



# TEXAS

Original Wetland Acreage	Remaining Wetland Acreage	Acreage Lost	% Lost
15,999,700	7,612,412	8,387,288	-52%

**Texas Wetlands:** Most Texas wetlands are palustrine; estuarine wetlands are next in area. Lacustrine, riverine, and marine wetlands are ecologically significant but cover a smaller area. The most extensive wetlands are the bottom-land hardwood forests and swamps (forested and scrub-shrub wetlands) of East Texas; the marshes (emergent wetlands), swamps, and tidal flats (unconsolidated-shore wetlands) of the Gulf of Mexico coast; the playa lakes of the High Plains; and the small, shallow, inland depressional basins called potholes found in coastal areas.

<a href="#">Summary</a>	<a href="#">Individual Features</a>	<a href="#">Regulation</a>	<a href="#">Water Quality Standards</a>	<a href="#">Mitigation</a>	<a href="#">Monitoring and Assessment</a>	<a href="#">Restoration</a>	<a href="#">Public/Private Partnerships</a>
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## SUMMARY

### Overall Program

The state provides protection for coastal and freshwater wetlands through a §401 Water Quality Certification Program and the Coastal Management Program (CMP). The State's 401 Certification Program is administered primarily by the Texas Commission on Environmental Quality (TCEQ); however, for oil and gas activities, the Railroad Commission of Texas (RRC) administers the program. The CMP is a networked program linking the regulations, programs, and expertise of state, federal, and local entities that manage various aspects of coastal resource use. Management of the CMP is overseen by the Coastal Coordination Council (Council), which is chaired by the commissioner of the General Land Office (GLO), with members from six other state agencies, four gubernatorial appointees, and Texas Seagrant.

### Innovative Features and New Programs/Initiatives

Surface water quality standards now define wetlands as waters of the state. In June 1995, the TCEQ added a "no net loss," state water quality standard and mitigation policies. In 2001, the TCEQ and the U.S. Army Corps of Engineers (Corps) signed a Memorandum of Agreement (MOA) to streamline the TCEQ's §401 Certification procedures for §404 dredge and fill permits. The MOA outlines §401 Certification procedures for Tier I projects or projects less than three acres of wetland impact and for Tier II projects greater than three acres of wetland impact. If applicants for Corps §404 permits qualify for Tier I and agree to comply with a list of Best Management Practices, the TCEQ waives certification for the Tier I project. The TCEQ will continue to certify or deny §401 Certification for Tier II projects. Certain types of rare or ecologically significant wetlands are not eligible for Tier I. These include pitcher plant bogs, swamps dominated by bald cypress and tupelo gum trees, mangrove marshes, coastal dune swales, and Caddo Lake wetlands.

The Small Business and Individual Permitting Assistance Office, established by the Coastal Coordination Act, opened in 1997. This office is managed by a Permitting Assistance Coordinator and serves as a clearinghouse for permit information and is designed to assist applicants with permitting requirements or in developing permit applications. The permitting assistance office can schedule meetings between an applicant and agency staff or can meet with the applicant on-site to provide site-specific guidance on alternative project designs or on how to reduce impacts to coastal natural resources. This effort helps the applicant develop a project that can be expedited through the permitting process.

As of October 1, 2001, the name "Permitting Assistance Office" was changed to the "Permit Service Center (PSC)" and the functions of the office were expanded to provide the following services: (1) receipt and tracking of the joint permit application form for the Corps, GLO, TCEQ, RRC, and TPWD for all projects in the lower half of the Texas coast; (2) screening of applications and working with applicants to ensure their completeness; and (3) forwarding of screened applications to the appropriate state and/or federal agency for processing. On October 1, 2002, the PSC began screening applications for technical completeness, as well. In serving the upper Texas coast, the PSC provides permitting assistance only at this time; however, use of the Joint Permit Application Form, will soon be expanded to the upper coast.

In 2001, the GLO updated and automated the Resource Management Code (RMC) system with the assistance of the state and federal natural resource agencies. The RMC system, established in the late 1970s and updated in 1989, allows state and federal resource agencies to assign one or more two-letter codes to each state-owned submerged land tract in bays and estuaries and the Gulf of Mexico. Each RMC represents a development guideline with the intent of explaining how development of a state tract can be accomplished without causing damage to the coastal natural resources in the area. The RMCs have been used by energy producers and other potential users of submerged coastal lands to design their projects in a manner that avoids or minimizes damage to coastal natural resources, including wetlands. The use of RMCs has often expedited the permitting process. Updated, on-line codes for state-owned submerged tracts will serve as a valuable tool to better manage submerged lands. New RMCs are available on the GLO's web site at [www.glo.state.tx.us](http://www.glo.state.tx.us).

The TPWD received a grant from the U.S. Environmental Protection Agency (EPA) in 1997 to develop a voluntary registry of private and public lands available for mitigation or restoration. Part of the project is to identify, consolidate and prioritize potential wetland restoration sites on public land. Once the list is complete, the process of matching projects with potential funding sources for wetlands mitigation will be streamlined and critical projects on public lands can be identified. This project also includes a voluntary Wetlands Restoration Site Registry for private landowners. The registry program will function like "want ads," linking those who do not own land, but need or want to do wetlands restoration, with property owners who have similar goals. The Registry contains a searchable database of public and private sites that are available for restoration. The site is located at <http://realvid.tpwd.state.tx.us:8080/wetland>.

Texas now has matching funds to help implement wetland restoration projects. In 1999, the Texas Legislature passed the Coastal Erosion Planning and Response Act (CEPRA). The CEPRA resulted in the availability of \$15 million in state funds over the two years for coastal erosion and wetland restoration projects. The CEPRA authorizes the GLO to implement a comprehensive CEPRA program that includes designing, funding, building, and maintaining erosion projects alone or in partnership with other governmental and non-governmental entities. The GLO allocated funds to 34 erosion response projects for Cycle 1. Based on the success of the initial 2000-2001 program (Cycle 1), the 77<sup>th</sup> Legislature appropriated an additional \$15 million for the CEPRA program during the 2002-2003 biennium (Cycle 2). In Cycle 2, 41 erosion response projects were completed or are under construction. The 78<sup>th</sup> Legislature appropriated over \$ 7 million for the CEPRA program for the 2004-2005 biennium (Cycle 3). Cycle 3 funds were awarded to 20 erosion response projects, including several that are coupled with marsh restoration.

## State Wetland Conservation Plan

In 1997, the TPWD developed a Texas Wetlands Conservation Plan (<http://www.tpwd.state.tx.us/wetlands/programs/conservation/>), and the TPWD, GLO, and TCEQ have developed a Seagrass Conservation Plan for Texas.

### No Net Loss/Net Gain Goal

Rules of both the CMP (31 Texas Administrative Code (TAC) §501.14(h)(1)(A)) and §401 water quality certification have no net loss goals.

## INDIVIDUAL FEATURES:

### Regulation

#### Wetland Regulatory Statutes and Administrative Rules

Texas agencies involved in wetland permitting or review are the TPWD, GLO, TCEQ, and RRC. The TPWD's primary responsibility is protecting the state's fish and wildlife resources. It provides recommendations to local, state, and federal agencies that approve, permit, license, or construct development projects in wetlands. The GLO is a state agency responsible for the management and use of state-owned public lands, including coastal wetlands to an inland boundary of mean high tide. State lands are in the bays and estuaries and Gulf of Mexico from mean high tide to 10.35 miles offshore in the Gulf (approximately 4 million acres). The GLO is a proprietary and not a regulatory agency, and the user of state-owned lands usually pays a fee for mineral extraction, occupancy, or encumbrance. Instruments authorizing the use of state-owned coastal lands are issued under the authority of the School Land Board (SLB) or the Commissioner of the GLO. The three-member SLB may grant the following interests in coastal public lands: (1) leases for public purposes; (2) easements for purposes connected with the ownership of littoral property; and (3) channel easements to the holders of any surface or mineral interest in coastal public land.

The CMP protects coastal wetlands and other coastal natural resources in the Texas coastal zone. The CMP policies (31 TAC §501.14(h)(1)(D)) for development in coastal wetlands are for dredging, filling, and construction and are based on the EPA §404(b)(1) Guidelines.

The chief mechanism for state regulation of wetlands is water-quality certification under §401 of the Clean Water Act (CWA). This process essentially allows the state to determine whether federal permits for discharges into the surface waters of the state will be granted, denied, or conditionally granted. Section 401 certification authority covers all Corps permits under §404 of the CWA, permits or licenses issued by the Federal Energy Regulatory Commission, and National Pollutant Discharge Elimination System permits under §402 of the CWA. Most actions are under the jurisdiction of TCEQ, but oil and gas production activities covered by §404 are certified by the RRC.

Wetlands are included in the definition of "waters in the state" (30 TAC §307.3(a)(45)), and Surface Water Quality Standards apply to wetlands. In 1995, the TCEQ revised its rule governing state §401 certification of federal §404 dredge and fill permits. The revisions included affirming the goal of "no net loss" of wetlands and incorporating key components of the EPA §404(b)(1) Guidelines into the TCEQ's §401 review. Activities subject to certifications must avoid adverse impacts, including cumulative and secondary impacts. The mitigation sequence found in the §404(b)(1) Guidelines is incorporated into §279.11(c). This mitigation sequence is summarized as avoidance of all impacts for which there are practicable alternatives, taking appropriate and practicable steps to minimize potential adverse impacts, and requiring compensatory mitigation for all unavoidable impacts that remain after avoidance and minimization. If an activity is not water-dependent, practicable alternatives are presumed to exist, unless the applicant demonstrates otherwise. Section 279.11(c)(4) includes a statement that under some circumstances the impact of a project may be so significant that even if alternatives are not available,

certification may be denied regardless of the compensatory mitigation proposed. Currently, the TCEQ reviews §404 and 10/404 permits involving coastal wetlands and other waters of the state over three acres in size. Best management practices to protect water quality are required of applicants with projects three acres or less in size.

### **Wetland Definition and/or Delineation; Comparability With Federal Definition**

The State of Texas has adopted a wetland definition similar to the Corps and EPA definition. Wetlands, as defined by the Texas Water Code, §11.502 and for purposes of §401 water quality certification and CMP (GLO, 1995), are:

an area (including a swamp, marsh, bog, prairie pothole, or similar area) having a predominance of hydric soils that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances supports the growth and regeneration of hydrophytic vegetation.

Also, §11.506 of the Texas Water Code states that "if the state definition conflicts with the federal definition in any manner, the federal definition prevails." The State depends on the Corps and qualified consultants for wetland delineations.

### **Evaluation Methodology**

The Corps, along with other state and federal resource agencies, has developed a draft Regional Guidebook for the Application of Hydrogeomorphic Assessments to Northwest Gulf of Mexico Tidal Fringe Marshes. Various other evaluation methodologies, including a modified Wetland Evaluation Technique, have been used to evaluate wetlands for the mitigation banking programs.

### **Regulated and Exempted Activities**

The state, under §401 Certification, regulates all activities regulated by §404 in all areas of the state, including the coastal zone.

### **Special Provisions for Agriculture and Forestry**

State wetland definition excludes irrigated acreage used for farmland and man-made wetlands less than an acre.

### **Penalties and Enforcement**

The TCEQ has joint enforcement options with the Corps to maximize resources. Pursuant to §§26.019, 26.121(c), and 26.136 of the Texas Water Code and Chapter 337, the TCEQ may issue orders, assess administrative penalties, and take other necessary action if a person violates the state water quality standards or other applicable state water quality requirements.

### **Permit Tracking**

The GLO uses an Access Database to track projects being reviewed for consistency in the coastal zone. The Corps uses the RAMS Database system.

### **State General Permit (PGP or SPGP) for Section 404**

None.

### **Assumption of Section 404 Powers**

No.

## **Joint Permitting**

Public notices issued by the Corps are joint public notices between the TCEQ and the Corps.

## **Special Area Management Plans and Advanced Identification Plans**

None.

## **Role of Local Governments**

Wetland regulation in Texas has traditionally been the responsibility of state and federal agencies. Local governments have several regulatory tools available for the conservation wetlands, including zoning, subdivision regulation, nuisance prohibition, water pollution regulation, and interlocal contracting.

## **Staffing (Regulatory Staff)**

Estimated: 8 in the CMP; 10 GLO field staff; 3 at the PSC, an unknown number at the TPWD, TCEQ, and RRC.

## **Water Quality Standards**

### **Wetlands and Water Quality Standards**

See the descriptions under the above section on Regulation.

### **Wetland Definition**

See the description under Wetland Definition above.

### **Designated Uses**

See the description under Regulation above.

### **Narrative and/or Numeric Criteria**

All narrative and applicable numeric water quality criteria apply to wetlands.

### **Antidegradation Policy**

The State's §401 antidegradation policy applies to wetlands.

### **Other**

None identified.

### **Staffing (Wetland Water Quality Staff)**

Eight part-time.

## **Mitigation**

### **Mitigation Policy**

The TPWD and GLO currently recommend compensation for wetland impacts during review of Corps §10/404 permit applications. The TPWD has a statutory requirement for mitigation for relatively large water resource development projects. The Parks and Wildlife Commission seeks full mitigation for fish and wildlife losses resulting from water resource development projects in excess of 5,000 acre-feet per year (TEX. WATER CODE §11.151). Mitigation measures include improving lands to replace hunter opportunity loss and using fishery management techniques (PARKS & WILDLIFE CODE §57.141). Mitigation can include acquisition and management of fish and wildlife habitats or specific measures such as improvement of spawning and nursery habitats. In determining whether to require an applicant to mitigate adverse impacts on a habitat, the commission may consider any net benefit to the habitat produced by the project.

The GLO requires at least a 3-to-1 mitigation or compensation ratio for all unavoidable adverse impacts to natural resources on state-owned submerged lands. Mitigation is required for damage resulting from such activities as dredging, filling, propwash, oil and gas development, and pipeline construction. Mitigative measures include revegetation of disturbed areas, recontouring of land, replacement of oyster reefs, and habitat creation in the form of scrapedown and/or planting and restoration. Mitigation for impacts to state resources should occur on state land; however, if state land is not available, private land may be used as long as a conservation easement is granted to the GLO for access and control over the mitigation site.

The GLO reviews proposed projects to ensure that all steps are taken to avoid adverse impacts. Unavoidable impacts are compensated for according to the following preferred sequence for replacement of habitat loss: (1) on-site and in-kind; (2) off-site and in-kind; (3) on-site and out-of-kind; and (4) off-site and out-of-kind. Mitigation conditions are included in GLO lease or easement contracts as a requirement for project approval.

In 1995, the TCEQ and the RRC revised their rules governing state §401 certification of federal §404 dredge and fill permits. The revisions of 30 TAC Chapter 279 include affirming the goal of "no net loss" of wetlands and incorporating key components of the EPA §404(b)(1) Guidelines into the TCEQ's §401 review. Pursuant to §279.11(b), activities that require certifications must avoid adverse impacts, including cumulative and secondary impacts. The mitigation sequence found in the §404(b)(1) Guidelines is incorporated into §279.11(c). This mitigation sequence is summarized as avoidance of all impacts for which there are practicable alternatives, taking appropriate and practicable steps to minimize potential adverse impacts, and requiring compensatory mitigation for all unavoidable impacts that remain after avoidance and minimization. If an activity is not water-dependent, practicable alternatives are presumed to exist unless the applicant demonstrates otherwise. Section 279.11(c)(4) includes a statement that under some circumstances the impact of a project may be so significant that even if alternatives are not available, certification may be denied regardless of the compensatory mitigation proposed.

The RRC issues §401 Certification for oil, gas, and geothermal activities. Proposed revisions to the RRC rules on §401 Certification requires that §404 permits comply with all applicable water quality requirements, including applicable criteria of the §404(b)(1) Guidelines.

In 1995, state agencies assisted the Galveston District Corps in developing technical guidelines for compensatory mitigation for §10/404 permits. The guidelines include techniques for creating salt marshes, seagrasses, and forested wetlands.

## **Mitigation Banks**

There are currently six mitigation banks operating and one proposed bank in the Corps, Fort Worth District, and six operating banks in the Galveston District. The Corps and other members of the Mitigation Bank Review Team use the federal mitigation banking guidelines to guide the development of banks.

## **In-Lieu Fee Program**

The Corps, Fort Worth District and The Nature Conservancy of Texas have formed an agreement to establish a regional in-lieu fee program for the Corps, Fort Worth District. The program is intended to provide compensatory mitigation primarily for smaller adverse impacts to wetlands. The Corps, Galveston District also has an in-lieu fee program.

## **Ad Hoc Arrangements**

None.

## **Mitigation Database**

None.

## **Staffing (Mitigation Staff)**

No separate mitigation staff.

## **Monitoring and Assessment**

### **Mapping/Inventory**

The U.S. Fish and Wildlife Service (FWS) has used November and December 1992 and February and March 1993 color infrared aerial photography to update National Wetland Inventory (NWI) maps (scale 1:24,000) for coastal Texas. Previous inventories were conducted using 1950's, 1978/1979, and 1989 photography. Wetlands have been delineated and classified according to Cowardin et al. (1979) on 496 U.S. Geological Survey 7.5-minute maps covering 21 coastal counties. A Nueces County Atlas that includes wetland values and conditions, fish and wildlife utilizing the wetlands, lists of wetland plants and hydric soils, status and trends information, wetland acreage statistics, and NWI maps was completed in 1998 (Moulton and Dall, 1998). In addition, the FWS has conducted a National Status and Trends study in coastal Texas. The goal of the study was to produce comprehensive, statistically valid acreage estimates of wetlands losses and gains for the time period between the 1950's and the 1990's for the coastal region as a whole. Status and trends information was completed in 1997 (Moulton et al., 1997). In addition, status and trends information is available for the Galveston Bay system through the Galveston Bay Estuary Program (White et al., 1993) and for the Corpus Christi area through the Corpus Christi Bay National Estuary Program (White et al., 1998).

The TPWD and Rice University have also classified and monitored wetlands in the Laguna Madre, Corpus Christi Bay, Galveston Bay, and Sabine Lake areas, using satellite thematic mapper imagery and applying the NOAA CoastWatch Change Analysis Program protocol (Thomas and Ferguson, 1990). Information from the digitized maps (scale 1:24,000) can be used for oil spill response or Natural Resource Damage Assessment. In addition, the TPWD has developed guidelines for sensitive wetlands that will provide the basis for regulations regarding such coastal issues as oil spill prevention and response, natural resource damage assessment, mitigation, and acquisition. The TPWD has used a wide range of data--including data on fisheries, waterfowl, and wetland habitats--to

identify and assess sensitive wetlands. Both the FWS and TPWD inventories will be used to determine the status and trends of wetlands and to assess progress toward the goal of no overall net loss of coastal wetlands.

The University of Texas, Bureau of Economic Geology (BEG) (White, 1983-1989) interpreted and delineated wetlands along the entire coast using color-infrared, 1:66,000-scale positive transparencies taken primarily in 1979 by NASA. Emphasis is placed on vegetative communities and flood frequency. Several units such as saltwater marshes, brackish-water marshes, freshwater marshes, and wind-tidal flats have been subdivided into areas defined by frequency of flooding. These different flood-prone units were determined primarily through photographic analysis supported by a limited number of field surveys in which the kinds of vegetation and the soil moisture or degree of inundation were recorded. The BEG is currently interpreting and mapping Texas barrier island wetlands and aquatic habitats on recent and historical aerial photographs, using and revising existing historical data where necessary (White et al., 2002).

A more accurate estimate of coastal wetlands acreage will be possible as the USDA Natural Resources Conservation Service (NRCS) digitizes hydric soils data for coastal counties. NRCS has currently completed digitization of soils maps for some coastal counties.

### **Wetland Classification and Assessment**

No classification system is available that measures wetland quality.

### **Overall wetland gain and loss tracking system**

No tracking system, other than periodic status and trends studies.

### **Staffing (Monitoring and Assessment Staff)**

No separate monitoring and assessment staff.

## **Restoration**

### **Program Description**

There is substantial restoration, especially in the Houston-Galveston area. The GLO surveyed the lower watershed of Dickinson Bayou and the Dickinson Bay area for wetland restoration and creation sites (Calnan and Jennings, 1994). Dickinson Bay and Dickinson Bayou are located between Houston and Galveston on the upper Texas coast. Dickinson Bay is a secondary bay on the western shoreline of Galveston Bay. It was determined that Dickinson Bay and the Dickinson Bayou watershed would greatly benefit from comprehensive wetland restoration and creation projects. Water and sediment quality data, erosion information, and wetland status and trends data indicate that the bay and bayou are damaged ecosystems in need of restoration. Wetland restoration and creation plans were developed for three demonstration projects in the tidal segment of Dickinson Bayou and one in Dickinson Bay. Plans for each site included goals, site descriptions, and marsh restoration/creation techniques. The site plan for creating intertidal marsh on the south shoreline of Dickinson Bay has been implemented by NRCS. The project will provide shoreline stabilization that will function as a 1,400-ft oyster reef and fish habitat and will provide protection for newly created emergent wetlands. All plans can be used to help satisfy the goal in the Galveston Bay Plan (Galveston Bay National Estuary Program, 1995) of creating or restoring 15,000 acres of vegetated wetlands in the Galveston Bay system within 10 years.

The use of dredged material to restore and create wetlands in the Galveston Bay system is being promoted by the Houston Ship Channel Beneficial Uses Group. In addition, a Comprehensive Conservation and Management Plan of the Galveston Bay National Estuary Program (GBNEP) is

promoting the development of a program for the beneficial use of dredged material which includes funding mechanisms to meet the added costs of handling and processing the material when nonbeneficial disposal is eliminated.

The Houston Ship Channel Widening and Deepening Project will entail the removal and disposal of approximately 88 million cubic yards of dredged material over the 50-year life of the project (Turner Collie & Braden, Inc. and Gahagan & Bryant Associates, Inc., 1995). Approximately 4,250 acres of marsh habitat is proposed to be created from the dredged material. A demonstration marsh was constructed using materials, equipment, and techniques that would replicate those that are envisioned for the BUG plan. In addition, the National Marine Fisheries Service (NMFS) examined the potential for biological gains and losses from marsh creation using dredged material in various parts of Galveston Bay (Zimmerman et al., 1992). The NMFS also compared animal abundance and biomass per unit area between salt marsh and unvegetated open bay habitats. The NMFS found that the abundance and biomass of crustaceans and fishes were significantly higher in salt marsh than in open water habitats, and that the lower and eastern parts of Galveston Bay appear to have the best chance for success in marsh creation based upon highest abundance and biomass of marsh fauna and largest differences between marsh and open water (Zimmerman et al., 1992).

A project to identify and evaluate potential sites for wetland restoration, enhancement, or creation in the Corpus Christi/Nueces Bay area was funded by a grant from the EPA through the GLO, with support from the Corpus Christi Bay National Estuary Program and the Center for Coastal Studies, Texas A&M University, Corpus Christi, Texas (Smith et al., 1997). The project also included developing sound, scientifically based plans to restore, enhance, or create wetland functions for at least two sites representative of each wetland category in the Corpus Christi/Nueces Bay area, including fresh, brackish, and salt marshes, seagrasses, and bottomland hardwoods. Factors considered included the presence of hydric soils, restorable hydrology, and important functions to be performed by the restored wetlands.

With CMP funding and other sources, the Galveston Bay Foundation (GBF) has developed a Habitat Conservation Blueprint for Galveston Bay (1998) to identify potential wetland restoration sites in the Galveston Bay system. A series of public meetings was held to develop consensus on priorities for habitat conservation. A matrix of implementation sources was prepared to match projects with funding sources. A final list of 167 sites for restoration and/or conservation, along with potential strategies, was developed. Information in the plan has been disseminated through a wide variety of media, including printed materials, videotapes, public media, special events, and the GBF's educational programming. The goal of the Blueprint is to restore 24,000 acres of Galveston Bay habitat by the year 2010.

The TPWD received a grant from the EPA in 1997 to develop a voluntary registry of private and public lands available for mitigation or restoration. Part of the project identified and prioritized potential wetland restoration sites on public land. This project also includes a voluntary Wetlands Restoration Site Registry for private landowners. The registry program functions like "want ads," linking those who do not own land, but need or want to do wetlands restoration, with property owners who have similar goals. The Registry contains a searchable database of public and private sites that are available for restoration. In August 2000, there were 111 landowners in the program, resulting in a total of approximately 41,000 acres of registered lands. The site is located at <http://realvid.tpwd.state.tx.us:8080/wetland>.

**(This is also described above under new programs)** Texas now has matching funds to help implement wetland restoration projects. In 1999, the Texas Legislature passed the Coastal Erosion Planning and Response Act (CEPRA). The CEPRA resulted in the availability of \$15 million in state funds over the two years for coastal erosion and wetland restoration projects. The CEPRA authorizes the GLO to implement a comprehensive CEPRA program that includes designing, funding, building, and maintaining erosion projects alone or in partnership with other governmental and non-governmental entities. The GLO allocated funds to 34 erosion response projects for Cycle 1. Based on the success of the initial 2000-2001 program (Cycle 1), the 77<sup>th</sup> Legislature appropriated an additional \$15 million for the CEPRA program during the 2002-2003 biennium (Cycle 2). In Cycle 2, 41 erosion response projects

were completed or are under construction. The 78<sup>th</sup> Legislature appropriated over \$ 7 million for the CEPRA program for the 2004-2005 biennium (Cycle 3). Cycle 3 funds were awarded to 20 erosion response projects, including several that are coupled with marsh restoration.

**Restoration/Creation Projects**--The following are examples of coastal wetland restoration projects, studies, and plans that are underway or completed:

- Many coordinated wetland restoration efforts have been completed or are underway in the Galveston Bay estuary, including the following examples: Galveston Island State Park (240 acres protected, 21 acres restored, and 388 acres enhanced); San Jacinto State Park (130 of 200 acres restored); East Galveston Bay (800 linear feet of marsh restored); Clear Creek Beneficial Uses of Dredged Material (12 acres restored and 4.2 acres created); Pierce Marsh (3.4 acres planted and 63 acres restored); and John M. O'Quinn I-45 Estuarial Corridor Acquisition and Restoration (900 acres protected and restored). Restoration projects beginning in 2000-2001 and that are either completed or ongoing; include Christmas Bay, Halls Lake, Jumbile Cove, Little Cedar Bayou, Delehide Cove, and North Deer Island. In addition, the GLO and TPWD received a National Coastal Wetlands Conservation grant in 2003, from the FWS to protect and restore wetlands in the Starvation Cove area of West Bay. The approximately \$1 million grant is for acquiring 100 acres on West Galveston Island, restoring 10 acres of estuarine marsh and one acre of seagrass, and protecting, by the installation of a breakwater, an additional 452 acres of wetlands and uplands on the Island. The Galveston Bay Foundation's (GBF) Habitat Conservation Blueprint (1998) set a goal of restoring 24,000 acres of habitat in the Galveston Bay area by 2010. Altogether, with the implementation of all four (Galveston Island State Park, Jumbile, Delehide, and Starvation Coves) wetland/seagrass/tidal flat protection/restoration projects on West Galveston Island, almost 1,800 acres of marsh/seagrass/tidal flat will have been protected or restored on Galveston Island.
- Since January 2003, the GLO and Council have assisted in the restoration and protection of over 7,600 acres of coastal wetland and native coastal prairie through reimbursements to Coastal Impact Assistance Program grant awardees.
- Since its beginning in 1999, nearly 2,400 Marsh Bash (now Marsh Mania, a GBF sponsored event) volunteers have created more than 60 acres of wetlands in the Galveston Bay system.
- The NMFS's Galveston, Texas, laboratories received funding from the EPA to restore seagrasses in a part of western Galveston Bay. The goal of the project is to create one hectare (approximately 2.5 acres) of viable *Halodule wrightii* habitat in West Bay. The objectives are to determine survival and growth rates of transplanted seagrasses and to obtain evidence of increased faunal densities above those in neighboring nonvegetated substrates. Toward these ends, *Halodule wrightii* was transplanted to two areas along western Galveston Island during late April and early May 1994.
- A Beneficial Uses Disposal Plan has been incorporated into the project to deepen and widen the Houston Ship Channel. The plan provides for creation of 4,250 acres of intertidal salt marsh in Galveston Bay over the 50-year life of the project. Beneficial-use sites will be created in upper, mid, and lower Galveston Bay. There will not be enough new-cut clay dredged material available during initial project construction to completely construct all perimeter levees for the sites. Therefore, all available good quality levee-building material will be used to construct as many cells as possible during initial project construction. Openings will be left in levees of cells not immediately needed for maintenance material disposal and marsh establishment to retain their estuarine habitat functions as long as possible.

The construction of a large-scale demonstration marsh for the purpose of identifying environmental and design parameters and management requirements was recommended by the Beneficial Uses Disposal Plan. The 220-acre demonstration marsh was constructed in 1993 in upper Galveston Bay. Following construction of the marsh, management of the dredged material was undertaken to achieve the target fill elevation. Bioengineering parameters for the marsh were patterned after naturally occurring attributes at reference marshes near the site. Monitoring and management plans have been developed which will

track the planting plan, the development of marsh habitat, and utilization by avian species (Turner Collie & Braden, Inc. and Gahagan & Bryant Associates, Inc., 1995).

So far, the Bayport Demonstrations Marsh is a successful restoration/creation site and can be a model of other restoration projects in the Galveston Bay system. After two growing seasons, there were no differences in total plant cover among all plant spacings. Planting of sprigs on 11m centers was the most cost-effective planting method. Newly created circulation channels, ditches, and levee breaches will enhance marsh productivity and provide additional access for marine organisms.

- Other examples of the beneficial uses of dredged material to restore wetlands in the Galveston Bay system are the Clear Creek Beneficial Uses of Dredged Material Demonstration Project and the San Jacinto State Park Project. Both projects involve extensive partnerships and demonstrate innovative techniques in marsh restoration.
- In 1998, the TPWD and GLO received a FWS National Coastal Wetlands Conservation Grant to protect and restore wetlands on Shamrock Island in Corpus Christi Bay. The Shamrock Island project consists of construction of: 1) a 3,600 ft geotextile tube (geotube) to protect the Island's northwest shoreline; 2) a feeder beach for nourishing the Island's southern shoreline; and 3) five acres of marsh vegetation/open-water habit to be created between the geotube and the Island. Construction of the geotube and feeder beach was completed in March 1999. Marsh vegetation was planted in October 1999 and September 2000. Seagrasses are becoming abundant between the geotube and the Island shoreline, because of the decreased turbidity and turbulence provided by the geotube breakwater.
- The Bureau of Reclamation has conducted a demonstration project in Rincon Bayou/Nueces River delta marshes. The project is designed to complement the ongoing Nueces Estuary Regional Wastewater Planning Study sponsored by the City of Corpus Christi, the state, and several local entities. The objective of the project is to provide more frequent releases of fresh water and accompanying nutrients and sediment to increase productivity in the Nueces-Corpus Christi estuary. Work on the project was completed in 1995, and the successful demonstration project is now permanently diverting river waters into the delta marshes.

### **Restoration Program Goals**

The GBF has set a goal of restoring 24,000 acres by 2010.

### **Eligibility Criteria**

Both public and private lands are eligible for restoration.

### **Restoration Database**

No known database that tracks restoration projects.

### **Staffing (Wetland Restoration Program Staff)**

No separate restoration staff, although the GLO's CEPRA program (described above under new programs) has a staff of approximately six FTEs.

### **Public/Private Partnerships**

### **Acquisition Program**

None specifically for wetlands.

## Public Outreach/Education

(The following information has a coastal emphasis.) A number of joint GLO and TPWD educational efforts have occurred or are being developed and apply to both publicly- and privately- owned wetlands. Many of the wetlands educational materials have been developed through EPA State Wetlands Protection grants.

- (1) Wetlands educational workshops have occurred annually on the coast since 1991.
- (2) A Texas Coastal Wetlands poster was developed by TPWD artists.
- (3) Coastal wetland packets with brochures and a poster highlighting wetland status and trends and functions and values, regulatory and nonregulatory protection methods, wetland contacts, and a wetland bibliography were developed by the GLO.
- (4) (Wetland newsletters, including CMP newsletters focusing on wetlands during National Wetlands Month in May and the TPWD Texas Wetlands newsletter, were developed by both the GLO and TPWD.
- (5) Proclamations from both ex-Governors Ann Richards and George W. Bush declaring May National Wetlands Month in Texas were issued.
- (6) A Seagrass and Boating brochure was developed by the TPWD, in association with the Boaters Trade Association of Texas and with assistance from the GLO.
- (7) A Wetlands Assistance Guide for Landowners, which is intended to provide a quick reference for landowners interested in protecting wetlands on their property, and a pocket-sized brochure summarizing incentive programs discussed in the Wetlands Assistance Guide, were developed by the TPWD (TPWD, 1995b). The Guide also discusses the functions and values of wetlands, conservation options, wetland regulatory requirements, and agency contacts.
- (8) An educational wetlands video (22 minutes in length) produced by the TPWD describes the different types of wetlands found in Texas, the function of wetlands and their importance to both humans and the natural environment, their rate of loss, and the efforts currently underway to conserve wetlands, is available from the TPWD. The TPWD is also producing a bottomland hardwoods video to illustrate their significance, why they are being lost, and how they can be protected.
- (9) Magazine articles concerning wetlands have been published in the Texas Parks and Wildlife magazine.
- (10) In addition, the GLO and TPWD are assisting the Texas Agricultural Extension Service in developing a Wetland and Coastal Resources In-Service Training Manual for Texas to assist county agricultural extension agents with wetlands issues.
- (11) Through the Texas Environmental Awareness Network, educational programs provide current information on natural resources, including wetlands, which are presented via satellite to educators throughout the state. The program Eye on Earth is broadcast by the Texas Education Agency via its T-Star Network. Two programs focused on groundwater and coastal concerns, including wetlands.
- (12) An extensive, annotated Texas Coastal Wetlands Bibliography is on the WetNet system (<http://www.glo.state.tx.us/wetnet/pubs.html>).

- (13) A Texas Coastal Wetlands Guidebook (Moulton and Jacob, 2001) identifies 111 wetland sites of all types that may be visited by educators and others who may be planning to visit a regional wetland site. Site descriptions include Internet addresses that provide more detailed information.
- (14) The GLO, in cooperation with state and federal agencies and with funding from the EPA, has developed a wetlands information sharing system for the Internet called the WetNet (<http://www.glo.state.tx.us/wetnet/>). The WetNet Project is a system for sharing wetlands information, including geo-spatial and permitting data, with the public, academics, and government agencies. The WetNet gives users of the system desktop access to GIS technology. Participating state and federal agencies agree to maintain data coverages pertinent to wetland protection on the WetNet.

### **Tax Incentives**

A priority action in the Texas Wetlands Conservation Plan is developing tax incentives for wetlands.

### **Technical Assistance**

The TPWD has developed a Wetlands Assistance Guide for Landowners (TPWD, 1995).

### **Other Nonregulatory Incentives for Private Landowners**

None identified.

### **Wetland Training and Education**

The CLE International holds an annual conference on Texas Wetlands. The conference, usually held in Austin or Houston in February, emphasizes primarily regulatory issues.

### **Watershed Planning**

None identified.

### **Special Problems**

Large areas of depressional, coastal prairie pothole, and playa lake wetlands are now considered isolated and no longer jurisdictional.

### **Coordination**

Although no one state agency is primarily responsible for coordination, the TPWD is probably the agency that is most responsible for consistency (see e-mail address for Rollin MacRae below), since the TPWD coordinated the development of the Texas Wetlands Conservation Plan.

### **Contact Person(s)**

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## State Agency E-mail Contacts

[tcalanan@glo.state.tx.us](mailto:tcalanan@glo.state.tx.us) – Texas General Land Office

[rollin.macrae@tpwd.state.tx.us](mailto:rollin.macrae@tpwd.state.tx.us) – Texas Parks and Wildlife Department

[mfisher@tceq.state.tx.us](mailto:mfisher@tceq.state.tx.us) – Texas Commission on Environmental Quality

[leslie.savage@rrc.state.tx.us](mailto:leslie.savage@rrc.state.tx.us) – Texas Railroad Commission

## Guidebooks, Brochures, Websites, Other Educational Materials

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Galveston Bay National Estuary Program. 1995. The Galveston Bay Plan: the Comprehensive Conservation and Management Plan for the Galveston Bay Ecosystem. The Galveston Bay National Estuary Program, a program of the Texas Natural Resource Conservation Commission. Publication GBNEP-49. 457 pp.

Grimes, W. D., and Jimmy Martinez. 1997. Developing a methodology for monitoring the impact of dredging activities on coastal wetland resources. Project report submitted to the U.S. Environmental Protection Agency, Region 6, under Cooperative Agreement CD996411-01-0, Texas General Land Office, Coastal Division, Austin, TX. 22 pp.

Houston-Galveston Area Council. 2000. Seabrook Wetland Conservation Plan. <http://www.hgac.cog.tx.us/resources/seabrook/seabrook.html>. 44 pp.

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- Moulton, D. W., and D. M. Dall. 1998. Atlas of National Wetlands Inventory Maps for Nueces County, Texas. National Wetlands Inventory, U.S. Fish and Wildlife Service, Albuquerque, NM. 58 pp.
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### **Selected Web Sites**

[www.glo.state.tx.us/wetnet/](http://www.glo.state.tx.us/wetnet/) -- General Land Office Wetlands Network

[www.glo.state.tx.us/coastal/cmp.html](http://www.glo.state.tx.us/coastal/cmp.html) – Texas Coastal Management Program

[www.tnrcc.state.tx.us/admin/topdoc/gi/236/](http://www.tnrcc.state.tx.us/admin/topdoc/gi/236/) -- Galveston Bay Estuary Program

[www.cbbep.org/](http://www.cbbep.org/) -- Coastal Bend Bays and Estuary Program

[www.beg.utexas.edu](http://www.beg.utexas.edu) – University of Texas, Bureau of Economic Geology

[www.swg.usace.army.mil/](http://www.swg.usace.army.mil/) -- Galveston District, U.S. Army Corps of Engineers

[www.swf.usace.army.mil/](http://www.swf.usace.army.mil/) --Fort Worth District, U.S. Army Corps of Engineers

[www.wetlands.com/regs/tlpge01b.htm](http://www.wetlands.com/regs/tlpge01b.htm) – Wetlands Regulation Center

<http://ifw2es.fws.gov/documents/r2es/TexasWetlands.pdf> – Texas Coastal Wetlands: Status and Trends, mid-1950s to early 1990s