panicum amarum*) as a co-dominant. Beach morning glory (*Ipomoea imperati*), goat foot morning glory (*Ipomoea pes-caprae*), and Gulf croton (*Croton punctatus*) are also found. These four species occur predominantly on the beachside of the dune because of their low tolerance to salt spray. Other important associated grasses which occur mainly on the backside of the dunes include seacoast bluestem (*Schizachyrium scoparium*), gulfdune paspalum (*Paspalum monostachyum*), marshhay cordgrass (*Spartina patens*), and thin paspalum (*Paspalum setaceum*). The reference community also supports a diverse understory community of perennial legumes and other forbs such as camphorweed (*Heterotheca subaxillaris*), American snoutbean (*Rhynchosia americana*), partridge pea (*Chamaecrista fasciculata*), and Hoary milkpea (*Galactia canescens*). Heavy grazing and elimination of fire results in a change from an open tallgrass prairie to a Mid/Short/Annual grass community (1.2). The Gulf side of the dune will increase in beach morning glory and goat foot morning glory. The backside of the dune will decrease in seacoast bluestem and gulfdune paspalum and an increase of red lovegrass (*Eragrostis secundiflora*), thin paspalum, threeawns, camphor weed, and crotons (Croton spp.).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	2326	3867	6081
Forb	981	1065	1597
Shrub/Vine	56	112	168
Total	**3363**	**5044**	**7846**

Figure 11. 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
Mid/Short/Annual Grass

This community is composed of midgrasses, shortgrasses, and annual grasses. Thin paspalum, red lovegrass, and threeawns on the backside of the dune and an increase in the population of beach morning glory and goat foot morning glory on the Gulf side of the dune. This site occurs due to overgrazing and the absence of fires. Overgrazing of bitter panicum and seaoats on the Gulf side of the dune lead to an increase of beach morning glory and goat foot morning glory. Overgrazing of seacoast bluestem and gulfdune paspalum result in an increase of thin paspalum, lovegrass, and threeawns. Further decline leads to partridge pea, crotons, camphor weed, annual panicums, and sunflowers. Bare ground is increased leaving this community susceptible to active dunes. Restoration is possible with the application of prescribed grazing and periodic prescribed burning.

Pathway 1.1A
Community 1.1 to 1.2

Heavy continuous grazing and lack of fire transition the site to Community 1.2.

Pathway 1.2A
Community 1.2 to 1.1

Prescribed grazing and return of periodic fire will restore Community 1.1.

State 2
Active Dune

Vegetation severely reduced or absent.

Community 2.1
Active Dune

This plant community forms because of continued overgrazing or a hurricane. Overgrazing removes all vegetation and allows the dune to become unstable. Hurricanes cause the vegetation to be burned by high salinity content carried by high winds laden with coastal water. Vegetation can also be buried under thick sediment deposits of sand. Some areas are scoured and devoid of vegetation and may temporarily suffer complete vegetative loss. This community can recover to reference conditions given enough time. Deferment is the main management practice for recovery. Vegetation typically reestablishes through propagules sent by remaining plants, therefore recovery will be dependent on remnant population densities.

Transition T1A
State 1 to 2

Continued heavy grazing, lack of fire, or a hurricane will remove vegetation and cause a transition to State 2.

Restoration pathway R2A
State 2 to 1

Deferment and time will restore reference conditions. Active dunes will need to be stabilized by vegetation in order for restoration to take place.

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	**Tallgrasses**			942–2466	
	bitter panicgrass	PAAM2	*Panicum amarum*	942–2466	–
	seaoats	UNPA	*Uniola paniculata*	942–2466	–
2	**Tallgrasses**			471–1233	
	gulfdune paspalum	PAMO4	*Paspalum monostachyum*	471–1233	–
	little bluestem	SCSC	*Schizachyrium scoparium*	471–1233	–
3	**Midgrasses**			353–925	
	thin paspalum	PASE5	*Paspalum setaceum*	353–925	–
	saltmeadow cordgrass	SPPA	*Spartina patens*	353–925	–
4	**Grasses**			118–308	
	Grass, perennial	2GP	*Grass, perennial*	118–308	–
	Wright's threeawn	ARPUW	*Aristida purpurea var. wrightii*	118–308	–
Forb					
5	**Forbs**			235–616	
	partridge pea	CHFA2	*Chamaecrista fasciculata*	235–616	–
	American snoutbean	RHAM	*Rhynchosia americana*	235–616	–
6	**Forbs**			118–308	
	dayflower	COMME	*Commelina*	118–308	–
	goldentop	EUTHA	*Euthamia*	118–308	–
	hoary milkpea	GACA	*Galactia canescens*	118–308	–
	camphorweed	HESU3	*Heterotheca subaxillaris*	118–308	–
	Riddell's ragwort	SERI2	*Senecio riddellii*	118–308	–
Shrub/Vine					
7	**Vines**			94–247	
	beach morning-glory	IPIM	*Ipomoea imperati*	94–247	–
	bayhops	IPPE	*Ipomoea pes-caprae*	94–247	–
8	**Shrub**			22–62	
	pricklypear	OPUNT	*Opuntia*	22–62	–

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 sandy soils of this site is rapid. However, because of the level terrain and proximity to the Gulf of Mexico, this site may be inundated periodically.

Recreational uses

The Padre Island National Seashore is a popular tourist designation throughout the year. Because the National Seashore endeavors to preserve Padre Island in its natural state, visiting the island is very much like stepping back into the past. Birdwatching and saltwater fishing are popular recreational uses.

Inventory data references

A team of range specialists and soil scientists, with years of coastal field experience, made onsite field visits to evaluate the vegetation present on this site to provide this technical ecological site description. Six R-417 forms were used from Matagorda Island in Calhoun County.

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Approval

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Acknowledgments

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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)	
Contact for lead author	
Date	05/13/2025
Approved by	Bryan Christensen

Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

2. **Presence of water flow patterns:**

3. **Number and height of erosional pedestals or terracettes:**

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

5. **Number of gullies and erosion associated with gullies:**

6. **Extent of wind scoured, blowouts and/or depositional areas:**

7. **Amount of litter movement (describe size and distance expected to travel):**

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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

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:

    Sub-dominant:

Other:

Additional:

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

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

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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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:**

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17. **Perennial plant reproductive capability:**
