

T E X A S

beaches & dunes





Texas beaches and dunes

Texas General Land Office • Jerry Patterson, Commissioner

Texas beaches and dunes



Intertidal

1. **Brown Pelican** – *Pelecanus occidentalis*
2. **Double-crested Cormorant** – *Phalacrocorax auritus*
3. **Laughing Gull** – *Larus atricilla*
4. **Sanderling** – *Calidris alba*
5. **Sargassum Weed** – *Sargassum* sp.
6. **Long-billed Curlew** – *Numenius americanus*
7. **Coquina** – *Donax texasianus*
8. **Ghost Shrimp** – *Callinassa islagrande*
9. **Polychaete Worms** – *Scolecopsis squamata*
10. **Mole Crab** – *Emerita benedicti*
11. **Willet** – *Catoptrophorus semipalmatus*

Backbeach to Dune

12. **Ghost Crab** – *Ocypode quadrata*
13. **Sea Purslane** – *Sesuvium portulacastrum*
14. **Goat-foot Morning Glory** – *Ipomoea pes-caprae*
15. **Little Yellow Sulphur** – *Eurema lise*
16. **Gulf Croton** – *Croton punctatus*
17. **Keeled Earless Lizard** – *Holbrookia propinqua*
18. **Kemp's Ridley Sea Turtle** – *Lepidochelys kempii*
19. **Dragonfly** – *Epicordulia* sp.
20. **Sunflower** – *Helianthus* sp.
21. **Indian Blanket** – *Gaillardia pulchella*

Subtidal

22. **Heart Cockle** – *Dinocardium robustum*
23. **Lettered Olive** – *Oliva sayana*
24. **Lightning Whelk** – *Busycon contrarium*
25. **Keyhole Urchin** – *Mellita quinquiesperforata*
26. **Common Baby's Ear** – *Sinum perspectivum*

Dune

27. **Bitter Panicum** – *Panicum amarum*
28. **Spotted Ground Squirrel** – *Spermophilus spilosoma*
29. **Luna Moth** – *Actias luna*
30. **Western Diamondback Rattlesnake** – *Crotalus atrox*
31. **Kangaroo Rat** – *Dipodomys ordii*
32. **Prickly Pear** – *Opuntia lindheimeri*
33. **Marshhay Cordgrass** – *Spartina patens*
34. **Coyote** – *Canis latrans*
35. **Turkey Vulture** – *Cathartes aura*
36. **Northern Harrier** – *Circus cyaneus*
37. **Sea Oats** – *Uniola paniculata*
38. **Beach Evening Primrose** – *Oenothera drummondii*

Dune Anatomy

39. **Swale**
40. **Coppice Mound**
41. **Wet Beach**
42. **Blowout**
43. **Foredune**
44. **Eolian Ridge**
45. **Mean High Tide**



Sand Dunes

What are dunes and why are they important?

Dunes are a resilient natural barrier to the destructive forces of wind and waves. They are the least expensive and most efficient defense against storm-surge flooding and beach erosion. Dunes absorb the impact of high waves and storm surges, preventing or delaying the intrusion of waters into inland areas. Dunes hold sand that help replenish eroded beaches after storms as well as buffer windblown sand and saltspray. By serving as our front line of defense against tropical storms and hurricanes, sand dunes can prevent property loss and save lives.

What factors threaten the stability of sand dunes?

The growth of mainland coastal population centers and the increasing development and recreational use of the barrier islands threaten the stability of the dune environment. Construction and heavy use of the beaches contribute to dune deterioration. The vegetation that secures sand is destroyed, sand is lost, and the dune line is breached by roads, trails, and storm runoff. Dune damage that results from human activities accelerates the damage caused by wind and wave erosion.

What can be done to preserve dunes and prevent dune deterioration?

- The natural defense dunes provide can be strengthened by enhancing the development and stability of existing dunes and by building new ones. Native vegetation can be planted to accelerate sand accumulation. Plants such as bitter panicum, sea oats, and marshhay cordgrass can help trap sand and stabilize dunes. Temporary structures such as slatted wood or plastic sand fencing may also be used, but use of natural plantings is preferable.
- In areas where local sand supply is insufficient, dunes can be artificially constructed with imported beach-quality sand. These constructed dunes must be vegetated to maintain their stability.
- Before beginning any beachfront construction or dune restoration activity, check with your local government beach and dune authority to obtain the proper permits and to ensure that no dunes will be harmed. To report destruction of dunes, or if you have any questions about dune protection or restoration, call the General Land Office Beach Access and Dune Protection Program at 1-800-998-4GLO.

Beach and Dune Anatomy

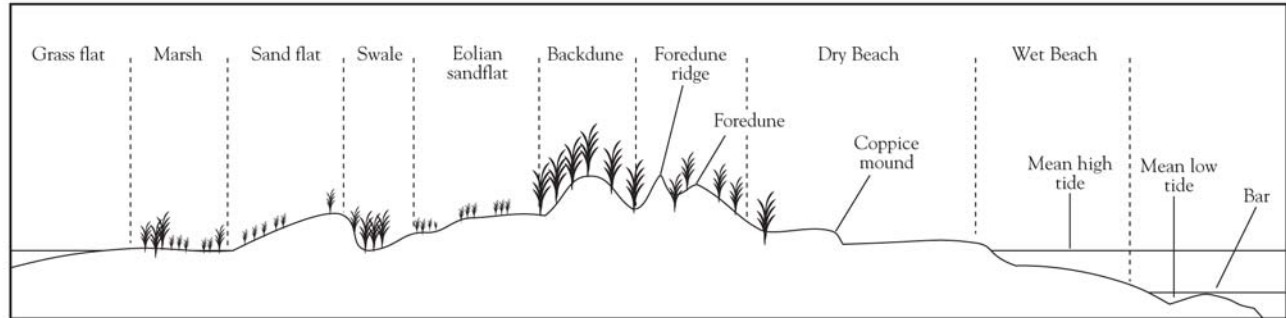


Figure 1. Cross section of a typical Texas barrier island

The **beach** extends from the mean low tide line to the line of natural vegetation along the shoreline (fig. 1).

The **wet beach** is the area affected by normal daily tides.

The **dry beach** is inundated only by storm tides and the higher spring tides. The dry beach also supplies sand to the dunes.

Coppice mounds, the initial stages of dune growth, are formed as sand accumulates on the downwind side of plants and other obstructions on or immediately adjacent to the beach. The mounds are a source of sand that is exchanged via water with offshore bars.

Coppice mounds may become vegetated and eventually increase in height, becoming foredunes.

Foredunes are the first clearly distinguishable, vegetated dune formations landward of the water. They are also the first to dissipate storm-generated wave energy.

The **foredune ridge** is high, continuous and well stabilized by vegetation. This ridge normally rises sharply landward from the foredune area but may rise directly from a flat, wave-cut beach immediately after a significant storm. The foredune ridge helps block storm surge and prevents it from washing inland.

The Sand Cycle

Beaches and dunes are integral parts of a dynamic environment in which sand is constantly exchanged. During the calm conditions that prevail throughout most of the year on the Texas coast, waves average 2 to 4 feet in height and are less frequent than during storms. These calmer waves transport sand from offshore bars and the surf zone to the beach, causing the beach to gradually build up, or accrete. In time, sand is blown onto the foredune, where it is trapped by vegetation and stored until displaced by storms.

During a storm, high-energy waves flatten the beach. Waves washing against the base of the foredunes erode sand, undermining and collapsing the seaward dune face. In severe storms, the dune face commonly recedes several yards—in extreme cases as much as 100 yards—leaving a steep cliff (fig. 2).

Sometimes dunes are destroyed. Retreating waves carry the eroded sand offshore and deposit it just seaward of the surf zone in large bars. This process of dune erosion and sand movement dissipates much of the energy of storm waves. Sandbars also dissipate storm wave energy by causing waves to break further offshore.

If the supply of sand remains constant, the natural exchange between the beach, dunes and offshore areas will repair and rebuild dunes to a height and width determined by local conditions. However, the loss of vegetation that traps and holds sand makes the beach and dunes more susceptible to wind and water erosion, thus inhibiting their recovery from storms. Bays, channels, marshes and grass flats behind the weakened foredune are exposed to storm-surge flooding and to the accumulation of windblown sand.

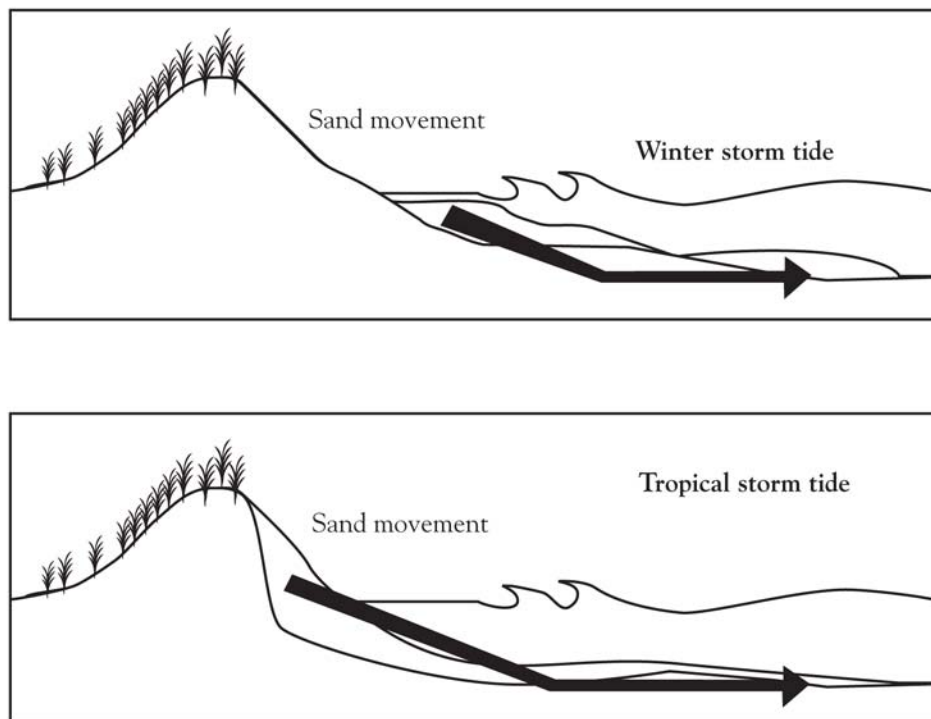


Figure 2. Action of storm waves on foredunes

The Beach Access and Dune Protection Program

The responsibility for preserving the dunes and protecting the public's right to use and enjoy the beach is shared by the state and local coastal governments. Statewide minimum, uniform standards for dune protection ensure that dunes on South Padre Island receive the same protection as the dunes on Bolivar Peninsula. Similarly, statewide beach access standards protect everyone's right to use and enjoy oil Texas beaches.

Cities and counties along the coast are required to adopt laws to protect dunes, dune vegetation, and the public's beach access rights. Usually, these local laws are adopted as beach access and dune protection plans. Although they may vary slightly from one local government to another, these plans generally require dune protection pennies and beachfront construction certificates for any construction activity within 1,000 feet of the high tide line.

Dune protection permits detail the actions an owner, builder, or developer must take to prevent or minimize damage to dunes on a construction site. Typically, a dune protection permit will require that the builder avoid dunes when possible. Where dunes are unavoidably damaged or destroyed, the permit may

require that the builder repair the damage or replace dunes and dune vegetation.

Local governments also issue beachfront construction certificates, which ensure that coastal construction does not interfere with the public's access to, use of and enjoyment of the beach. Some certificates may require the construction of new public beach accessways or the provision of off-beach parking.

The state reviews local beach access and dune protection plans and certifies that they meet the minimum state standards set forth in the General Land Office rules. The General Land Office reviews and comments on applications for local dune protection permits and beachfront construction certificates.

The Beach Access and Dune Protection Program is designed to help local landowners and communities protect and preserve their beaches so that all Texans can continue to enjoy them. If you have any questions or comments, please call the Coastal Division of the General Land Office at 1-800-998-4GLO.

Goals of the Beach Access and Dune Protection Program

The Beach Access and Dune Protection Program is designed to:

- Help beachfront property owners and local governments maintain a healthy beach/dune system;
- Assist local governments in managing the Texas coast so that the interests of both the public and private landowners are protected;
- Reduce the erosion of public beaches and discourage erosion-response methods, such as rigid shorefront structures, that can have a harmful impact on the environment and public and private property;
- Reduce flood losses and minimize loss of life and property;
- Protect the public's right of access to, use of, and enjoyment of the public beach;
- Ensure timely and predictable governmental decision making and permitting processes; and
- Educate the public about coastal issues.

Dune Damage

When the height of approaching storm waves exceeds the height of depressions along the dune ridge, water overflows the low points and washes down the landward side of the dunes, eroding sand and carrying it inland (fig. 3). These washover (or toplayer) areas deepen and widen under continual wave attack, allowing larger volumes of water to spill across the dune line and flow farther inland. In very severe storms, washover waters may even cut into interior lands areas.

Areas of frequent major washovers may regenerate dunes slowly due to the volume of sand removed through erosion and because the vegetation has been scoured.

Storms may also produce **washouts in** dune areas. These are similar to washovers, differing primarily in the direction of eroding waters. Generally, storm runoff from barrier islands and peninsulas is directed toward the bays. If there are breaches or depressions in the dunes, however, rainwater that collects in the **swales** (valleys between the dunes) may be channeled through these low points and overflow onto the beach, carrying sand with it (fig 4).

Washouts may also be formed by retreating bay waters. Hurricanes, particularly slow-moving ones, may pile water into bay systems. If natural channels to the gulf are too narrow to accommodate water retreating from the bays, washouts may cut across the low areas of least resistance in the barrier islands.

Blowouts are breaches in the dunes caused by wind erosion. They are aligned with prevailing southeasterly winds and are often cut down to the water table (fig. 5). During storms, blowouts may become channels for storm-surge waters from the gulf.

Disturbance of the foredunes, by vehicle, pedestrians, construction work, or grazing animals can destroy vegetative cover and promote wind erosion. If unchecked, this erosion can lead to almost complete removal of dunes, depleting the supply of sand available for exchange during storms. Sometimes entire dunes are bulldozed to level a construction site or to lay pipelines. In these cases, damage is not limited to the immediate site. Dunes adjacent to the site are exposed to wind erosion.

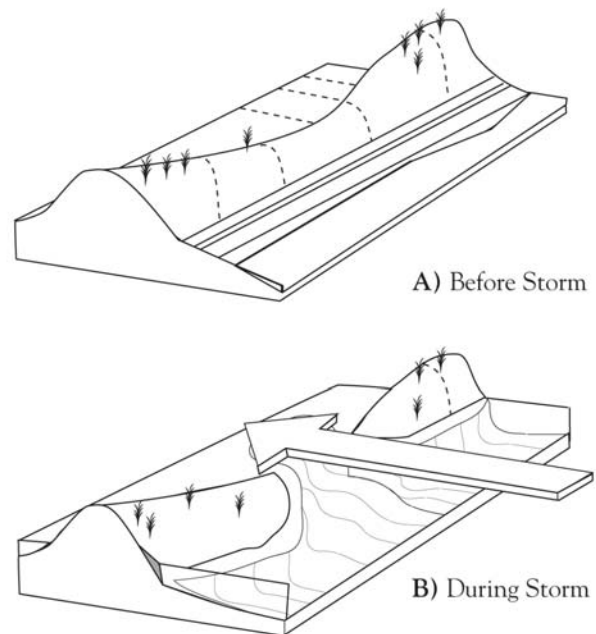


Figure 3. Washover from storm surge

Continued—

Seawalls, bulkheads and groins protect property landward of them against erosion. However, these structures can enhance shoreline erosion elsewhere. By withholding sand that would otherwise be transported alongshore, erosion-control structures, such as groins, inhibit dune development in areas downdrift of them. In general, rigid structures are less efficient than the naturally resilient dunes as defense against storm surge. The beach directly in front of a vertical seawall may be eroded by waves rebounding off the structure during storms. The seawall itself may eventually be undermined (fig. 6). Concrete slabs exposed to similar conditions will be undermined and eventually collapse under their own weight. Slabs connected to supporting pilings can pull down decks and house foundations, causing the entire house to roll forward onto the beach.

Devegetation of dunes can ultimately be as damaging as direct removal or withholding of sand. Vegetation is often removed from a large area when a construction site is cleared. Plants are trampled and uprooted by pedestrian traffic, motor vehicles, horses and grazing cattle. As trails are established along frequently used routes through the dunes, the vegetation is destroyed and the wind begins to carry sand from the exposed area. The continual loss of sand deepens the trail. Sloughing away of sand from the trail's sides widens it. A washout or washover may then develop.

Improperly constructed beach access roads through the dunes are subject to the same erosive processes and may become channels for storm surge.

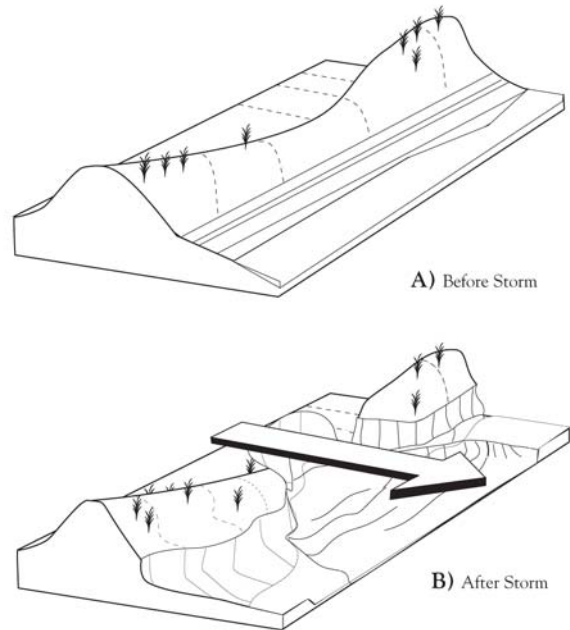


Figure 4. Washover in a dune ridge from retreating bay waters or stormwater runoff

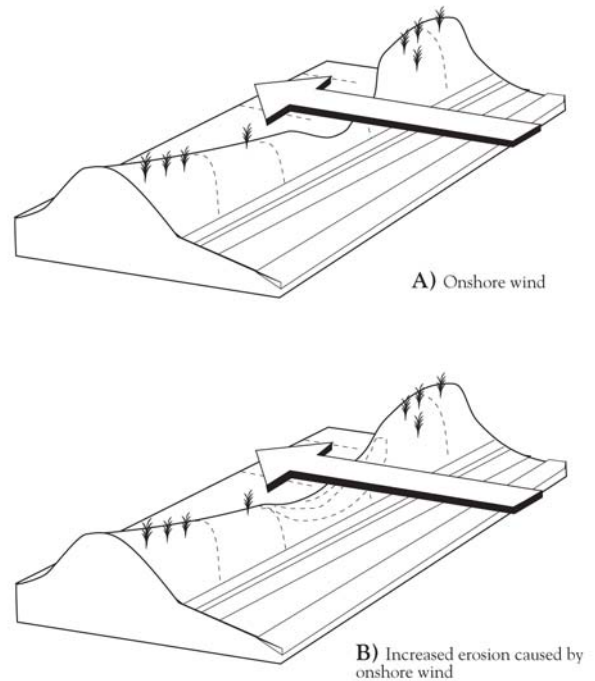
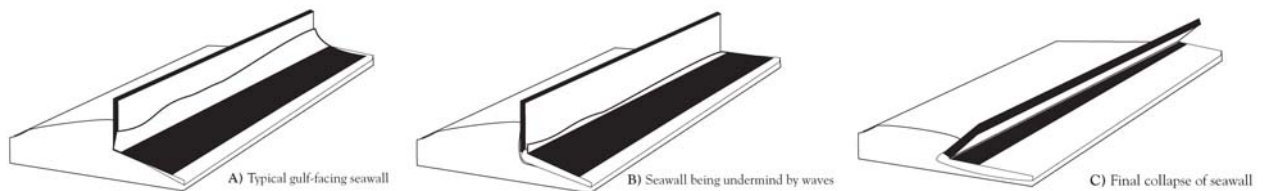


Figure 5. Formation of a blowout



Beach and Dune Conservation Education

Many Texans are beginning to appreciate the great natural and economic benefits provided by healthy dunes. Large, well-vegetated dunes can absorb the energy of storms and high waves, providing effective protection for coastal homes, businesses, and properties.

For years, coastal citizens, local governments, coastal landowners and many organizations have worked together to protect our dunes and beaches from damage.

If you are interested in joining with other Texans to protect and build coastal dunes and beaches, or if you need information on programs that address beach and dune protection, contact the following organizations or agencies. The best place to start is the General Land Office, Coastal Resources Program.

For general information, contact:

Coastal Resources Program

Texas General Land Office

PO Box 12873

Austin, Texas 78711-2873

1-800-998-4GLO

www.glo.state.tx.us/coastal.html

For information on shoreline changes,

Bureau of Economic Geology

The University of Texas at Austin

Box X, University Station Austin,

Texas 78713-8924

(512) 471-1534

Publications Department

(512) 475-9513

(512) 471-0140 (Fax)

pubsales@beg.utexas.edu

Contacts at:

[Local Beach/Dune Permitting](#)

[Authorities](#)

For endangered species information, contact:

Texas Parks and Wildlife Department

Resource Protection Division

4200 Smith School Road

Austin, Texas 78744

(512) 389-4800

1-800-792-1112

For information on enforcement of the
Open Beaches Act, contact:

Office of the Attorney General

Natural Resources Division

300 W. 15th Street

Austin, Texas 78701-2548

(512) 463-2012

For information on using vegetation for shore-
line stabilization, contact:

Natural Resources Conservation Service

101 S. Main Street

Temple, Texas 76501-7682

(254)-742-9800

For information on coastal flooding and building requirements, contact your county or municipal floodplain administrator, engineer, or planner.