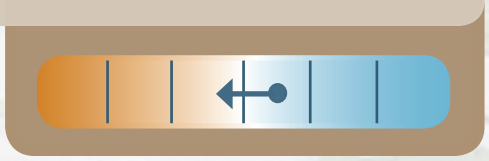
FOCUS QUESTION 5:

Are habitats for fish and wildlife increasing or decreasing?



What was measured: Acres of seagrass communities, acres of saltwater marsh, acres of freshwater marsh, number of rookery islands

Answer: Overall, seagrass communities are increasing along the Texas Coastal Bend. The Bureau of Economic Geology recorded 29,096 acres of seagrass in 1950 and 45,329 acres in 2004. The Texas Coastal Bend estuarine marshes are also increasing due to relative sea-level rise, where estuarine marsh spread into areas previously occupied by tidal flats. Coastal Bend palustrine (freshwater) marshes are decreasing due to island development, agricultural practices on the island, drier conditions and the landward movement of the salt/freshwater boundary.

There are currently around 185 rookery islands in CBBEP area and most have been eroding away at varying rates.

INDICATOR #14: Seagrass coverage.

Condition/Trend: Good/Improving

I. BACKGROUND

Submerged seagrass meadows are a dominant, unique subtropical habitat in many Texas bays and estuaries. These marine plants play critical roles in the coastal environment, including nursery habitat for estuarine fisheries, a major source of organic biomass for coastal food webs, effective agents for stabilizing coastal erosion and sedimentation, and major biological agents in nutrient cycling and water quality processes.

Five seagrass species occur in Texas. These species represent highly specialized marine flowering plants (but not actually true grasses) that grow rooted and submersed in the higher salinity waters of most Texas bays and estuaries.

Propeller scars within turtle seagrass bed.

Seagrasses were determined to be worth $9,000 to $28,000 per acre for commercial, recreational, and storm protection functions in Texas. The importance of seagrasses is that they are highly productive plant communities that provide habitat and forage for fish and wildlife, stabilize coastal sediments, and decrease wave energy. The biodiversity and productivity of seagrass meadows are directly linked to coastal economies.

The three state agencies with coastal resource management responsibility for seagrasses are the TCEQ, TGLO, and TPWD. These three agencies collect substantial amounts of coastal data and monitor status and trends of seagrasses along the Texas coast.

II. CONCERNS

Seagrasses, like all green plants, must have sunlight to grow. Disturbances to seagrass meadows can be natural, such as hurricanes, algal blooms, or high runoff from rivers during floods. Man-made seagrass meadow disturbances include: dredging and filling, nutrient loading, and propeller scarring. Dredging

can remove the grasses directly, cover them up by depositing spoil on top of them, and limit light penetration from resulting turbidity. Excessive nutrient loading leads to algal blooms which limit sunlight. Prop scars on an individual basis may seem minimal compared to other threats, but when multiplied by the thousands become a serious impact as well.

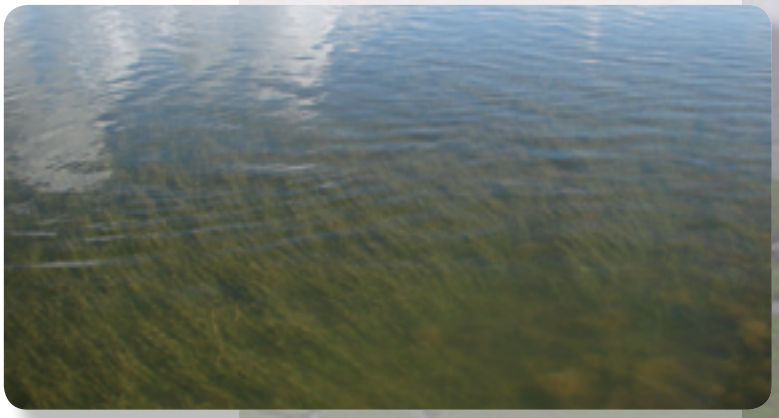
III. LOCAL LEVELS

For the combined Redfish Bay, Harbor Island, and Mustang Island segments of the Nueces estuary system, total seagrass bed area may appear fairly stable over 40 years, but this conclusion ignores the dynamic cycles in localized seagrass bed changes. Overall, a net increase occurred in total area for the system between 1958 and 1994 (1,981 acres). This gain was due primarily to the large expansion of seagrass into the Harbor Island complex between the late 1950s and 1975 (84% or 2,500 acres) and along Mustang Island (33% or 926 acres) between 1974 and 1994. The simultaneous 13.3% decrease (1,324 acres) and accompanying bed fragmentation in seagrass beds noted for Redfish Bay over the period from the late 1950s to 1994, suggest that seagrass conditions should be interpreted with caution for the entire system.

Dredging of Redfish Bay in the 1960s not only resulted in a loss of about 1,324 acres of seagrasses, turbidity associated with dredging Redfish Bay, Harbor Island, and the back side of Mustang Island for oil and gas exploration resulted in blanketing seagrass habitats with sediments and subsequent disappearance of seagrasses.

In a report completed in 2006 by the Bureau of Economic Geology (BEG) titled "Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Island: Coastal Bend," overall seagrass communities are increasing along the Texas Coastal Bend. BEG recorded 10,297 acres of seagrass in 1950 and 20,752 acres in 2004. The conversion of tidal flats to seagrass beds is a result of a relative rise in sea level plus subsidence.

In a report completed in 2008 by the Bureau of Economic Geology titled "Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area," the BEG found that in 2004 a total of 24,577 acres of seagrasses were present within the estuarine systems of Corpus Christi and Aransas Bay. Seagrass is most extensive in the Corpus Christi Bay/Estuary, followed closely by Redfish Bay. In Redfish Bay, TPWD created a State Scientific Area, in order to develop seagrass protection measures.



Undisturbed Seagrass Meadow.

According to the 2008 BEG Report, seagrasses increased in total area during each period (1950's–1979 and 1979–2004), with a total net gain of 5,777 acres from the 1950's through 2004. Approximately 87% of this gain occurred from 1979 through 2004. The geographic area with the largest increase in seagrasses is Corpus Christi Bay; other areas experiencing an increase in seagrasses are Lamar Peninsula, Live Oak Peninsula, Port Bay, and Oso Bay. Expansion frequently occurred in areas previously mapped as tidal flats and open water.

IV. REFERENCES

- Handley, L., Altsman, D., and DeMay, R., eds., 2007, Seagrass Status and Trends in the Northern Gulf of Mexico: 1940 – 2002: U.S. Geological Survey Scientific Investigations Report 2006-5287, 267 pp.
- Pulich, W., Jr., B. Hardegree, A. Kopecky, S. Schwelling, C.P. Onuf, and K. Dunton. 2003. Strategic Plan for the Texas Seagrass Monitoring Program. Texas Parks and Wildlife Department, Austin, TX. 36 pp.
- Texas Parks and Wildlife. 2007. Propeller Scarring. http://www.tpwd.state.tx.us/landwater/water/habitats/seagrass/general/propscar.phtml
- Tremblay, T., Vincent, J., and Calnan. T. March 2008. Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area. Bureau of Economic Geology. 101 pp.
- White, W., Tremblay, T., Waldinger, R., and Calnan T. 2006. Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Islands Coastal Bend. Bureau of Economic Geology. 64 pp.

INDICATOR #15: Saltwater marsh.

Condition/Trend: Good/Improving

Good

I. BACKGROUND

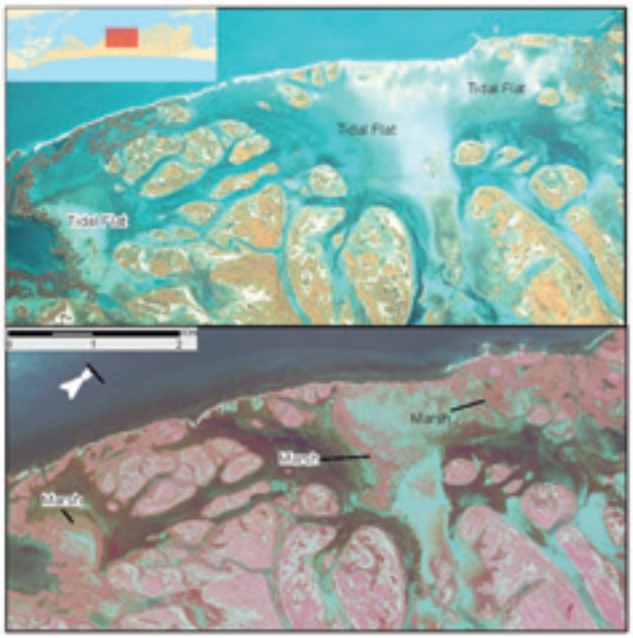
Saltwater marshes, also known as tidal marshes or estuarine marshes, are important habitats of the Texas Coastal Bend estuaries; functioning as nursery and foraging areas for wildlife, filtering water-borne contaminants, stabilizing sediments, protecting shorelines, and reducing floods. Marshes are also imperiled habitats due to increasing human development along the Texas Coast.

Tidal marshes are formed and maintained by a number of factors including the unique balance between freshwater inflow and the tidal flushing of saline water.

The Army Corps of Engineers is responsible for protecting the integrity of the nation's waterways through a program established to regulate the discharge of dredged and fill material into waters of the U.S. The Texas General Land Office also regulates and permits projects associated with saltwater marshes. Before a permit can be granted, the applicant must show that the project has considered all viable alternatives to avoid or minimize impacts as much as possible. Any wetland loss must be compensated for by constructing new wetlands, or by restoring or enhancing existing wetlands.

II. CONCERNS

Historically, marsh areas were not recognized as being a necessary part of the interconnected ecological system and were aggressively converted to agricultural lands, canals or filled in to create dry land. Now marsh areas are better understood and appreciated for their role in flood control, water quality, and wildlife habitat. Many state and federal incentives have been created to help conserve, restore, and create wetlands.



Spread of estuarine marsh into tidal flats on San Jose Island from 1979 (top) through 2004 (bottom).

Today, concerns that persist are: filling marsh for commercial development, public infrastructure, dams, and conversion of marsh for farming. Sea level rise and subsidence are the most recent developments being discussed that can change habitat types over a long period of time.

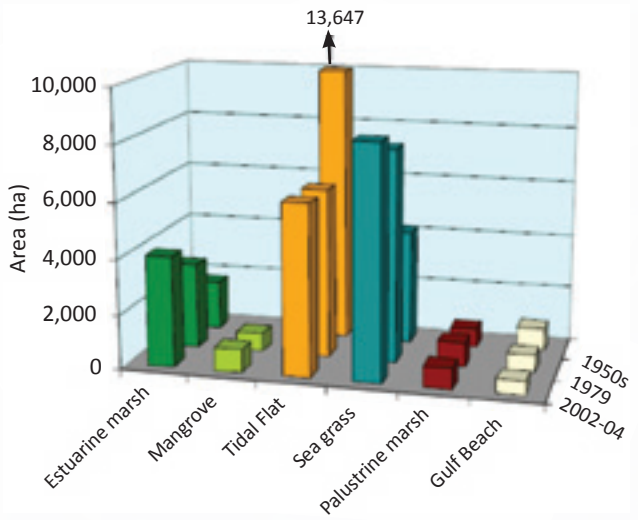
It is important to conserve the Coastal Bend marshes due to the ecological and economic values they bring to the area.

III. LOCAL LEVELS

In a report completed in 2006 by the Bureau of Economic Geology (BEG) titled "Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Islands: Coastal Bend," BEG looked at the Coastal Bend Barrier Island complex and found a total of 9,906 acres of estuarine marsh existed, as well as scrub/shrub wetlands (primarily mangroves) which had a total area of 2,068 acres.

Estuarine marshes increased in total area during each period (1950s–1979 and 1979 to 2002–04), with a total net gain of 5,550 acres from the 1950s through 2002–04. According to the 2006 BEG study, Texas Coastal Bend barrier island estuarine marshes are increasing due to the expansion of marsh into low flats and into former uplands.

In a report completed in 2008 by the Bureau of Economic Geology titled "Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area," the BEG found a total of 26,728 acres of estuarine marsh within the estuarine systems of Corpus Christi and Aransas Bay in 2004.



Area distribution of major habitats in the Texas Coastal Bend barrier islands study area in the 1950s, 1979, and 2002-04.

Mouth of the Aransas River

Estuarine marshes, combined with scrub/shrub, increased in total area during the period 1950s–1979 and decreased in total area during the period 1979–2004, with a total net gain of 4,831 acres from the 1950s through 2004. The primary change was the result of relative sea-level rise, where marshes spread into areas previously occupied by tidal flats.

	1950s	1979	2004
Habitat	**acre**	**acre**	**acre**
Estuarine Marsh	26,230	36,647	36,634
Mangrove	not mapped	1,642	2,068

Total area of saltwater marshes in the 1950s, 1979, and 2004 in the estuarine systems of Corpus Christi Bay and Aransas Bay and the Coastal Bend Barrier Island complex.

IV. REFERENCES

- Tremblay, T., Vincent, J., and Calnan, T. March 2008. Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area. Bureau of Economic Geology. 101pp.
- White, W., Tremblay, T., Waldinger, R., and Calnan, T., 2006. Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Islands Coastal Bend. Bureau of Economic Geology, 64 pp .

INDICATOR #16: Freshwater marsh.

Condition/Trend: Good/Degrading

I. BACKGROUND

Fresh to brackish water marshes found on the Texas coast are unique features of the barrier island system. These marshes were formed as the barrier island grew seaward, and the series of swales that were left behind from the building of sand ridges form marsh habitat. Water in these marshes is derived from a combination of runoff from the adjacent dunes and from groundwater. Water percolates through the sandy dunes very easily, and generally comes to the surface in the swales between the dunes. Many of these swales rarely have ponded water on the surface, but because groundwater is found just under the surface for extended periods of time, only wetland vegetation can survive.

Although ephemeral in nature, these wetlands play an important role in the barrier island ecosystem. These palustrine (fresh water) marshes are home to many birds and animals that use them as a source of food and water. Birds from all over North America use Texas coastal habitats during migration and many species spend the winter on the coast using the freshwater wetlands.

The Army Corps of Engineers is also responsible for protecting certain freshwater wetlands in the same way as the saltwater wetlands.

	1950s	1979	2004
Habitat	**acre**	**acre**	**acre**
Palustrine Marsh	22,611	19,785	15,801

Total area of palustrine marshes in the 1950s, 1979, and 2004 in the estuarine systems of Corpus Christi Bay and Aransas Bay.

II. CONCERNS

The major threat to freshwater barrier island marsh habitat is draining and filling for development of beach houses, condominiums, hotels, marinas, boat docks, and their supporting infrastructure. The destruction of dune-stabilizing vegetation by human activities can cause dunes to migrate, consequently filling those wetlands. The biggest current source of loss for freshwater coastal wetlands is urban sprawl.

Mullen's Bayou, Refugio County

Some of the important factors of these wetlands are that in times of ample rainfall, these depressions provide scarce freshwater and wetland habitats for island fauna. When these depressions are dry, biological diversity on the barriers is depleted. The depressional wetlands play a role in regulating the fresh groundwater levels; many acting as recharge areas when the groundwater level declines.

III. LOCAL LEVELS

In a report completed in 2006 by the Bureau of Economic Geology (BEG) titled "Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Islands: Coastal Bend," BEG looked at the Coastal Bend Barrier Island complex and found that from 2002 to 2004 a total of 1,895 acres of palustrine marsh existed. Palustrine habitats had their largest distribution in 1979, at 2,199 acres, and lowest in the 1950s at 1,643 acres.

According to BEG during 2004, North Padre Island had the largest amount of palustrine wetlands totaling 879 acres, followed by San Jose Island with 726 acres. Mustang Island had 230 acres and Harbor Island had the least at 59 acres, probably due to the small size of the island.

According to the 2006 BEG study, Coastal Bend barrier island palustrine marshes are decreasing from the 1979 coverage due to island development, agricultural practices on the island, and drier conditions.

In a report completed in 2008 by the Bureau of Economic Geology titled "Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area," the BEG found a total of 13,906 acres of palustrine marsh within the estuarine systems of Corpus Christi and Aransas Bay in 2004.

Palustrine marsh had its largest distribution in the 1950s, at 20,968 acres, and lowest in 2004 at 13,906 acres. The average rate of palustrine marsh loss for both time periods was about 147 acres/yr.

The Copano mainland, Lamar Peninsula, Live Oak Peninsula, coastal prairies, and Port Bay all experienced fluctuations in palustrine marsh area and contain transitional areas dominated by *Spartina spartinae*. Drier climatic conditions caused by long-term drought had a diminishing effect on the areal extent of palustrine marsh by 2004. At the local level, community development in places like Key Allegro and Aransas Pass contributed to gross losses of wetlands. The overall trend was characterized primarily by reduction (–84%) of palustrine marsh through conversion to uplands. On the Mission and Aransas Rivers, palustrine marsh experienced significant loss over the long term. Most palustrine marsh loss was located in areas that had become estuarine marsh because of landward movement of the salt/freshwater boundary within the river system.

Palustrine wetland along channel in Live Oak Ridge

IV. REFERENCES

- Tremblay, T., Vincent, J., and Calnan, T. March 2008. Status and Trends of Inland Wetland and Aquatic Habitats in the Corpus Christi Area. Bureau of Economic Geology. 101pp.
- White, W., Tremblay, T., Waldinger, R., and Calnan, T., 2006. Status and Trends of Wetland and Aquatic Habitats on Texas Barrier Islands Coastal Bend. Bureau of Economic Geology, 64 pp.

INDICATOR #17: Rookery islands.

Condition/Trend: Poor/Degrading

Improvement Needed

I. BACKGROUND

Colonial-nesting waterbirds within the coastal zone require islands for breeding that provide suitable nesting structure (such as shrubs for wading birds, bare ground for terns, etc.), are free from predators and disturbance sources, and are relatively close to feeding areas. Rookery islands, in contrast to barrier islands, are typically smaller and free from predators. Rookeries in the Coastal Bend range in size from mere spits of shell hash which are sometimes submerged at the highest tides, to the 300+ acre Pelican Island in Corpus Christi Bay. Vegetative structure ranges from unvegetated bare ground to well-developed hackberry (*Celtis laevigata*) and mesquite (*Prosopis glandulosa*) mottes. Approximately 185 islands exist within the Coastal Bend region that have at some time in the last 30 years been used by nesting waterbirds.

Portland Causeway Island with Nesting Platforms

II. CONCERNS

Human presence and development on the coast have significantly altered the historical ecology of colonial waterbirds. Many islands, and a greater total acreage of islands, were created in the mid- to late-20th century associated with dredging activities for navigation and oil/gas development. Large islands are typically unsuitable for nesting by waterbirds because they support permanent populations of predators such as raccoons and coyotes. Most rookery activity takes place on smaller islands or ones which have been aggressively managed to remove predators.

Erosion has led to the complete loss of several islands, and the partial (and ongoing) loss of almost all others. Deepening of adjacent waters for navigation channels, increased ship traffic, loss of oyster reef structure due to commercial harvesting, and relative sea level rise have resulted in increased wave energy battering rookery island shorelines, and a net loss of island area.

An increasing number of bay users, primarily recreational fishermen, create an additional stress to nesting birds. Especially when they are unaware of, or unconcerned with, the effects of their disturbance on nesting birds. Human disturbance can lead to egg and chick death, or even complete colony abandonment.

One of the best ways to address the loss of rookery islands is the creation of new , strategically located islands. New Island, in Nueces Bay, was created in 2001 and has provided several thousand pairs of birds a nesting opportunity in subsequent years. Island creation projects are expensive however, requiring extensive engineering, permitting, dredging, and equipment mobilization.

III. LOCAL ROOKERY ISLAND INVENTORY

There are currently around 185 islands in the CBBEP area, as identified in the Colonial Waterbird and Rookery Island Management Plan, from the northern extent of the Land Cut in the Upper Laguna Madre northward to Aransas Bay. In the past 10 years, one island (New Island in Nueces Bay) has been created, a few such as Pelican Island (Corpus Christi Bay) have received dredge deposits and a breakwater to provide erosion protection. Most other rookery islands have been eroding away at varying rates. Some have lost functionality as rookeries, most likely due to recreational activites and human disturbance, especially in Redfish Bay. In some cases, disturbance appears to have led to the loss of most species on an island while the more tenacious laughing gull (a human-subsidized species) has persisted.

Incised bank due to erosion of southeast-facing shore of Causeway Island, Nueces Bay (November 2007)

Nesting Platforms

Black Skimmers Nesting

Pelican Island in Corpus Christi Bay. The breakwater was constructed to provide erosion protection.

IV. REFERENCES

- Chaney, H., and Blacklock, G. April 2005. Colonial Waterbird and Rookery Island Management Plan. Coastal Bend Bays & Estuaries Program. 303 pp.