

**Briefing Paper on Galveston Bay Plan Action Items**  
**Species Protection**

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**Overview**

Goals of the Galveston Bay Plan

- Reverse the declining population trend for affected species of marine organisms, and maintain the populations of other economically and ecologically important species.
- Eradicate or reduce the population of exotic/opportunistic species which threaten desirable native species, habitats, and ecological relationships. Prevent the introduction of additional exotic species.

Galveston Bay wildlife and fisheries populations have tremendous value in ecological, economic, and social, terms. Galveston Bay contributes one-third of the state's commercial fishing income and over one-half of the state's recreational fishing expenditures.

There is a tradition in natural resource management to focus on the management of single species. This is true of fisheries management even though fishing methods are often non-selective and capture many species. It is especially true of the approach to management of threatened and endangered species, despite the requirement in the ESA that habitat conservation plans be developed for every listed species. Only recently has the approach of ecosystem management begun to be considered.

Species that live in and around Galveston Bay can be categorized according to their relationship with bay user groups. There are species that support commercial fisheries and are managed to perpetuate the species and the fishery. Shrimp, oysters and blue crabs are the primary species in this category. There are species that form the basis of recreational fishing and are managed to conserve the fishery and species. Examples of these are common predatory fish, e.g. spotted seatrout, red drum and flounder. Some species are important to people because they are entertaining, e.g. dolphins and pelicans. Such charismatic species often receive special management treatment. Some species appeal to an aesthetic sense and receive protection and management attention for that reason, e.g. waterbirds. Then there are species that attract little attention because they are small, inedible, drab or difficult to observe. These are seldom managed.

No one knows which of the species in and around Galveston Bay are critical to the conservation of species diversity. The removal or addition of a species to the food web can lead to fundamental changes in the number or types of species present. This is why the Endangered Species Act can be applied to any taxonomic group. We will discuss the

efforts at protecting single species, but keep in mind the possibility that other species may be more useful as indicators of the health of the GB ecosystem.

When one thinks of species protection, one typically thinks of managing desirable species. However, undesirable species commonly known as exotic or invasive species must also be managed. Exotic species are defined as species existing in habitats outside of their native range. Invasive species are exotics that reproduce and establish in naturalized populations that negatively impact native species, habitats or ecological relationships. Invasive species are introduced unintentionally (i.e. accidental release) or intentionally (i.e. for a management purpose) and can have ecological, economic, and social repercussions.

The system for establishing species protection has resulted in various types of regulations which address fishing, hunting, scientific collecting, harvest or harassment of endangered species, treatment of marine mammals, transport and sale of invasive species, etc. There are also non-regulatory approaches to the protection of special species, such as public education on conservation and animal rights.

### **Historical Data Trends**

It is clear that human settlement and harvesting of some species has changed the distribution and abundance of individual species. Some of these changes are in direct response to fishing pressure. Other changes are indirect effects of habitat loss and disturbance or changes in predator or prey abundance. It is often difficult to distinguish among the potential causes for decline. For example, diamondback terrapins once supported a commercial fishery for turtle soup, but are now rare. Large numbers of terrapins were harvested, but nesting habitat on islands in the bay has also declined dramatically. Seventy years ago tarpon were commonly caught in the bay, but now the species is extremely rare. Did the fishing pressure or the decline in water quality lead to this change?

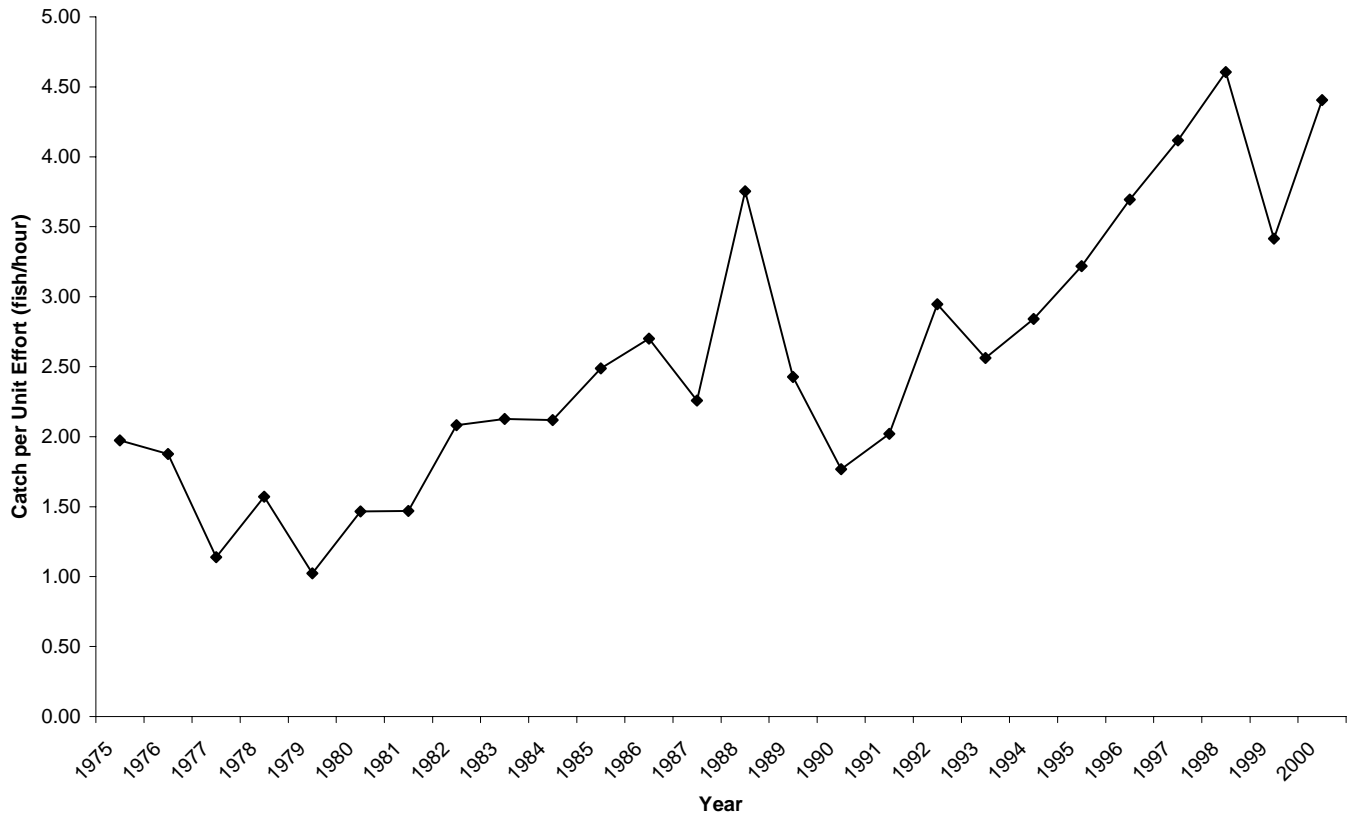
#### *Finfish*

Natural resource management agencies are responsible for monitoring the health of wildlife populations that they manage and recommending regulations to maintain or restore those populations. One way to track their assessment of the status of protected species is the stringency of the regulations. Over time both fishing and hunting regulations have become stricter. Until 1981 red drum and spotted seatrout were not considered gamefish in Texas and harvest was not regulated. Since that time the number of these species that can be legally retained has decreased. Also, the minimum size that can be legally retained has increased. This suggests that the fishery managers believe there is a potential for decreasing abundance and size of the populations. Under current regulations it is unlawful to retain more than three red drum, five black drum or ten spotted seatrout per day.

The monitoring data that have been collected since 1975 do not show a trend of decreasing abundance among the species that support the Galveston Bay recreational fishery (see Figure 1). The abundance of adult fish is estimated by catch per hour using a

gill net. Most major game fish species, i.e. red drum, black drum, sand seatrout exhibit no significant trend in abundance over the period of record. A major exception to this stability is the abundance of spotted seatrout, which has increased significantly since 1975.

Figure 1. Total Annual Catch per Unit Effort of Spotted Seatrout in Galveston Bay Using Gill Net. Figure created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data source: Parks and Wildlife Department.



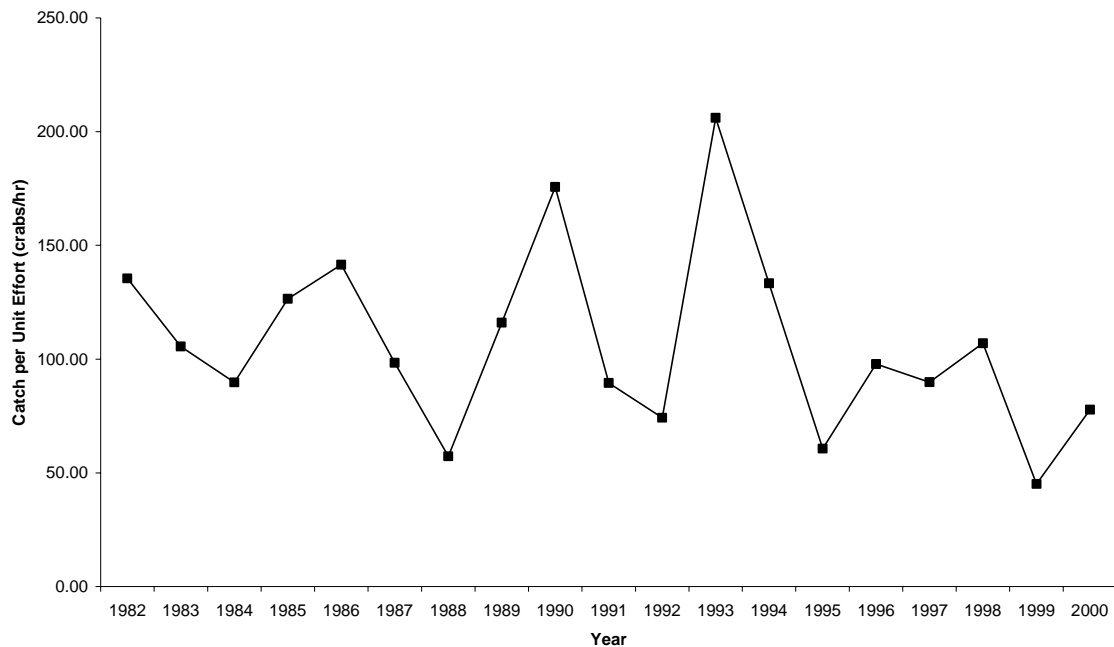
### *Shrimp and Crabs*

Shrimp and crab have been harvested commercially from Galveston Bay since before 1840. Early harvest was by hand-drawn seine. The first motorized shrimp boats were introduced in the 1920's. Average harvest size of shrimp in the 19<sup>th</sup> century was 6 to 7 inches. The use of modern trawling technology has encouraged the harvest of small shrimp and the average size is now around 4 inches. As technology improved and fishing pressure on shrimp increased over the last 75 years, the state agency responsible for regulating fishing has enacted more stringent regulations. Commercial shrimping is now restricted from certain "nursery" bays. There are regulations on the mesh size of trawls, the size of trawls, the time of day, and the allowable daily catch. There are no consistent trends over time in the abundance of shrimp or the landings of the shrimp fishery.

Commercial and recreational fishing for blue crabs has been conducted for at least 160 years, but the intensity increased dramatically in the 1980's. Crab traps are much more

abundant in the bay today than they were 20 years ago and shrimp trawling increased in intensity until the late 1990s. The average size of crabs has decreased and the abundance has decreased in several sub bays. Figure 2 below summarizes the monitoring results from TPWD trawl samples collected at randomly chosen sites in all parts of the bay accessible to a bay trawler. The downward trend in blue crab catch per hour is not significant.

Figure 2. Total Annual Catch per Unit Effort of Blue Crab in Galveston Bay Using Shrimp Trawl. Figure created by the Galveston Bay Status and Trends Project, Houston Advanced Research Center. Data source: Parks and Wildlife Department.



### *Sea Turtles*

In the 19<sup>th</sup> and early 20<sup>th</sup> centuries, there was a commercial fishery for sea turtles in the Texas coastal bend. People around Galveston Bay used the product, but sea turtles were never as common along the upper coast. Disturbance of nesting sites and fisheries-related mortality (i.e. intentional harvest and by-catch) resulted in a precipitous decline in population size of sea turtles. In the 1940's there were more than 40,000 Kemp's Ridley turtles estimated in the breeding population around Rancho Nuevo in Mexico. All six species of sea turtle found in the United States are listed as threatened or endangered. They receive regulatory protection through the protection of nesting beaches and through the requirement that trawlers use turtle excluder devices on their nets.

### *Brown Pelicans*

There are two species of pelicans. The white pelican breeds around lakes and ponds in the western U.S. and lower Canada. The brown pelican uses coastal habitat in all seasons. Along the West, Gulf and East Coasts, the brown pelican population declined and was listed as endangered in 1970, but has since recovered in much of the range. The populations from Alabama to North Carolina were delisted in 1985. One explanation for the decline of brown pelicans is the prevalence of chlorinated pesticides such as DDT that interfered with reproduction. This is unlikely to be the entire explanation because both pelican species are fish eaters, as are other water birds, and no other waterbird species exhibited such a sharp decline.



Photo courtesy of the Texas Parks and Wildlife Department

Brown pelicans are legally protected from killing and harassment. Their nesting habitat has been protected. The result of protection, pollution reduction and habitat improvement has been a resurgence of the population along the Gulf coast. In Galveston Bay, nesting pairs of brown pelicans have risen from 6 pairs in 1973 to over 3,900 pairs in 2003.

### *Migratory Birds*

Galveston Bay and surrounding wetlands are important wintering habitat for migratory waterfowl: ducks, geese, grebes and mergansers. The US Fish and Wildlife Service (USFWS) has published fifty years of data on breeding population estimates of ten species of duck collected from habitat in Alaska, Canada and Montana and the Dakotas (Wilkins et al, 2005). The efforts to enhance both breeding and wintering habitat have been successful for most species. Of the species studied, only Northern pintail and scaup (greater and lesser combined) had long term downward trends in abundance. Most of the land acquired for National Wildlife refuges around Galveston Bay was purchased for migratory waterfowl winter habitat.

Migratory birds are defined very broadly for protection by the Migratory Bird Treaty Act, which was first passed in 1916. Over 1,000 bird species are protected under treaties with Canada, Mexico, Japan and Russia. Efforts are underway to protect habitats used for resting and feeding after migratory flights across the Gulf.

### *Invasive Species*

The introduction by humans of non-native plants and animals into Galveston Bay and its watershed has been occurring since pre-history. Native Americans brought useful plants to their campsites. Early settlers brought domestic plants and animals that escaped or were released from culture, e.g. feral pigs. Over time agriculture experimented with exotic species that became feral, e.g. Bahia grass and John son grass. Later the horticulture industry sold ornamental plants that escaped from cultivation, e.g. Chinese privet and Chinese tallow. More recently an aquarium trade has distributed animals that

have been released from captivity into the tributaries of the bay, e.g. armored catfish and channeled apple snail. Some species have been inadvertently distributed by international shipping, e.g. fire ants.

### **Status in the Lower Galveston Bay Watershed**

The current fisheries independent monitoring of aquatic species in Galveston Bay by the Texas Parks and Wildlife Department (TPWD) suggests that the regulatory system is protecting the populations of game fish. Over the last 20 years the abundance of spotted seatrout has increased. There is no indication of decline in abundance of any major game fish population in the bay over the last 20 years. Historical reports of some species, such as striped bass and tarpon, species that are now absent or rare, indicate declines in abundance prior to the initiation of monitoring records. Shrimp abundance goes up and down by year, but has no pattern indicative of population decline. Blue crab shows some indication of population decline in certain subbays of Galveston Bay.

Many species of hunted waterfowl have declined below their long term average abundances (estimated from 1955 to 2003). Gadwall, pintails, scaup, wigeon, blue-winged and green-winged teal all had estimated population sizes in 2004 that were significantly below the long term averages. All of these species use Galveston Bay or surrounding wetlands as winter habitat. Decreasing abundance of these species is more likely due to declines in quantity or quality of breeding habitat rather than declines in quantity or quality of wintering habitat or increases in hunting mortality.



Photo courtesy of the Texas Parks and Wildlife Department

Similar declines have been seen in some of the species of water birds that use Galveston Bay all year. The cause of their decline does not appear to be a decrease in the productivity of the bay. At least four species of wading birds that feed along the margins of the bay and nest in vegetation near the water have declining trends in abundance over the last 20 years. The chart below summarizes the status of a representative collection of marsh feeders and open water feeders. Only 1,185 pairs of great blue heron and 1,276 pairs of reddish egret were observed nesting around Galveston Bay in the summer of 2003. Over 2,400 pairs of roseate spoonbill were counted in colonies around Galveston Bay in 2003. Only 769 nests of least tern were counted in 2003, but this species has had fewer than 2000 pairs since 1974.

Figure 3. Indicator Describing Trends in Water Bird Abundance. Table created by the Galveston Bay Indicators Project, Houston Advanced Research Center. Data source: US Fish and Wildlife Service Texas Coastal Program.

Feeding Guild	Species	20 Year Trend
Marsh Feeders	Great Blue Heron	Declining
	Reddish Egret	Declining
	Roseate Spoonbill	Stable
	Snowy Egret	Stable
	Tricolored Heron	Declining
	White Ibis	Stable
Open Water Feeders	Black Skimmer	Declining
	Brown Pelican	Increasing
	Least Tern	Stable
	Royal Tern	Stable
	Sandwich Tern	Stable

*Invasive Species*

Exotic species are thoroughly integrated into the Galveston Bay watershed and are significant components of all ecosystems except the salt water of the bay itself. In the freshwater tributaries, water hyacinth sometimes multiplies to cover all the surface of the bayou. Exotic fish, such as cichlids, carp and armored catfish are often more common than the native fish fauna. In some prairies, exotic grasses are a major component of the plants; in others Chinese tallow trees have grown into an extensive monoculture replacing the native grasses. Also in the prairies, fire ants are so common they exclude many native ant species. In the bay, there are introduced species, but the dominant species of the component ecosystems are native, e.g. oysters and *Spartina* (marsh grass). There are no exotic fish or large shellfish that have become common in the salt water of the bay.

**Managing the Resource**

*Regulatory Approach*

The TPWD is responsible for managing fisheries populations as well as commercial and recreational harvest of fisheries resources in the State of Texas. Over the last 30 years, fishing regulations appear to have accomplished the objectives of protecting the subject species and their fisheries. A few historical fisheries for Galveston Bay have ceased to exist, e.g. the diamondback terrapin and recreational striped bass fisheries. There is no longer a commercial net fishery for red drum and other game fish in Texas. The species

that were harvested in the commercial net fishery currently support a large, valuable recreational fishery and have stable populations. One of the most heavily targeted species in the recreational fishery, spotted seatrout, has a growing population very likely due to a combination of fishing regulations and catch and release activities by recreational. Commercial bay shrimping is extensively regulated and the resource appears biologically sustainable. However, economic pressures are causing shrimpers to target smaller shrimp resulting in lower yields. The state has established a program to freeze the number of bay shrimping licenses and buy back licenses from commercial shrimpers in an effort to reduce trawling effort in the bays. Regulations on commercial blue crab fishing are becoming stricter, but the impact on the species can not yet be determined. Programs have also been implemented to remove continuously fishing, derelict crab traps from Galveston Bay waters. Oyster fisheries are extensively regulated for size and season. Fishing pressure appears to be less of a concern than pollution for the sustainability of this resource. Prohibition of harvest for protection of consumer health is common in Galveston Bay. Harvesting is prohibited by area or for time periods due to concentrations of bacteria or harmful algae.

Hunting regulations on migratory waterfowl, i.e. ducks, geese, coots and mergansers, wintering around Galveston Bay have been in place for many years. Hunting regulations also include additional species, i.e. rails, gallinules, snipe and sand hill cranes that use wetland and terrestrial habitat near the bay. Shooting these species is permitted if regulations are followed and no more than the permitted number are taken. Most other bird species are protected from hunting. The regulations appear to be ineffective in protecting some species. Breeding habitat seems to be the limiting resource for species that continue to decline despite low limits on harvesting.

The regulation requiring turtle excluder devices on shrimp trawls is one component in the overall effort to increase sea turtle populations. Other management efforts include seasonal fisheries closures near sea turtle nesting beaches, protection of beach nesting habitats, and HeadStart juvenile release programs. While sea turtle populations continue to be at risk, recent nesting activity on beaches of the upper Texas coast show promise for these species.

### *Invasive Species*

There are prohibited lists for aquatic nuisance species managed by the TPWD and for aquatic and terrestrial invasive plant species managed by Texas Department of Agriculture. Exotic species placed on these lists are known to disrupt natural ecosystems resulting in economic implications. Any one who transports, releases or sells a species on one of these lists in the state is subject to legal penalties. This regulatory approach has been effective in limiting the expansion of some nuisance species, such as grass carp that are easy to recognize and have barriers to dispersal. This approach has been less effective at reducing the spread of weed species that are spread by difficult to identify seeds and have no barriers to dispersal.



### *Non-regulatory Approach*

Acquisition of land for habitat of specific species has been successful in the protection of some species, but not others. Expansion of national wildlife refuges has helped snow goose populations, but has been ineffective in reversing the decline of pintails, gadwall and wigeon. Establishment of a refuge for Atwater's prairie chicken next to the bay north of Texas City has been unsuccessful in establishing a stable or growing population of this endangered species.

Construction of bird nesting islands has been successful in attracting birds to nest in the new habitat, but it is impossible to attribute any increase in any species to the new nesting habitat. Restoration and creation of saltmarsh wetlands and seagrass meadows improves habitat for fish and birds. Whether the abundance of some species increases as a result of the new habitat is unknown.

TPWD has a program to breed and rear fish for stocking in coastal bays. This program was initiated for red drum in the early 1980s. Since 1985 TPWD has released more than 80 million red drum into the Galveston Bay system. The monitoring data for red drum does not show an increase in abundance that could be attributed to this program, but it could be preventing a decline. Similar stocking efforts are underway for other game fish.

Educational programs that encourage catch and release practices among fishermen can be considered a form of protection of species. There is evidence to suggest that survival of properly handled fish is high. Thus the mortality rate from fishing could be reduced. This may be part of the reason for the increase in spotted seatrout, but there is no way to extract this conclusion from the available data.

### *Invasive Species*

Many invasive species have been introduced intentionally by people in the context of agriculture, horticulture and aquarium or pond stocking. There are non-regulatory educational programs designed to reduce the demand for exotic species in these contexts. In horticulture there is a large movement to encourage the use of native plants. In agriculture, there are efforts to restore prairies to native vegetation for grazing and native species habitat. Members of the aquarium trade are attempting to reduce the frequency of releases of aquarium species to natural environments. In all of these cases, more can be done to increase the reach and effectiveness of programs designed to minimize the introduction of exotic species in the Lower Galveston Bay watershed.

## **Conclusion**

Galveston Bay has lost some of the species that were present when settlers first recorded their observations. However, there are recent successes in protecting exploited fish stocks and the endangered brown pelican. When there is satisfactory quantity and quality of habitat and harvest or harassment of a species can be regulated, then efforts to protect species can be successful. Despite increasing efforts to create nesting habitat for herons and egrets and strong public support for that protection, several of these species are showing significant declines in abundance around Galveston Bay. Fish and shellfish species that make use of the bay in its current state can be protected by regulations.

Some processes that affect the health of species populations are difficult to regulate, e.g. spreading invasive plant species under current management structures. The species or habitat based regulatory model may be replaced in the future by ecosystem management, managing bay resources holistically by managing for the overall health of the bay system and the ecosystem services it provides. It will be difficult for agencies traditionally responsible for managing one component of the estuarine system (e.g. commercial fisheries, habitat protection, etc.) to manage for the health of entire bay ecosystem. For the shift to ecosystem management to occur, there must be greater management coordination between agencies with varying missions and regulatory responsibilities (e.g. coordination between TPWD which regulates commercial fisheries and the US Army Corps of Engineers which regulates dredging and filling of wetland nursery habitat). Additionally, the ecological, social and economic interdependence of various bay resources must be recognized and managed holistically. This paradigm shift will be difficult to achieve.

If we are to implement the objectives of the Galveston Bay Plan, stronger measures will be needed to protect and restore populations of native species, to reduce the introduction and impact of exotic invasive species.

## **References**

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