STOP #1: PACKERY CHANNEL – BEACH TO BAY

We will start this field guide near the north jetty of Packery Channel and hike across the island to Corpus Christi Bay (**fig. 1**). The island emerges from the Gulf of Mexico at the beach. Behind the beach are a series of dunes. The dunes, which are mostly stabilized by vegetation, give way to a vegetated flat that extends back toward Corpus Christi Bay. Highway 361, the main road down Mustang Island, generally runs along the vegetated flat just behind the dunes. Away from the dunes, across the vegetated flats, is the bay margin at the edge of Corpus Christi Bay. In the shallow waters of the bay itself are the marine grassflats. The major environments are easy to recognize. Each has its own characteristics, each has its own flora and fauna, and they occur in a predictable sequence because each is linked to the others by interdependent processes.

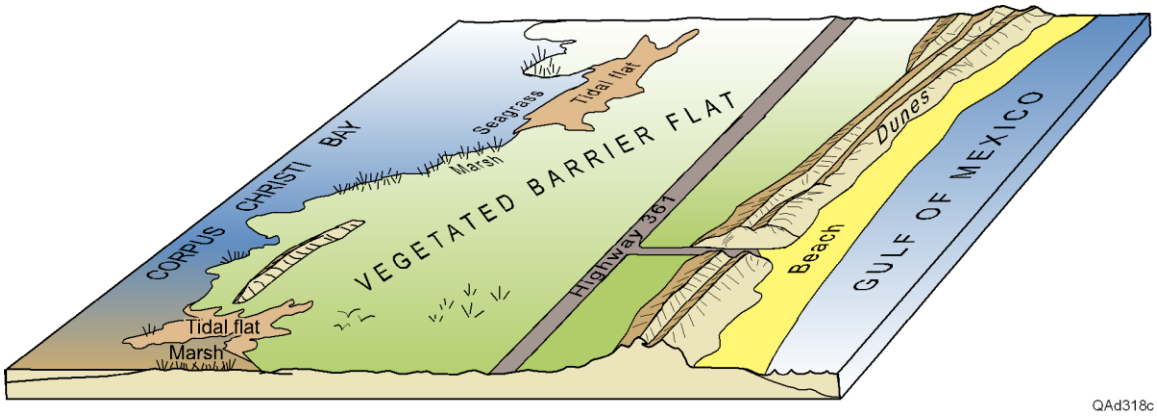

Figure 1. Schematic illustration of the major environments on Mustang Island.

PACKERY CHANNEL: Packery Channel, along with Newport Pass, 1852 Pass, and Corpus Christi Pass (Stop #2), form a complex of storm-washover channels along northern Padre Island and southern Mustang Island. A storm-washover channel is like a temporary tidal inlet that occurs where Gulf of Mexico waters driven by storms have washed over the island eroding a channel and depositing sand in the bay. Storm-driven waves from hurricanes have opened Packery Channel in 1933, 1945, 1961, 1964, 1967, and 1970. Each time the natural tidal currents were too weak to keep the channel open, and it was blocked with sand within a few months.

For many years residents in Corpus Christi debated the pros and cons of reopening Packery Channel to allow for the exchange of tidal waters between the Gulf of Mexico and Corpus Christi Bay and upper Laguna Madre. Reopening Packery Channel would require dredging the channel to a depth that would allow boats to pass between the Gulf of Mexico and Corpus Christi Bay. The pass would also need to be stabilized with jetties and re-dredged from time to time in order to keep the pass open. A jetty is a wall built into the ocean along a navigational channel that stabilizes the channel and provides protection from waves and currents. In 2003 the United States Army Corps of Engineers began a project to create a permanent tidal inlet at Packery Channel (**fig. 2**). A tidal inlet

is a channel through the barrier island that allows water driven by the tides to enter the bay at high tide and leave the bay at low tide.

Figure 2. Construction at Packery Channel, November 8, 2004. Photo courtesy of the City of Corpus Christi (http://www.cctexas.edu/engineering/packery).

BEACH: The beach, the gently sloping shore of a body of water which is washed by waves or tides, is a dynamic environment. This narrow strip of real estate is constantly being rearranged by the daily forces of waves, tides, and weather. **Figure 3** is a profile or cross section from the Gulf of Mexico to Corpus Christi Bay.

At first glance a beach seems like a simple environment. However, if you look closely this narrow interface between land and sea has many different parts; even the sandy part of the beach has different parts, the forebeach and the backbeach! The forebeach is the sloping part of the beach lying between the high tide mark and the low-water mark of the run-down of the waves at low tide. This area is constantly under the influence of waves and is exposed, then submerged, by the rise and fall of tides. The backbeach is the upper zone of the beach lying between the high tide mark to the point where vegetation begins or there is a change in slope. The backbeach is nearly horizontal or slopes down slightly landward. The backbeach is commonly under the influence of the wind. Only during high-water events are waves a factor in this zone. The backbeach is where most beach goers like to leave their blankets, umbrellas, and coolers.

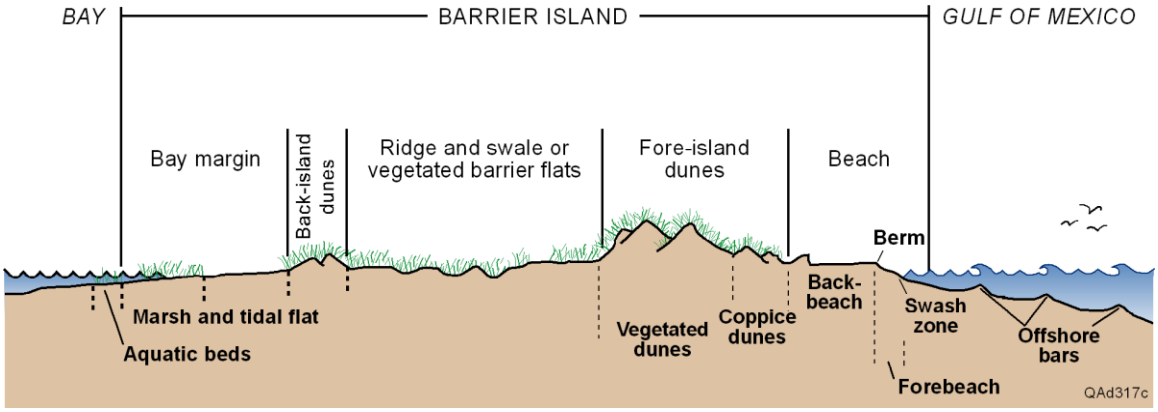

Figure 3. Schematic cross section of Mustang Island about 2 miles across, illustrating the major environments. Dune heights may exceed 25 feet.

DUNES: At the back of the beach are sand dunes (**fig. 4**). The dunes are an almost continuous chain of sand hills that form the spine of Mustang Island. The first observation you will make about the dunes is that the topography, the shape of the land, has suddenly changed. We are no longer on the gently upward sloping backbeach. We're now in the "hills"! The dune crests are the highest elevation on Mustang Island. The height of these dunes may reach 11 meters (36 feet), though 5 to 6 meters (16 to 20 feet) is a more common height. You will also notice that the dunes are more or less covered by vegetation. The island's existence depends upon sand dunes, especially those with vegetation. Other than people, the main threats to barrier islands are tropical storms and hurricanes. The dunes are the main defense against erosion by the powerful waves of a large storm. A large dune covered by dense vegetation is much more able to resist the power of a large storm than a smaller dune or a dune with less vegetation.

Sand dunes are formed by the wind. The wind picks up loose, dry sand from the beach and drops it in the dunes. Look at the dunes at the edge of the backbeach. Look at the size of the sand grains, the "texture" of the sand. The dune sand is generally finer than the beach sand, because winds typical of this area can't move coarse sand like the waves can. The dune sand is also more even textured; the sand grains have a more uniform size. Finer grained silts are carried far away by the winds, and coarser sand and shells are left behind on the beach.

There is a class of dunes that exists because of the interplay between plants and the winds. These coppice dunes (**fig. 5**) are irregular cones of sand crowned by plants. Coppice dunes form where a shrub, bush, or other plant interrupts the course of the wind. The turbulence caused by the plant slows the wind, and sand is deposited at the base of the plant. Over time, the sand pile grows larger and the plant grows taller to stay above the rising sand. Eventually the coppice dune will merge with other coppice dunes forming a foredune (**fig. 4**). The foredune is the first high ridge at the landward margin of the beach. The top of the foredune is an excellent vantage point for a good look at the barrier island. But try not to step on the plants that help stabilize the dune.

Figure 4. Vegetated dunes at the landward edge of the backbeach, Mustang Island State Park.

Figure 5. Coppice dunes formed at the back of the beach.

VEGETATED BARRIER FLAT: The largest environment on Mustang Island is the vegetated barrier flat, a flat, low-relief but bumpy plain, covered by plants, that extends from the back of the dunes almost to Corpus Christi Bay (**fig. 1**). There are some patches of back-island sand dunes, as well as depressions that host small freshwater ponds and marshes, and it is covered by grass and other low vegetation. The vegetated barrier flat makes up a significant part of the barrier island. As the barrier island formed and grew by deposition of sediments on the Gulf shore, older beach and dune deposits were reworked by winds and storms to become the extensive barrier flat we see today. Compared with the beach, dunes, and bay margins, the vegetated barrier flat is a less active and more stable environment.

BAY MARGIN: Most of the bay margin has very low relief as the land gently merges with the shallow waters of Corpus Christi Bay. The environments of the bay margin are controlled by subtle changes in elevation, depth of water, and salinity. Because water depths are so shallow and relief is so low, a small change in water level may cause a large change in the amount of land that is either covered by water or exposed to the air. Winds, tides, and storms can cause water levels to rise or fall by a few feet. The main environments are salt marshes, marine grassflats, and tidal flats. These environments are of critical importance to the ecosystems of the bays and the Gulf of Mexico. These areas are the nurseries for all of the commercially important species of fish and shellfish. The bays are also the wintering ground for many species of waterfowl.

Salt marshes (**fig. 6**) occur at the transition between areas of generally dry land and the areas that are commonly covered by the waters of the bay. The bay side of Mustang Island is a good place to see salt marsh. Low marsh soils are covered by water for some significant part of most days, and the high marsh generally is only slightly above high tide. Because the soils are water-saturated, they have very little oxygen. It takes special plants to survive in an environment that has this combination of salt water and very little oxygen in the soils. The plants at the bay shore are an important part of the ecosystem of the bay, and important to the geology of the bay. The plants help stabilize the shore and also trap sediments. Over time, the sediment trapped by the plants may cause the shore to build out into the bay.

Figure 6. Salt marsh at the edge of Fish Pass on Mustang Island. Saltmarsh cordgrass is the vegetation at the waters edge. Photo by Tom Tremblay.