



*Protect the Natural Dune Seawall  
and Prevent Hurricane Destruction at Port Aransas, Texas*

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October, 2005*

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## **Executive Summary**

We have just witnessed the incredible destructive power of two major hurricanes, Katrina and Rita on the Texas, Louisiana, Mississippi and Alabama. Whole towns have been wiped from the face of the earth at Holly Beach, Cameron, Waveland, Gulfport, and other locations.

Our natural dune seawall is our only protection from total destruction in a major hurricane. Port Aransas beaches and dunes undergo a cycle of erosion during major storms and rebuilding in the calm between storms. We have broken that cycle in Port Aransas by not allowing the *critical coppice dunes* to rebuild seaward and extend the foredunes since Hurricane Allen eroded them 25 years ago. The problem is being made worse now that upper beach sand, deposited both naturally and by city equipment, is being transported to the water for it to wash away and be lost to our natural dune seawall forever. Heavy equipment operated by the City of Port Aransas is illegally destroying *critical coppice dunes* and their nursery area on the upper beach. This is extremely short sighted because most other Texas coastal communities are spending millions to place sand on their upper beaches, the very place where we are removing it. As Hurricane Katrina and Hurricane Rita have shown, coastal towns with no man-made seawall or natural dune seawall get totally destroyed in such storms.

Beach management that reduces the ability of our natural dune seawall to build out and up to the maximum possible is a great mistake when we realize that sometime we will have our Katrina, or Rita, or Celia, or Carla, or 1919 storm. It is coming, the only question is when. Let's allow natural beach processes build our *critical coppice dunes* so that they join onto the foredune ridge and extend it and improve our natural dune seawall protection the way nature intended. We can ignore powerful natural systems for a while, but in the end man always loses.

We are spending a fortune to unsuccessfully maintain a driving lane in the nursery where *critical dunes* form and weakening the future of our natural dune seawall at the same time. There is a better way!

Preventing the natural dune seawall from being rebuilt after storms, removing sand from the *critical coppice dune* area and the upper beach reduces the sand reservoir available to protect us when we get hit by a strong hurricane. We were able to stop damage to the dunes by dune buggies 35 years ago. Can we prevent damage being done by government now?

## Introduction

We have just witnessed the incredible natural destructive power of two major hurricanes, Katrina and Rita on the Texas, Louisiana, Mississippi and Alabama coasts. Now we are seeing the intentional destruction of our own dunes in Port Aransas. Our natural dune seawall is our only defense against the tragic loss of life and property that we saw elsewhere just a few weeks ago



when Katrina and Rita came ashore. Whole towns have been wiped from the face of the earth at Holly Beach, Cameron, Waveland, Gulfport, and other locations. These and other storms have caused severe erosion along Bolivar Peninsula, Galveston Island and Follets Island (Surfside) in Texas, and people are losing their homes to the sea. The photo on the left above shows the massive overwash on Dauphin Island, Alabama by Hurricane Katrina. Dauphin had little dune



development to protect it. The photo on the right above shows Surfside Village, Texas where several rows of houses have already been lost to beach erosion. Look at the houses now on the beach. Surfside has little or no natural dune seawall to protect it. The natural dune protection that it had has been removed by previous storms. The photo at the left shows what little is left of Holiday Beach, LA after Rita. Holiday Beach had no natural dune seawall (photo from National Geographic News).

Port Aransas and Mustang Island are fortunate to be protected by a wide band of strong, high vegetated dunes. This is our natural dune seawall and it provides the very best protection from destructive hurricane overwash, far better than an expensive and unsightly man made seawall. Short sighted beach management is putting our entire town at risk at the same time that it is costing large amounts of money to move sand. I am sure that we can find better uses



for that money in our rapidly developing town and at the same time manage our beaches to enhance the growth, strength and stability of our natural dune seawall.

## Texas Beaches are Eroding

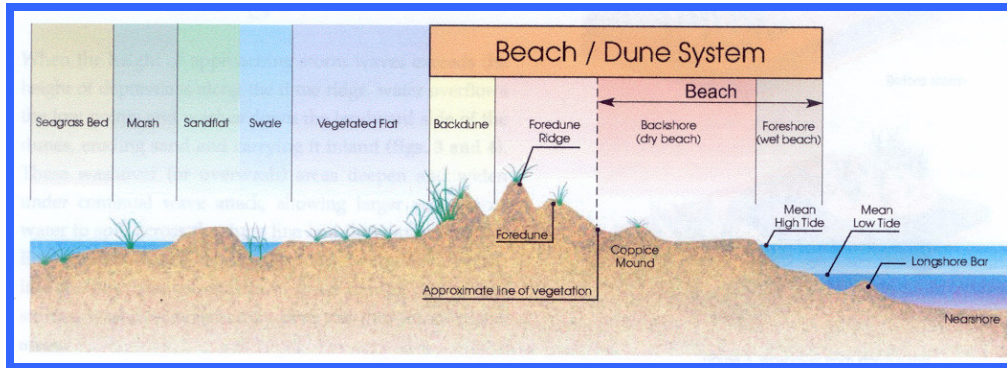
Nearly all of the Gulf beaches of Texas are undergoing rapid erosion. The only beaches that are not eroding are located adjacent to jettied inlets, at river deltas where the river flows directly into the Gulf, and in the longshore sediment convergence zone of Central Padre Island. Extremely severe beach erosion has been occurring on Bolivar Peninsula in the vicinity of Rollover Pass, West Galveston Island, Surfside on Follets Island, Quintana Beach, Sargent Beach, and South Padre Island.

The net result of man-made changes to the Gulf Coast and rivers of Texas is severe and accelerating beach erosion along much of the Gulf shoreline, at the same time that development is exploding as more people want to vacation or live on the Gulf beaches. The man-made changes that have caused this massive erosion cannot be undone, if we are to have water supplies and ports for Texas.

## Erosion of Port Aransas and Mustang Island Beaches

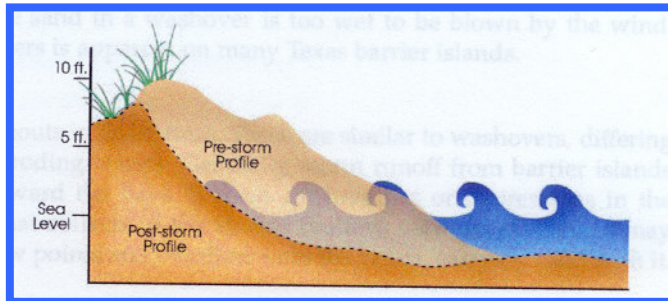
Most of Mustang Island is undergoing beach erosion and shoreline retreat of 2-3 ft./yr. From the Aransas Pass jetties to about 4 miles south of the jetties the beach and shoreline are stable and may even be growing slightly. This is because that section of the shoreline is in the wave shadow of the jetties and is protected from waves coming from the northeast and east which carry sand south along the beach. But, the southeast and south winds create waves that still carry sand to the north along the beach causing net growth or stability in that four mile stretch of beach just south of the jetties. We are lucky that the older part of the City of Port Aransas is located at one of the very few places in the Texas coast where there is little or no beach erosion and shoreline retreat. This is wonderful. It is good insurance for us to make sure our natural dune seawall is the strongest that it can be.

If we look at a typical profile across a barrier island like ours, we can see the relationship between the beach and the dunes and how they change in storms and the recovery period after storms. This diagram from the Texas General Land Office (GLO) is very similar to the actual situation here in Port Aransas. Cross Section of a Texas Barrier Island (Dune Protection and Improvement Manual, fourth edition, Texas General Land Office.



Cross Section of a Texas Barrier Island (Dune Protection and Improvement Manual, fourth edition, Texas General Land Office. <http://www.glo.state.tx.us/coastal/pdf/DuneManual.pdf>

Note the location of the coppice dunes with vegetation is in the transition zone between the beach and the dunes at the upper backshore (dry beach). They are miniature dunes and their correct name is coppice dunes. These coppice dunes form when dry sand blows up from the foreshore and the seaward part of the backshore and begins to accumulate around patches of vegetation or in small dunes with no vegetation. With time, the vegetation causes more sand to accumulate and the coppice dunes grow larger and eventually weld onto the foredune ridge or begin to form a new dune ridge seaward of the existing one. In this way, the line of vegetation and the vegetated dunes slowly grow seaward in the interim between hurricanes. The GLO paper defines “critical dunes as all dunes (coppice dunes, foredunes, foredune ridge, and some backdunes) that store sand to replenish eroding public beaches.” Clearly the dunes that form on the backshore of Port Aransas beaches are *critical dunes* and need to be protected.



This GLO illustration, shows how the beach-dune system changes during a storm. The higher the storm surge water level, the more important the protection by a strong natural dune seawall. Sand from the beach, the coppice dune area and the foredunes is eroded and is transported offshore into the nearshore bar zone, flattening the beach

profile. This has the very useful benefit of causing the waves to expend more energy offshore and reduce the rate of attack on the main dune line, buying precious time so that the storm has time to pass before destroying the entire natural dune seawall and the structures behind it. If the coppice dunes and the foredunes are well vegetated, the root system slows the rate of erosion of these *critical dunes* during wave attack by storms. Well vegetated coppice dunes on the upper beach in front of the main foredune line protect the foredunes from rapid undercutting and

collapse during wave attack. In extreme storms, the dunes erode back as much as 100 yards. Hurricane Carla which struck the coast at Port O'Conner in 1961, eroded the dunes back about 200 feet at Port Aransas, far to the south of where Carla went ashore. Parts of the coast with a poorly developed foredune ridge, well protected at the toe by vegetated coppice dunes can lose their entire dune system and then be subject to massive hurricane overwash which destroys virtually all man-made structures further inland. We just saw that happen in Katrina and Rita.

### What is the Problem with Port Aransas Beach Management?

Port Aransas from Horace Caldwell Pier to the Aransas Princess Condominium has an unnaturally wide beach created by our beach management practices since Hurricane Allen eroded the dunes in 1980. Note how wide the beach is from the pier to the Aransas Princess (between the red arrows).



Since 1980, traffic has been forced by traffic barrier posts to drive very close to the toe of the dunes, where vast amounts of dry sand is naturally blown in from the lower beach and deposited by the wind. This is the nursery where *critical coppice dunes* naturally form. Between the traffic and regular removal of the loose sand by

road graders and front end loaders, the *critical coppice dunes* have not been allowed to form and grow the vegetated dune line seaward to make up the loss in vegetated dunes eroded by Hurricane Allen back in 1980. In fact heavy machinery is destroying the nursery where infant dunes are born.

Shortly after Hurricane Allen, a new line of mile markers on high posts was installed along the beach. They are now buried in the high dune ridge facing the beach. If you look south of the Aransas Princess, the same line of mile markers is well inland, showing how much the *critical coppice dunes* have built the vegetated dunes seaward in the intervening period since Hurricane Allen. Also south of the beach where the traffic has been forced to drive up next to the dunes, you can see how much narrower the beach is. Our beach is not wide because it is newly deposited beach, it is wide because the *critical coppice dunes* have been either destroyed or not permitted to form. This weakens our natural dune seawall and has some very serious implications for our future ability to withstand a pounding attack of hurricane surge and waves. Remember, we will most definitely be subject to direct attack by a major storm again in the future. The only question is when.

As you can see, the normal cycle is for storms to erode the dunes and then for the dunes to rebuild seaward to their previous location or farther in the time between storms. This provides a larger reservoir of sand in the *critical coppice dune area and the foredunes* that must be eroded before more inland dunes and the town itself can be attacked by the storm surge and storm waves. We have not allowed the dunes to properly repair themselves in the 25 years since Hurricane Allen eroded them back. If we continue with this beach management method, we will have a net loss of *critical dunes* and our natural dune seawall with each succeeding storm. Instead of losing dune protection which then naturally repairs itself, the main dune line will retreat further with each storm until, finally, there is no natural dune seawall to protect us at all. Instead of “back and forth,” we are creating “back and back.”

There have been complaints from property owners about the high, partially man made, dune ridge along the beach where our beach is unnaturally wide. This has been created partially by stacking up sand and sargassum from beach cleaning and partially from wind-blown sand that could not be caught in the missing *critical coppice dunes* that should have been trapping the sand on the upper beach. Some of these property owners would like this, now well-vegetated dune ridge to be cut down to restore their view. That is very shortsighted planning as well as being highly illegal. Yes, they are partially man-made, but they are providing good storm protection. Someone has come up with the derogatory term “sand dam” to describe this *critical dune ridge*. Remember that one of the main reasons for constructing dams is to prevent major floods. The *critical* dune that some are calling a “sand dam” will serve well indeed to protect the structures landward of it from storm surge flooding and direct wave attack during the next major hurricane to strike Port Aransas. In other communities like Surfside Village near Freeport and Gilchrist on the Bolivar Peninsula, the residents are begging to have sand placed on the upper beach to stop the loss of their homes into the sea. There is no better hurricane protection than multiple wide rows of high and continuous vegetated dunes. Most residents along the coast would be thrilled to have what we are so willing to discard.

It has been argued that we need the wide beach to attract tourists. Cars never park more than one deep along our beaches, so at the minimum there is one car’s width of beach space for all beach goers. Visitors might be happier if they didn’t have to worry about getting stuck because they are driving in the loose sand *critical coppice dune* area. If we move the cars further down the beach where the sand is hard, cars won’t get stuck as they do now and *critical coppice dunes* will be able to form in their natural nursery area.



The city is currently moving truck loads of sand from the road area on the upper beach and dropping it into the water. According to the city manager, “We are depositing sand at the water’s edge from the road on occasion. Also, we are looking to start biting into what’s left of the seaweed dunes in November, and placing that material back in the water. Rita’s surge took out a lot of our seaweed dunes down

on the south end of the beach.” This apparently is with the blessing of the GLO. There has been a turnover of GLO staff and they don’t seem to grasp the seriousness of the situation and the fact that *critical coppice dunes* which are protected by state law are being destroyed. If a private party was to remove that sand or disturb that vegetation they would get a very heavy fine. A few years ago a tourist in a rented beach buggy was fined over \$1000 for driving over a very small amount of vegetation in the very same area that the city is removing it with heavy equipment.

At the very time that the city is transporting sand from the upper beach back to the water to be washed south of town forever, one can see that the waves from Katrina and Rita have eroded our beach down 2 or 3 ft along the line of traffic control posts!

The wind is trying to replace the sand eroded by those storms and to build the dunes and the vegetation seaward and the city is throwing that precious sand away. Other municipalities along the Texas coast, including Gilchrist, Galveston, Surfside, North Padre Island, and South Padre Island are spending



millions of dollars to put sand on their upper beaches. Every bit of sand that is removed from the *critical coppice dune* area and the upper beach is sand that a hurricane would have to remove before it could attack the main dune ridge and our homes. That sand prevents small storms from damaging the main dune line and delays major storm attack on the main dune line. Over decades the sand that is being thrown away in the water can build a strong and complete dune ridge adding to our natural dune seawall. Why would we want to throw away storm protection that the natural system provides at no cost?

### Our Beach Management Program is EXPENSIVE!

It costs a lot of money to continually scrape our upper beach so that cars can drive where dunes want to form. Just last week, I drove from Avenue G in Port Aransas to the Fish Pass. It was tough going along the wide beach in the photo above and I nearly got stuck a couple of times even though my truck has wide tires. From the Aransas Princess Condominium all the way to the Fish Pass, it was easy driving on the hard packed wet beach. In the section where a fortune is being spent moving sand, the driving was difficult and where the beach has much less “maintenance” the driving was easy. We are spending a fortune to unsuccessfully maintain a driving lane in the nursery where *critical dunes* form and weakening the future of our natural dune seawall at the same time. There is a better way! Port Aransas can surely find a better use for the money that is being spent moving vast amounts of sand.



## Conclusions

Natural barrier island beaches and dunes undergo a cycle of erosion during major storms and rebuilding in the calm between storms. We have broken that cycle in Port Aransas by not allowing the *critical coppice dunes* to rebuild seaward and extend the foredunes since Hurricane Allen struck 25 years ago. The problem is being made worse now that upper beach sand, deposited both naturally and by city equipment is being transported to the water for it to wash away and be lost to our natural dune seawall forever. This is extremely short sighted when most other Texas coastal communities are spending millions to place sand on their upper beaches, the very place where we are removing it. The first four miles of Port Aransas south of the jetties the beach is stable or growing while most of the rest of the coast is eroding, including the rest of Mustang Island. But, the natural dune seawall is our only protection from total destruction in a major hurricane. The last major storm was Celia in 1970 and Carla before that in 1961. As Hurricane Katrina and Hurricane Rita have shown, coastal towns with no man-made seawall or natural dune seawall get totally destroyed in such storms.

Beach management that reduces the ability of our natural dune seawall to build out and up to the maximum possible is a great mistake when we realize that one day we will have our Katrina, or Rita, or Celia, or Carla, or 1919 storm. It is coming, the only question is when. Let's allow natural beach processes to build our *critical coppice dunes* so that they join onto the foredune ridge and extend it and improve our natural dune seawall protection.

I spearheaded the effort to get highly destructive dune buggies and 4 wheel drive vehicles out of the dunes of Mustang and Padre island in the late 60s with an educational campaign. The next two photos show the severe damage done to the dunes by these vehicles. The picture on the left was taken on north Padre island and the one on the right on U.T. property at the gun mounts. The curving road is Beach St.



I organized graduate students and we gave slide shows, had kids do poster contests and talked on TV. At our request, the Marine Science Institute placed huge signs along the beach access road asking people “*Don't Drive in the Dunes, Protect the Natural Dune Seawall.*” It worked and the roads and the gulleys through the dunes healed with time. That led to Nueces County writing the first dune protection laws which was followed by the state dune protection laws now administered by the GLO. Now the damage is being done by city government, apparently with

the approval of the very state agency which is entrusted with protecting the dunes and our natural dune seawall.

Preventing the natural dune seawall from being rebuilt after storms, removing sand from the *critical coppice dune* area and the upper beach reduces the sand reservoir available to protect us when we get hit by the big one. We were able to stop damage to the dunes done by dune buggies 35 years ago. Can we prevent damage being done by government now?

For further information go to: <http://TexasCoastGeology.com>

## *Additional Information is Available on the Web*

<http://TexasCoastGeology.com>

*The following page has further information about protecting our natural dune seawall plus a lot of information about hurricanes affecting the Port Aransas and Corpus Christi area.*

<http://texascoastgeology.com/pabeach/naturalduneseawall.html>

*The following page shows photos of sand removal from just in front of the dunes at Port Aransas*

<http://texascoastgeology.com/pabeach/sandremoval.html>

*This document can be downloaded at:*

<http://TexasCoastGeology.com/beach.pdf>