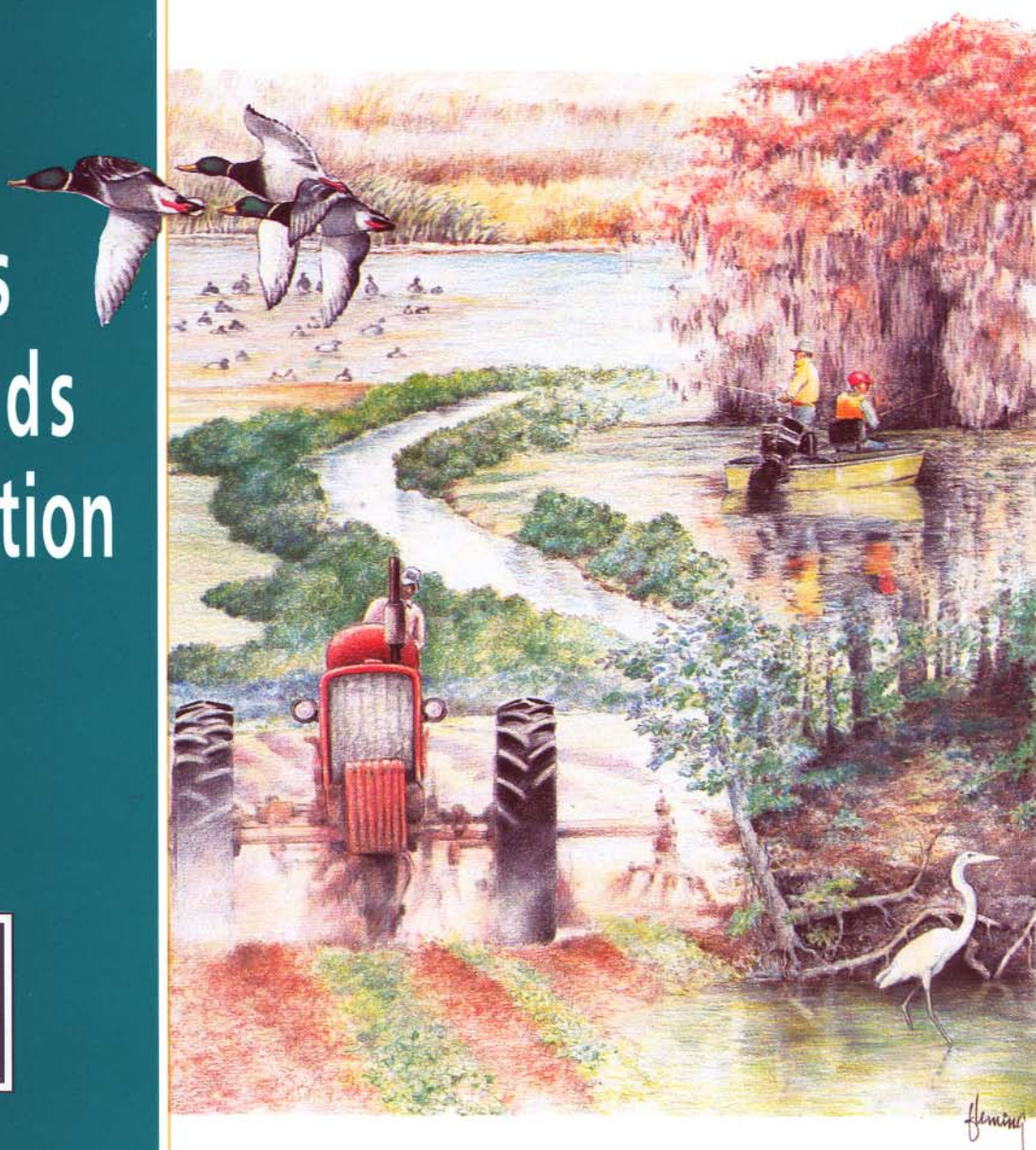


Texas Wetlands Conservation Plan



Texas Wetlands Conservation Plan



Texas Wetlands Conservation Program
Resource Protection Division
4200 Smith School Road
Austin, Texas 78744





STATE OF TEXAS
OFFICE OF THE GOVERNOR

GEORGE W. BUSH
GOVERNOR

July 31, 1997

My Fellow Texans:

As we plan for the next century, the use and conservation of water will remain a top priority. Texas' future will depend on the water resource strategies we implement today.

Wetland conservation is an integral part of a sound water policy. Wetlands form our state's most biologically diverse ecosystems and provide some of the most beautiful landscapes to be found anywhere in America. The ecological and economic benefits arising from these areas are enormous, as wetlands form nursery areas for commercial and recreational fisheries, provide critical wildlife habitat, minimize erosion and flooding, and support excellent outdoor recreation.

I believe that the future of Texas' natural resources is in the hands of its landowners and their deep commitment to be good stewards of those resources. The cooperative, voluntary approach to wetland conservation in the Texas Wetlands Conservation Plan represents a model for natural resource management in a private lands state like Texas.

The Plan is unique. First, it provides a non-regulatory and incentive-based approach to wetlands management, inviting private landowner participation in resource management. Second, it is the result of a remarkable cooperative effort. For more than a year, landowners, business interests, agriculture, conservation groups and government agencies worked together to construct a plan that would work for all Texans.

The conservation of our natural resources is an important legacy to future Texans. The Texas Wetlands Conservation Plan provides an excellent framework for voluntary stewardship of those resources.

Sincerely,

A handwritten signature of George W. Bush in dark ink, written over the word "Sincerely," and the printed name "GEORGE W. BUSH".

GEORGE W. BUSH

GWB/KAS/mc

**RESOLUTION BY THE
TEXAS PARKS AND WILDLIFE COMMISSION
REGARDING THE
TEXAS WETLANDS CONSERVATION PLAN**

WHEREAS, generations of Texans, from timber harvesters in the east to cattle ranchers in the west, have always known that good stewardship of the land is the smartest and simplest way to ensure that the valuable natural resources that fuel our economy are renewed and protected for the future; and

WHEREAS, among our many natural resources, Texas wetlands are one of the most extensive and valuable; they provide the link between land and water and are present in the Panhandle, East Texas, and along the entire Gulf Coast; and

WHEREAS, these unique ecosystems are recognized for the many benefits they provide to both the environment and the economy, including land erosion, water purification and groundwater recharge, fish and wildlife habitat, fishing and recreation and nature tourism; and

WHEREAS, current growing need for maintaining the benefits that war

WHEREAS, with participation is state agencies innovative me

WHEREAS, the regulatory, v representing conservation

WHEREAS, u supported Commission the Texas Conserva and Wild

WHEREAS Texas the Tex Assoc, Texas,

WHEREAS review an Wildlife D

WHEREAS, th incorporated managing wetlands across

NOW, THEREFORE BE IT RESOLVED, the Texas Parks and Wildlife Commission Conservation Plan and directs staff to continue working with landowners to conserve Texas wetlands; and, be it further

RESOLVED, the Commission directs staff to continue working with the Legislature on a Concurrent Resolution that supports the Plan; and, be it further

RESOLVED, the Commission directs staff to work with the Office of the Governor to give special recognition to wetlands during May, 1997.



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Ben Weinheimer, Texas Cattle Feeders Association
Ross Wilson, Texas Cattle Feeders Association
Kathy Wood, Playa Lakes Joint Venture, U.S. Fish & Wildlife Service

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For additional information on the Texas Wetlands Conservation Plan, contact Julie Anderson, Texas Parks and Wildlife, 4200 Smith School Road, Austin, Texas, 78744, (512) 389-4328.



*Great Egret in East
Texas Swamp*

TPWD

EXECUTIVE SUMMARY

Texas' wetlands are among its most valuable natural resources. These lands provide many economic and ecological benefits, including flood control, improved water quality, harvestable products, and habitat for our abundant fish, shellfish and wildlife resources. But Texas' wetlands are disappearing. About half of Texas' historic wetlands acreage has been converted in response to society's demand for food, fiber, housing and industrial development. If future generations of Texans are to enjoy the same economic vitality and quality of life as past and present generations, we must implement effective strategies for wetlands conservation.

Although wetlands issues are at times controversial, broad support exists among diverse interests on many aspects of wetlands conservation and public responsibility. Ninety-seven percent of Texas' land is privately owned and managed, and as such, management decisions on these lands are made by private landholders. Economics often dictate what these management strategies will be. Therefore, the Texas Wetlands Conservation Plan follows the philosophy of Aldo Leopold, who states, "When a farmer owns a rarity, he

should feel some obligation as its custodian, and a community should feel some obligation to help him carry the economic cost of custodianship” (Leopold, 1947).

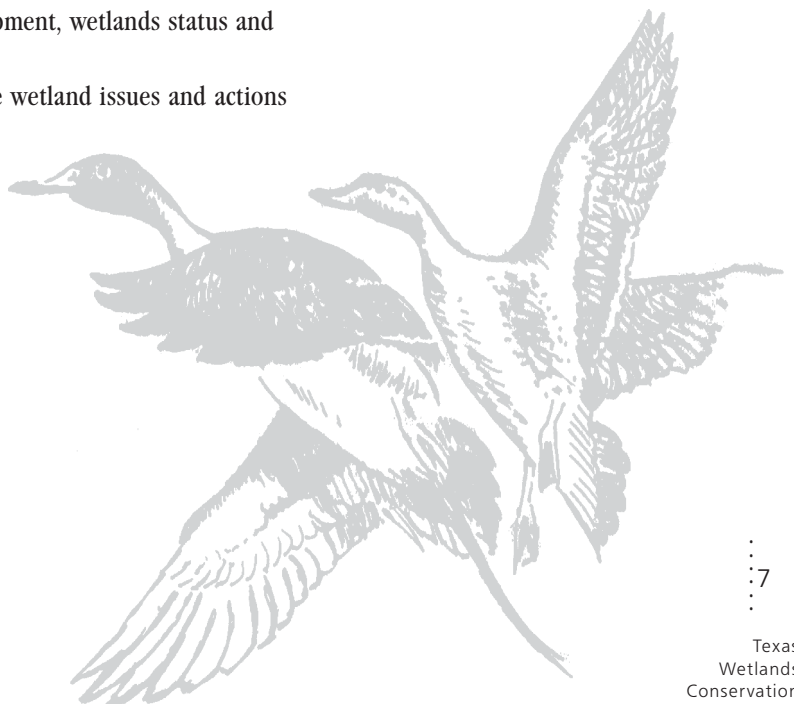
The Texas Wetlands Conservation Plan, initiated in April, 1994, focuses on non-regulatory, voluntary approaches to conserving Texas’ wetlands. Although development of the Texas Wetlands Conservation Plan (“the Plan”) has been coordinated by Texas Parks and Wildlife, the Plan is intended as a guide for wetlands conservation efforts throughout the state. The Plan focuses on:

- Enhancing the landowner’s ability to use existing incentive programs and other land use options through outreach and technical assistance;
- Developing and encouraging land management options that provide an economic incentive for conserving existing wetlands or restoring former ones; and,
- Coordinating regional wetlands conservation efforts.

Due to the extensive size and physiography of Texas, a “regional” approach was used to best characterize the diverse wetlands needs and resources of Texas. Three Regional Advisory Groups – one each in East Texas, the Panhandle and the Gulf Coast – identified sixteen regional or statewide issues associated with conserving Texas wetlands, and developed recommendations and proposals for action to address those issues. The Statewide Coordination Group provided additional support during the Plan’s development. Recommended actions will be implemented in phases by federal, state and local agencies and private groups. Wetland issues addressed in the Plan fall into five general categories: education; economic incentives; statewide and regional conservation; assessment and evaluation; and coordination and funding.

Chapters I through IV address the Plan’s goal, its development, wetlands status and trends in Texas, and specific wetland topics.

Chapters V through X contain the regional and statewide wetland issues and actions that form the core of the Texas Wetlands Conservation Plan.





*The Purple Gallinule
is often observed
walking on floating
lotus leaves*

TPWD

CHAPTER I. GOAL OF THE TEXAS WETLANDS CONSERVATION PLAN

“It shall be the goal of Texas to enhance our wetland resources with respect to function and value through voluntary conservation and restoration of the quality, quantity and diversity of Texas wetlands.”

The State recognizes that private landowners are stewards of a natural resource in which many of the benefits are accrued to the public. Ninety-seven percent of Texas’ land is privately owned and managed, and as such, management decisions on these lands are made by private landholders. Economics often dictate what these management strategies will be. Therefore, the Texas Wetlands Conservation Plan follows the philosophy of Aldo

Leopold, who states, “When a farmer owns a rarity, he should feel some obligation as its custodian, and a community should feel some obligation to help him carry the economic cost of custodianship” (Leopold, 1947). The state is committed to broadening landowner options, including the development of new economic incentives and the elimination of disincentives for wetlands conservation.

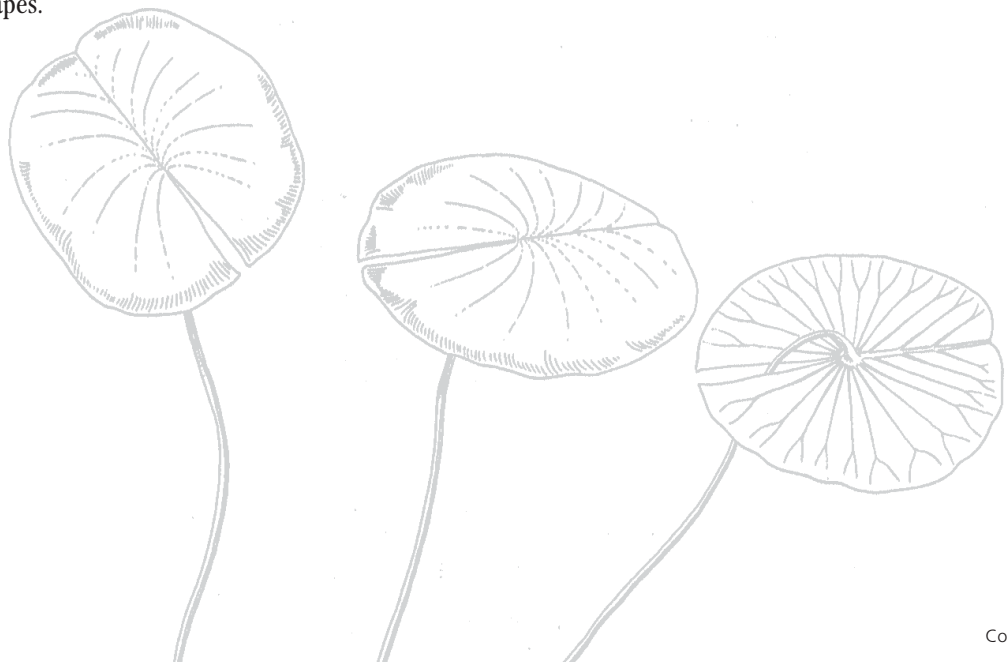
The Texas Wetlands Conservation Plan also focuses on providing private landowners with information to assist them in making informed, economically beneficial management decisions, while at the same time protecting wetland functions and maximizing the benefits that wetlands provide to all citizens.

The conservation of wetlands is an institutional challenge as well as a resource management challenge. Because of Texas’ size, conservation issues vary greatly between regions. To address these differences, the Plan recommends solutions to both statewide and regional wetlands issues. In all regions, protecting natural wetlands and restoring and enhancing wetlands that have been drained or modified is preferred to creating wetlands where none existed previously. Restoration opportunities may be limited by landowner interest, however; in this instance, wetland creation may be preferable to no action at all.

Conservation of wetlands includes improving the quality, quantity and diversity of Texas wetlands. Quality refers to the wetlands’ ability to perform necessary functions and values, such as flood storage, wildlife habitat and water quality improvement. An overall enhancement of wetland functions will occur statewide. Quantity refers to acreage of wetlands. Diversity means both protection of different wetlands types (e.g., bottomlands, playa lakes, coastal marshes) and protection of native biological diversity within wetlands systems and across Texas landscapes.

“The Plan has done a good job of bringing a lot of previously-distant groups into closer contact and agreement.”

Janice Bezanson,
Texas Committee on
Natural Resources





South Texas contains numerous resacas, or former streambeds, which provide invaluable habitat for wildlife

USFWS

CHAPTER II. INTRODUCTION

Texas' wetlands are among its most valuable natural resources. These lands provide many economic and ecological benefits, including flood control, improved water quality, harvestable products and habitat for our abundant fish, shellfish and wildlife resources. But Texas' wetlands are disappearing. About half of Texas' historic wetlands acreage has been converted from natural systems in response to society's demand for food, fiber, housing and industrial development. If future generations of Texans are to enjoy the same economic vitality and quality of life as past and present generations, we must implement effective strategies for wetlands conservation.

The issue of wetlands conservation on private lands is, in part, one of economic utility. Landowners who depend upon their land for income are faced with the need to secure sustainable economic benefits. Historically, realizing maximum benefit meant land conversion because retained wetlands were perceived as having little tangible economic

utility. However, retaining wetlands *can* be profitable if economic benefits are realized by landowners for their wetland conservation efforts. Several problems have prevented this: landowners were not aware of the benefits provided by wetlands, existing financial incentives provided insufficient economic return, and landowners had little access to information relating to alternate economic strategies or land-use options.

A means of involving landowners in the economic and conservation considerations of wetlands use is fundamental to the future of these lands and to the future of Texas. Concomitant to that involvement is the need for a public/private partnership for implementing innovative, economically-based, non-regulatory strategies for wetland management and stewardship. This is provided by the Texas Wetlands Conservation Plan.

Why was a Wetlands Conservation Plan initiated in Texas?

State Wetlands Conservation Plans were an outgrowth of the National Wetlands Policy Forum, which was convened in 1987 at the request of the U.S. Environmental Protection Agency. The charge to the Forum was that of addressing major policy concerns regarding nationwide protection and management of wetlands. The Forum consisted of twenty members representing business and agricultural interests, state and local government and academia. In its final report, the Forum provided approximately 100 recommendations for improving wetlands conservation, and it was in this Forum that the concept of “no net loss” of wetlands first gained general acceptance. In its recommendations, the Forum encouraged each state to prepare a State Wetlands Conservation Plan. The overall purpose of State Wetlands Conservation Plans is to improve the efficacy and efficiency of governmental and private sector efforts to protect, restore and create wetlands in a state or on tribal lands.

State Wetlands Conservation Plan development requires two key elements: (1) guidance on how to develop a Plan, and (2) funding assistance. In 1991, the World Wildlife Fund (1992) produced the *Statewide Wetlands Strategies: A Guide to Protecting and Managing the Resource*. It expands the recommendations from the National Wetlands Policy Forum and provides general guidelines for developing statewide comprehensive wetlands strategies. Financial assistance for State Wetlands Conservation Plan development was provided by the Environmental Protection Agency’s Office of Wetlands, Oceans and Watersheds through the Wetlands Protection State Development grants program. As of early 1997, over thirty states and Indian tribes have received funding to develop State Wetlands Conservation Plans. In addition, nine states and two tribes have completed plans (pers. comm. with Reggie Parrish, U.S. Environmental Protection Agency, Washington, D.C.).

Numerous projects related to wetlands had already been completed or were underway in Texas. Beginning in 1990, the Environmental Protection Agency funded a series of

“TPWD has done a remarkable job bringing together diverse interests and coming up with something workable.”

Maxine Johnston,
President,
Big Thicket Association

technical grants under the Wetlands Protection State Development grant program in Texas. However, the efforts of the responsible agencies were fragmented and poorly coordinated. Texas needed a single road map for wetlands management that melded the many pieces of the wetlands puzzle, that prioritized wetlands activities among agencies, and that fostered communication between agencies to maximize the effectiveness of available funding. Ultimately, Texas needed a plan to ensure the continued improvement of its wetlands resources in the future.

In August, 1993, the World Wildlife Fund hosted a workshop in Austin, funded by the Environmental Protection Agency and private foundation grants, for the states of Texas, Oklahoma, Arkansas and Louisiana. The meeting provided an overview of techniques for developing wetlands conservation plans. Following this workshop, the participating agencies agreed that Texas Parks and Wildlife would lead development of a formalized plan for Texas.

In 1994, Texas Parks and Wildlife received two grants that supported the Plan's development:

- National Park Service Land and Water Conservation Fund grant totaling \$149,000 (50/50 cost share), which funded preliminary Plan development and completion of the Wetlands Addendum as part of the Texas Outdoor Recreation Plan. The Wetlands Assistance Guide for Landowners, an educational video, and a quarterly newsletter were also supported by this grant.
- U.S. Environmental Protection Agency Wetlands Protection State Development grant totaling \$159,000 (75% federal/25% state) to develop the Plan.

History of Plan Development

In September, 1994, a Statewide Scoping Meeting was held that provided participants with an opportunity to apply their expertise to development of the Texas Wetlands Conservation Plan ("the Plan"). Participants represented a broad spectrum of wetlands interests, including landowners, state and federal agencies, conservation, agriculture, forestry and business.

Participants overwhelmingly supported landowner involvement during all stages of Plan development. Three principal needs were identified:

- Improved information transfer between agencies, groups and citizens;
- New incentives that would encourage landowners to conserve wetlands on their lands; and,
- Increased assessment of wetlands projects and research on conservation options.

In January, 1995, a Statewide Coordination Group was assembled to initiate development of the Plan. The Statewide Coordination Group consists of public and private sector representatives whose interests in wetlands extend statewide. This group was responsible for:

- Providing feedback and support to guide the direction of the Plan,
- Receiving and responding to information and updates from Regional Advisory Groups on Plan development,
- Providing a vehicle to convey information received from landowners and regional interests to agency officials, and
- Facilitating coordination, communication and cooperation among Texas resource agencies and private groups on wetlands conservation efforts.

Due to the extensive size and physiography of Texas, a “regional” approach was used to best characterize the diverse wetlands needs and resources of Texas. The Statewide Coordination Group worked in cooperation with three Regional Advisory Groups – one each in East Texas, the Panhandle and the Gulf Coast. These regions were selected because each contains a large wetland complex, and each has a distinct socioeconomic structure and specific land use. Wetlands in other parts of the state are important too. However, major wetland types, land uses and issues addressed in the three regions typically extended beyond those regions. Most of the recommended actions apply to wetlands statewide.

The purpose of the Regional Advisory Groups is twofold: to identify regional or statewide issues associated with conserving Texas wetlands, and to develop recommendations and proposals for action to address those issues. These results form the core of the Texas Wetlands Conservation Plan.

The Regional Advisory Groups met over the course of one year to discuss solutions to five general categories of wetlands issues that they identified:

- education,
- economic incentives,
- conservation,
- private ownership, and
- governmental relations.

Information from the three groups was combined into a single plan. The final draft, completed in December, 1996, was available for public review and finalized in the spring of 1997. Appendix C describes the public review process.

Existing Wetlands Planning Efforts in Texas

Wetlands planning in Texas has been influenced by opportunities and requirements initiated at the national, state and local levels. Five planning efforts have been undertaken at the state level in recent years that address different aspects of wetlands management and planning. The Texas Wetlands Conservation Plan is intended to bring all the wetlands conservation efforts together.

The **Seagrass Conservation Plan** was developed to address seagrass problems in Texas over the next ten years. A variety of interests outlined conservation goals for the Seagrass Plan, which include defining seagrass research needs, addressing management concerns, and expanding environmental awareness in citizens through education.

The **Coastal Management Program (CMP)** was authorized by state legislation passed in 1989 and amended in 1991. The law directed the General Land Office to coordinate development of a long-term plan for the management of uses affecting coastal resources with other state agencies, including Texas Parks and Wildlife, Texas State Soil and Water Conservation Board, Texas Natural Resource Conservation Commission, Texas Water Development Board, Texas Department of Transportation, and the Railroad Commission of Texas (Sec. 33.052, Texas Natural Resources Code).

The program applies to an exclusive list of primarily state and federal government actions within a boundary encompassing parts of the 19 Texas counties bordering the Gulf of Mexico. The CMP ensures that management of activities affecting coastal natural

“The Texas Wetlands Conservation Plan will help improve and coordinate efforts of both government agencies and the private sector to conserve our wetlands. The General Land Office supports the Plan and looks forward to working together on its implementation.”

Garry Mauro,
Commissioner,
Texas General Land Office

resource areas is consistent with the goals and policies adopted by the Coastal Coordination Council, which oversees the program. The consistency of an agency's actions is determined by the agency itself, but the Council may review actions that exceed established thresholds.

On January 10, 1997, the Department of Commerce approved the Coastal Management Plan under the federal Coastal Zone Management Act. This means that actions undertaken, approved, or funded by federal agencies within the coastal boundary must be consistent with the state's program, and it makes the state eligible for federal grant monies for coastal projects. To receive a copy of the CMP document, contact the Texas General Land Office at (512) 463-5385 or 1-800-85-BEACH.

The **State Wetlands Conservation Plan for State-owned Coastal Wetlands** provides protection through specific actions for state-owned coastal wetlands. Texas Parks and Wildlife and the General Land Office, with assistance from other agencies, are jointly developing this legislatively required plan (Ch. 14.002, Texas Parks and Wildlife Code). Eighteen specific items/actions must be included in the plan, including a goal of no overall net loss of state-owned wetlands, an inventory, wetland mitigation policies, a requirement for freshwater inflows to estuaries, a navigational dredging and disposal plan, education and research regarding boating in wetlands, the reduction of non-point source pollution, improved coordination among federal and state agencies, a plan to acquire coastal wetlands and other provisions. This plan is to be approved by both the School Land Board and the Parks and Wildlife Commission. To receive a copy of this plan, contact the Texas General Land Office at (512) 463-5100.

The **Texas Wetlands Plan (1995)** is a revision of the 1988 addendum to the *Texas Outdoor Recreation Plan (TORP)*, the State's Comprehensive Outdoor Recreation Plan. This addendum was required for Texas to qualify for federal Land and Water Conservation Fund monies in response to the Emergency Wetlands Resources Act of 1986. This Fund assists state and federal agencies in acquiring and developing federal, state and local government public outdoor recreation areas. The Texas Wetlands Plan is an interim report of the Texas Wetlands Conservation Plan. To receive a copy of the Wetlands Addendum, contact Texas Parks and Wildlife at (512) 389-4328.

The **Local Government Wetlands Plan** is a demonstration project that will incorporate the tools contained in *Texas Coastal Wetlands: A Handbook for Local Governments* (Texas General Land Office, 1997). The Texas General Land Office will form a partnership with a local government to develop a local wetlands plan. For more information contact the General Land Office at (512) 475-2330.

"The Texas Farm Bureau, which was represented at both the statewide and regional planning levels, would like to state its support for the Plan's development process and implementation."

Bob Stallman,
President,
Texas Farm Bureau

Wetlands Programs in Texas

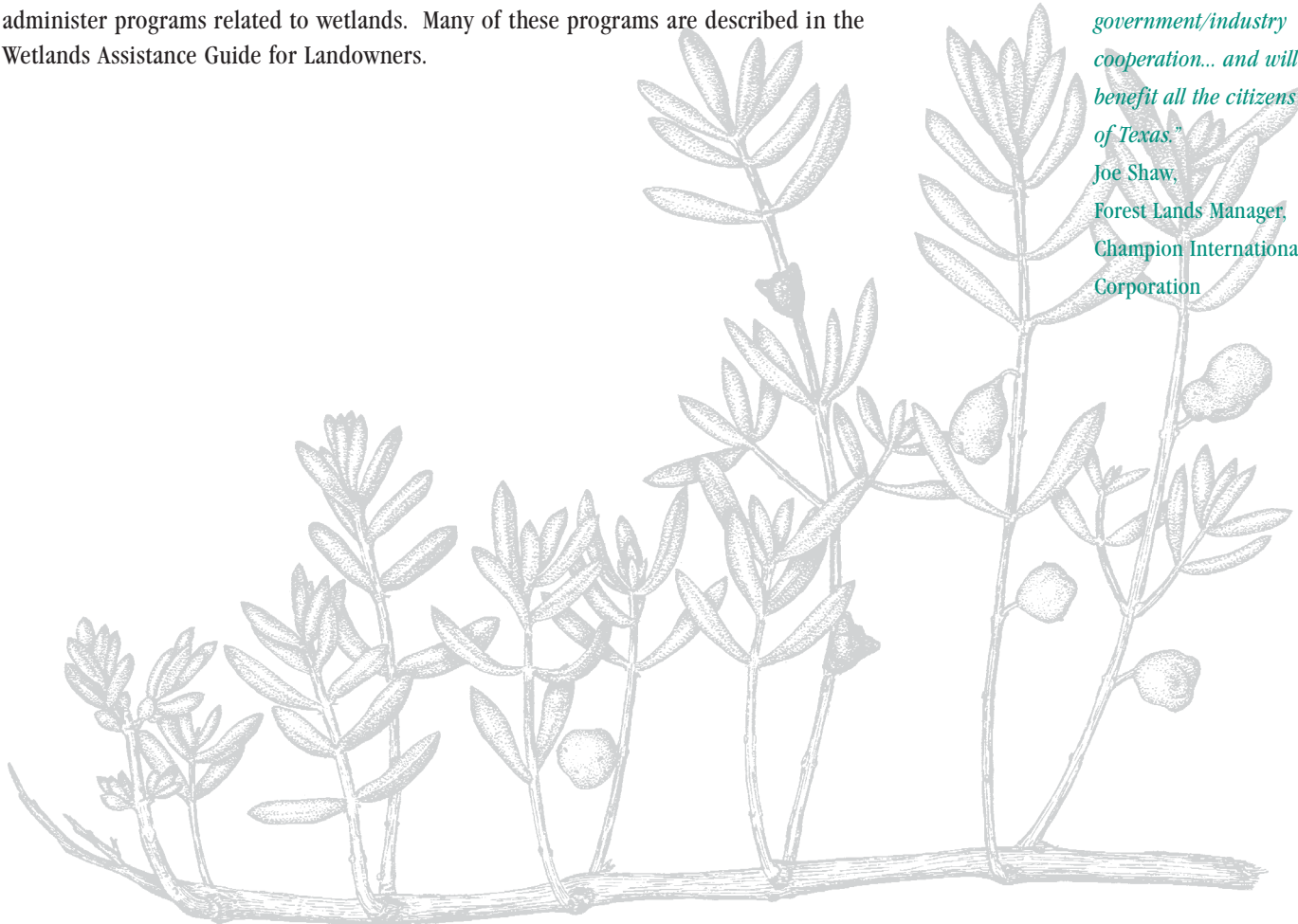
Many public and private sector organizations and individuals in Texas are involved in wetlands conservation and regulation. Each organization has a unique focus, which may include regulation, technical assistance to landowners, funding or land restoration sites. Alone, individual entities are often ill-equipped to meet wetlands conservation opportunities and challenges. However, together they form a web of conservation opportunities. A primary focus of the Texas Wetlands Conservation Plan has been to examine existing conservation options and address any “gaps” with innovative recommendations.

In 1995, a Wetlands Assistance Guide for Landowners was published that describes the programs, regulations and conservation options that affect landowners in Texas. The Landowner’s Guide summarizes existing state, federal and private programs that provide financial and technical assistance for wetlands protection. Other topics discussed include an assessment of landowner options for wetlands protection, a summary of existing federal and state regulations affecting wetlands, a list of contacts, and a description of the roles of state and federal agencies that are involved in wetlands regulation and management.

Appendix A provides an overview of agencies and organizations in Texas that administer programs related to wetlands. Many of these programs are described in the Wetlands Assistance Guide for Landowners.

“We believe that the Plan is another step in government/industry cooperation... and will benefit all the citizens of Texas.”

Joe Shaw,
Forest Lands Manager,
Champion International
Corporation





*Approximately
18 million
Americans hunted
waterfowl and
game species in
wetlands in 1991*

TPWD

CHAPTER III. TEXAS WETLANDS RESOURCES: DESCRIPTION, STATUS, TRENDS

Texas Wetland Types – What Wetlands does the Plan Address?

Although wetlands comprise less than five percent of its total land area, Texas has the fourth greatest wetland acreage in the lower 48 states (following Florida, Louisiana and Minnesota) (Dahl, 1990). These wetland ecosystems are extremely important to wildlife since Texas is one of the most important wintering areas for waterfowl in North America (Stutzenbaker and Weller, 1989).

Texas wetland types include swamps, bottomland hardwood forests, marshes, bogs, springs, resacas, cienegas, riparian areas, playa lakes and saline (alkaline) lakes. Wetlands are found along rivers, streams, lakes and ponds; in upland depressions where surface water

collects; and at points of groundwater discharge such as springs or seeps. They are found in both saltwater and freshwater systems. Some wetlands are continually wet; others are wet only for short periods during the year.

The demarcation between wetland and upland areas is not always clear. In many instances, wetland boundaries change over time due to varying rainfall, subsidence or other topography-altering activities. As their name indicates, they are “wet land,” since they are located in the transition zone between upland and open water. Both aquatic and upland plant and animal species may therefore depend on wetlands for their survival.

Many of the Texas wetland types described below would not meet the “regulatory” definition of a wetland (for a discussion of wetlands definition, see Chapter IV). Since the Texas Wetlands Conservation Plan is a non-regulatory strategy, recommended action items in the Plan apply broadly to all types of wetlands, and not strictly to those that meet the regulatory wetlands definition. The Plan, as well as many economic incentive programs, encourages restoration and enhancement of wetland areas that may fall outside of the scope of wetland regulatory requirements.

The Texas Wetlands Conservation Plan includes wetlands in the following regions:

East Texas contains a mosaic of wetland types including *forested wetlands*, *shrub swamps*, *marshes*, *oxbow lakes* and *bogs*. *Forested wetlands*, the most common wetland type in East Texas, are dominated by bottomland hardwood trees that grow in creek and river floodplains. In floodplains, the ebb and flow of floodwater shapes the forest floor into ridges, swales or flats. These elevational differences influence the duration of flooding or soil saturation, which, in turn, affect the type and abundance of plants that can grow. As a result, bottomland hardwood forests contain a diversity of trees, shrubs, herbaceous species and vines that grow together in different vegetation assemblages depending on soil type, water depth, velocity and flood duration.

Bottomland hardwood forests buffer water, one of our most precious resources, from human activities. Bottomlands anchor soil, prevent soil loss from scouring, and filter various pollutants from water (Wharton, 1980). Pesticides readily adhere to clay and organic particles, and floodplains are sinks for oil, nitrogen, phosphorus, sewage, fly ash and other particulates.

Bottomlands are open, productive systems that receive supplements from soil and organic matter upstream (Wharton, 1980). Bottomland productivity supports abundant fauna in that system and is crucial to biological production in downstream estuarine systems.



Bottomland hardwood forest in East Texas

Jack Bauer



*Pitcher plant bog in
East Texas*

TPWD

Bottomland hardwood communities in Texas support over 180 species of woody plants, including bald cypress, water oak, willow oak, overcup oak, water hickory, green ash, pecan, possumhaw, buttonbush, planertree and swamp privet. Characteristic herbaceous species include smartweeds, arrowhead, sedges, cutgrass, arrow arum, lizard's-tail, spiderlilies and bladderworts. Animals found in forested wetlands include wood ducks, mallards, eastern wild turkeys, swamp rabbits, gray and fox squirrels, raccoons, river otters, beavers, red-eyed vireos, alligator snapping turtles and cottonmouth water moccasins.

Shrub swamps are dominated by water elm (also known as planertree), buttonbush, and swamp privet. These plants often grow in dense stands with sparse herbaceous understory. Standing water or saturated soils are typically present throughout the year.

Freshwater marshes contain extensive stands of cutgrass, a perennial species, in deeper portions of the marsh. Other perennial plants occupying the adjacent shallower areas include several smartweed species, arrow arum, soft rush, spikerushes, arrowhead, maidencane and plumegrass. Numerous submergent species are found in deeper open water pools. Cutgrass marshes are seldom dry. Historically, during extreme, infrequent droughts, prolonged fires burned the organic, peat soils of cutgrass marshes. These fires reduced or eliminated the dense herbaceous cover, which temporarily favored the growth of many annual plant species.

East Texas *bogs*, found in association with bottomland hardwood forests, occur when bowl-shaped terrain features restrict water drainage. These systems are usually wet year round because of continuous groundwater seepage. Acidic conditions and poor soil aeration support plant communities containing a variety of specialized species, including carnivorous plants (sundews and pitcher plants) and sphagnum moss. Other plants include red maple, wax myrtle, alder, bladderworts, orchids, ferns and irises. Species composition is best maintained by periodic prescribed burns to control woody plants.

The **Gulf Coast** contains a diversity of salt, brackish, intermediate and fresh wetlands, including *wet prairies, forested wetlands, barrier islands, tidal flats, estuarine bays, bayous and rivers*. Coastal prairies also contain rice fields, which can provide excellent wintering waterfowl habitat. Saline and brackish marshes are most widely distributed south of Galveston Bay, while intermediate marshes are the most extensive marsh type east of Galveston Bay. The lower coast has only a narrow band of emergent marshes, but has a system of extensive bays, lagoons and small, near-shore ponds, which are critical freshwater

sources to diving ducks that feed in saline and hypersaline lagoons. Rainfall along the coast varies from 65 cm (lower coast) to 139 cm on the upper coast (Texas Department of Water Resources, 1984). The existence and extent of specific plant species within these different wetland types depends on their tolerances to fluctuating salt concentrations and variability in water depth. Some overlap of species can be found within the different wetland types on the Gulf coast.

Submerged aquatic vegetation (primarily seagrasses) grows in permanently inundated areas ranging from highly saline to brackish waters, but thrives in shallow subtidal areas of less than six feet. Most submerged aquatic vegetation, including shoalgrass, widgeongrass, manatee grass, clover grass and turtle grass, is found in the Lower Laguna Madre. Because submerged aquatic vegetation is found below the mean high-tide line, most areas are state-owned (Texas General Land Office, 1997).

Tidal flats are located in the intertidal zone and are consistently exposed and flooded by tides. Tidal flats, characterized by sand, silt and clay, have minimal vegetation but are important feeding grounds for coastal shorebirds, fish, and many invertebrates including crabs, oysters, clams, shrimp and mussels. Texas contains more tidal flats than any other state (23% of the nation's total) (Texas General Land Office, 1997).

Salt marsh (average salinity 18 ppt) has the greatest tidal fluctuation of all marsh types. Soils have a lower organic content than fresher types located further inland (Chabreck, 1972). Salt marshes contain relatively few plant species and are characterized by *Spartina alterniflora* (smooth cordgrass), a species that depends on water fluctuations. Behind this zone may be saltgrass, needle rush, blackrush, saline marsh aster, saltwort, glasswort and sea lavender.

Brackish marsh communities are transitional between saline and intermediate marshes (average salinity 8.2 ppt). They are still subject to daily tidal influence. Marsh soils have a higher organic content than salt marshes, and water levels are also higher. Brackish marshes contain numerous small bayous and lakes. Dominant species include marshhay cordgrass, saltgrass, saltmarsh bulrush, Olney bulrush and widgeon grass (Chabreck et al., 1989).

Intermediate marshes (average salinity 3.3 ppt), somewhat tidally influenced, have greater plant diversity than saline or brackish marshes (Chabreck et al., 1989). Species found here include seashore paspalum, marshhay cordgrass, Olney bulrush, arrowheads, common reedgrass, coastal water-hyssop, bearded sprangletop, pondweeds and naiad.

Fresh marshes support the greatest diversity in plant species of all marsh types. They are normally free from tidal influence, exhibit slow drainage and have the highest soil organic content of coastal wetlands (Chabreck et al., 1989). Dominant vegetation includes maiden cane, giant cutgrass, American lotus, white water-lily, smartweed, marsh millet, arrowhead, seedbox, coontail, alligator weed and many others.

Coastal prairies, often called "rice prairies" because of the current land use, generally extend from the coastal marshes to as much as 75 miles inland. The former tall grass



*Coastal tidal flats
in the Lower Laguna
Madre*

TPWD



Coastal dunes

TPWD

prairies (*Andropogon* spp.) dotted with shallow, ephemeral prairie wetlands (called potholes) and meandering bayous, creeks and rivers were replaced by agricultural fields, especially following World War II, in response to an increased market demand for rice and other crops (Stutzenbaker and Weller, 1989). Those wetlands that were not drained or “land-leveled” for enhanced crop production were often drained to eliminate potential hazards for cattle or to improve grazing conditions during wet cycles (pers. comm. with David Curtis, 1997). Today’s rice and grain fields that are flooded during the fall and winter receive heavy waterfowl use, especially by pintails, mallards, geese and many wading birds (Gulf Coast Joint Venture Management Board, 1990).

Texas coastal wetlands are an important wintering and migration area for North American waterfowl. Other birds of special concern, such as the bald eagle, peregrine falcon, brown pelican and whooping crane, all depend on Texas marshes and estuaries, as do otter, alligator, swamp rabbit, furbearers and amphibians. Texas coastal marshes and estuaries provide productive nursery and spawning areas and habitat for seafood species and other marine organisms.

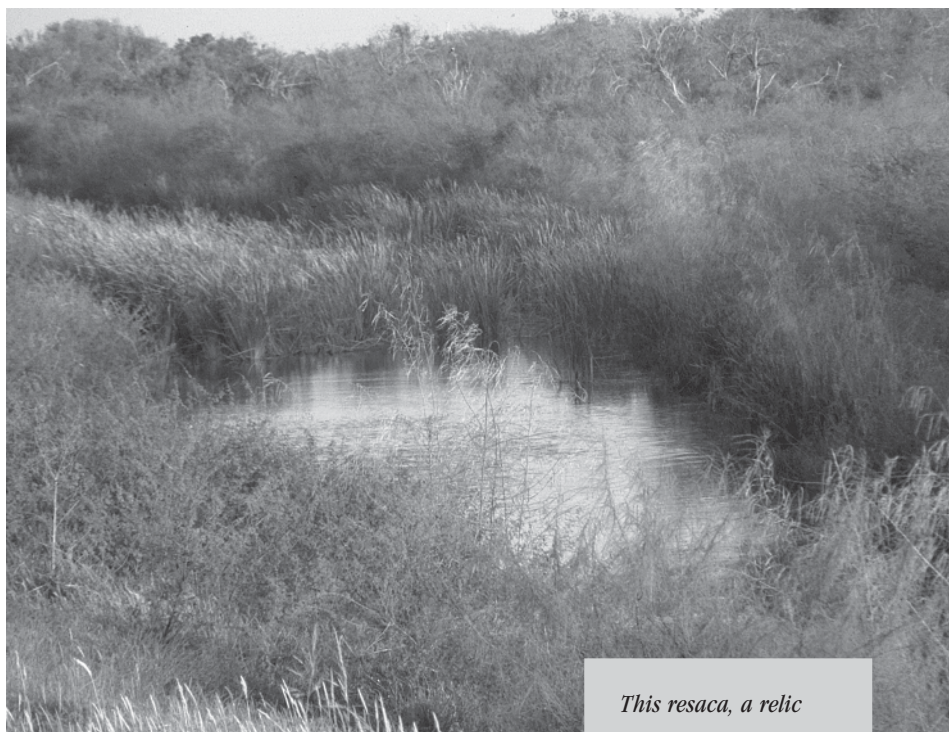
South Texas freshwater or brackish wetlands include small, isolated depressions, or *potholes*, and *resacas*, which are relic meanderings of the Rio Grande River. *Coastal potholes*, formed when clay soils exposed by wind action trap and hold water, often supply the only fresh water for resident wildlife in an area generally devoid of creeks and rivers. Potholes depend on rainfall or underground water sources. High evaporation rates and temperatures may cause potholes to retain water only temporarily or seasonally. The potholes are primarily located in the counties of Cameron, Hidalgo and Willacy of the Lower Rio Grande Valley and in the sand plains of South Texas, near the coast in Kenedy, Kleberg, and Willacy counties (Witten and Zemites, 1989). Potholes are also found north of Corpus Christi but tend to be smaller, shallower and more ephemeral (pers. comm. with David Curtis, 1997).

The vegetation composition of potholes depends upon the amount of water available. Non-permanent wetlands contain both wetland and upland species. Common wetland vegetation includes duckweed, saltmarsh spikerush, common cattail and smartweed. Upland vegetation associated with coastal potholes includes live oak, wax myrtle, plantain, silverleaf sunflower and panic grass. Many animal species depend on wetland vegetation for cover, nesting and resting. Coastal potholes are wintering grounds for waterfowl, shorebirds,

songbirds, waders, and several species of mammals, fish, and invertebrates. Coastal brushland potholes may also be prime habitat for threatened and endangered species such as the ocelot and jaguarundi.

In the lower Rio Grande Valley, oxbows or *resacas* are common. Resacas are former streambeds that are subject to repeated drying and flooding, thus forming long quiet ponds. Vegetation associated with resacas includes retama and huisache.

Resacas thrive on periodic inundation from river flooding. However, levees, floodways, and reservoirs, along with irrigation diversion, have virtually eliminated flood flows to resacas, which are no longer scoured and flushed. Siltation has become a major problem within the resacas due to the absence of scouring and the increase in urban runoff, shoreline erosion, and general degradation of water quality (Ramirez, 1986).



This resaca, a relic meandering of the Rio Grande River, is found on the Santa Ana National Wildlife Refuge

USFWS

The High Plains and Rolling Plains of the Panhandle support wetlands predominantly in *playa lakes and saline lakes* (High Plains), and in water-table influenced basins and *riparian habitats* (Rolling Plains). Playas are ephemeral wetlands characterized by Randall or Ness clays, and are very similar to coastal potholes, but have a different geologic origin. Saline lakes are generally larger than playas, are very saline, and are influenced by groundwater. A few playas and playa-like basins with connections to groundwater occur in the Rolling Plains. *Riparian wetlands* include vegetation along main channels of creeks and rivers and associated wet meadow, perched water table lakes and beaver pond habitats. Riparian wetlands in the Panhandle are characterized by Plains cottonwood, netleaf hackberry, buttonbush, native plum, western dogwood and persimmon. Salt cedar and Russian olive have both been introduced in the last fifty years and have changed the character and successional characteristics of these riparian systems (Brinson et al., 1981).

The *playa lakes* region of the United States includes portions of Colorado, Kansas, New Mexico, Oklahoma and northwestern Texas. Texas alone has over 19,000 playas (Guthery et al., 1981). Playas, surrounded by vast acreages of winter wheat, corn and other grain crops, are the migrating, wintering and breeding area for several million ducks, geese and other migratory birds. The area historically has wintered a large portion of the Shortgrass Prairie Canada goose population. Hundreds of thousands of mallards, pintails and other ducks terminate their southward migration in this checkerboard of water havens and grainfields.

Other wildlife species in the Panhandle, a region of limited habitat availability, rely heavily upon the habitat associated with the playa basins. Several threatened and endangered species use wetland habitat in the playa lakes region, including the bald eagle. Many neotropical (summer) migrant birds use playas as well, including the long-billed curlew, American avocet, killdeer, mountain plover, lark bunting and American kestrel.

Because playa lakes are fed by rainwater, many may be dry for extended periods of time. The unpredictable and dynamic nature of the playa is natural and necessary to maintain



Playa lakes and surrounding upland buffers provide excellent habitat for many species of wildlife and waterfowl in the Panhandle

TPWD



Riparian vegetation in the Panhandle's Rolling Plains

TPWD

primary productivity and biodiversity. The 86 plant species living in playas have adapted to this rapidly changing environment. The most common plants found in the playa lakes include spikerush, curly dock, bulrush, cattail, pink and willow smartweed, pondweed, wollyleaf bursage and barnyard grass. Woody species in riparian habitats include Plains cottonwood, buttonbush, netleaf hackberry, native plum, western dogwood, and persimmon.

Central Texas wetlands, including *seeps, springs and freshwater streams* and their associated *riparian systems*, are found throughout the limestone formations of the Edwards Plateau.

Riparian systems and associated woodland areas are the most widespread wetland type found in Texas, as they are found in the Rolling Plains of the Panhandle to the South Texas brushlands to the forests of East Texas. The riparian zone of a river, stream or other

water body is the land adjacent to that water that is, at least periodically, influenced by flooding. Aridity, topographic relief, and presence of depositional soils most strongly influence the extent of high water tables and associated riparian ecosystems. In the eastern and central United States, riparian zones are called bottomlands and floodplain forests, while in the west they are recognized as bosque or streambank vegetation (Johnson and McCormick, 1979). Riparian areas provide protective pathways of migration for birds, deer and small mammals, as well as habitat for many animal species. Vegetation found along Central Texas streams includes bald cypress, pecan, possumhaw, smartweed, sugarberry, boxelder, buttonbush and black willow.

Central Texas contains numerous *springs*, which typically flow into freshwater streams. Springs are fed by ground water that issues through a natural opening in the rock or soil. In comparison to streams fed by surface water, spring-fed streams have a more constant supply of water, which supports vegetation such as marsh purslane, water pennywort and cattail (Brune, 1981). Spring systems are highly vulnerable to water pollution and over-utilization by nearby cities and agricultural projects. Many springs no longer flow because aquifer waters have been over-utilized. Edwards Plateau and the Trans-Pecos springs support threatened and endangered species whose numbers will continue to decline with reductions in stream flow.



Central Texas stream

TPWD

Trans-Pecos Texas, located in far western Texas within the Rio Grande and Pecos River basins, is dominated by Chihuahuan Desert salt basins and flats, desert scrub, desert and semi-desert grasslands, and very locally by evergreen woodlands and montane forests. Wetlands occur within each of these ecosystems.

Although Trans-Pecos wetlands probably account for less than two percent of the total regional land surface, they are highly significant to the region's wildlife diversity. Desert wetlands shelter endemic desert fishes, reptiles and invertebrates and are especially important to the region's diverse bird life.

Desert basin salt flats, which are remnants of ancient lakes, contain water seasonally or permanently, depending on annual rainfall. Vegetation may include algal mats or plants (mostly grasses) adapted to saline conditions (Brown, 1982).

Perennial *riparian corridors* have narrow bands of woodland vegetation, many of which have been invaded by salt cedar (*Tamarix*), an exotic shrub. Stream water quality varies from saline to fresh and crystal-clear to heavily mineralized, or it may be laden with sediments, pollutants or sewage (Brown, 1982).

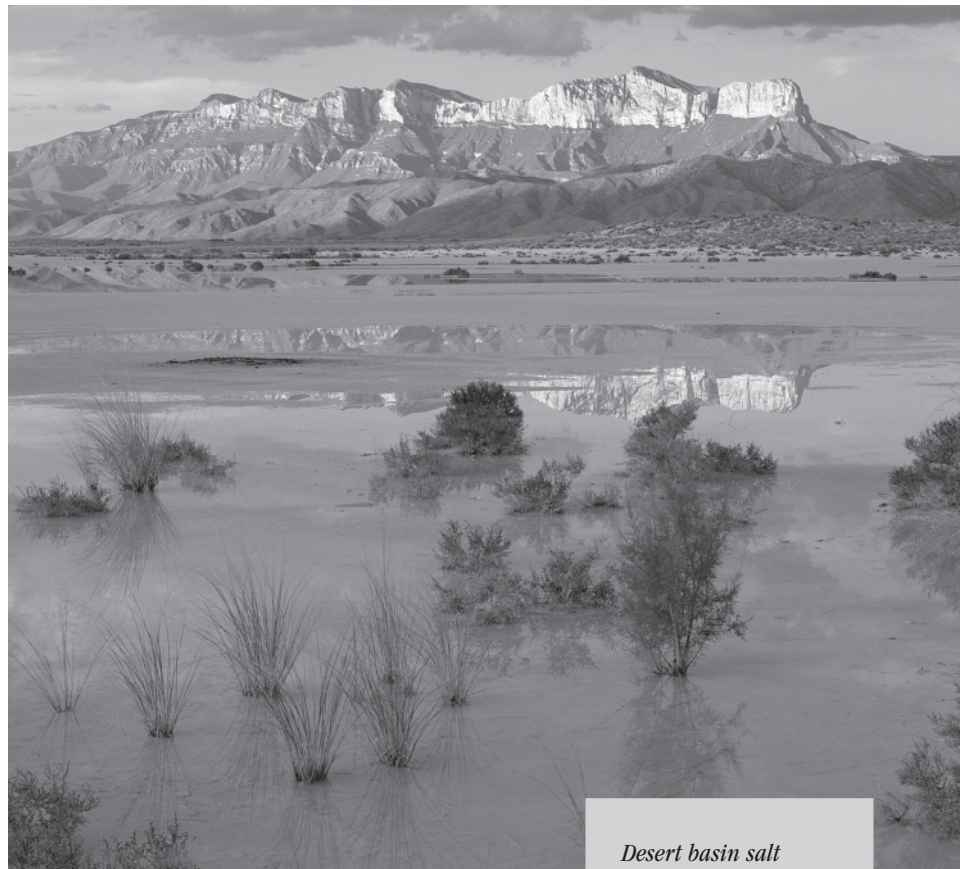
The region still shelters many headspring areas varying from fresh to slightly saline. At one time, headsprings were associated with desert marshes, called *ciénegas*, which are dominated by grasses, sedges and rushes. Most *ciénegas* today, however, have been lost by water mining, water diversion or overgrazing. *Ciénegas* still occur throughout the Trans-Pecos in areas with abundant soil moisture, for example, in mid-elevation and montane



*Cottonwoods identify
this riparian area
in Big Bend National
Park*

Earl Nottingham

areas in the Davis Mountains sub-region. Cienegas that occur where soil is lacking or very shallow are called seeps or hanging gardens, which are dominated by columbine, poison ivy, ferns and orchids (Hendrickson and Minckley, 1984).



*Desert basin salt
flats beneath the
Guadalupe Mountains*

TPWD

Functions and Values of Wetlands

Wetlands contribute tens of billions of dollars and hundreds of thousands of jobs to the national economy each year. Furthermore, the loss of wetlands entails substantial costs, primarily to the landowners and taxpayers who must replicate the valuable services that wetlands provide. Federal, state, and local government decision-makers will be less likely to lease, give away, or sell valuable wetlands for development projects if the wetland values become generally recognized and accepted. Many private landowners are evaluating the economic value of wetlands in terms of lease hunting, fishing, or other ecotourism attractions as compared to the cash yield of the land as cropland. In many cases, a combination of uses on adjacent tracts may be the most beneficial to wildlife and the landowner.

Fish and Wildlife Values

Diverse wetland types provide habitat for many plant and animal species. Most freshwater fish depend on wetlands for food, spawning and nursery grounds (Tiner, 1984). Many recreationally and commercially important fishes and invertebrates use wetlands as nursery or spawning grounds.

Both coastal and inland wetlands provide habitat for many types of resident and migratory birds. Waterfowl utilize wetland plants and animals for food while over-wintering or during migration stopovers. Wetlands are also important breeding areas, and they provide cover for nesting waterfowl and other birds.

About 35% of all rare and endangered animals depend upon wetland habitat (Kusler, 1983). Protection of wetland habitats and controlled harvest have allowed populations of the once endangered American alligator to rebound such that controlled hunting is permitted in some states, including Texas.



Wetlands provide migrating, breeding, feeding and nesting habitat for many wildlife species, including these white pelicans

TPWD

Environmental Quality Values

Wetlands absorb and filter sediments, nutrients and other natural and manmade pollutants that would otherwise degrade rivers, streams and lakes. Wetland filtration of particulates and contaminants could save an estimated \$1.6 billion a year in cleanup costs to downstream water supplies (Clark et al., 1985).

The ability of wetlands to trap and hold nutrients results in high rates of primary productivity, which increases food supplies for aquatic invertebrates, various shellfish and forage fish that are food for larger predatory fish and birds.

Socioeconomic Values

Flood Control. Vegetation along rivers, streams and other wetlands offsets flood damage by reducing the velocity of floodwaters that travel through the system, which allows water to percolate into and be stored in the underlying soils. Over time, the floodwaters are slowly released back into the river or stream, the atmosphere and the groundwater. By reducing the rate and amount of storm water entering the river or stream, wetlands lessen



Cliff Shackelford

Birding has increased 155.2% since 1982 in the United States, much of which occurs in wetlands
(1994/95 National Survey on Recreation and the Environment)

the destructiveness of the flood. The destruction of remaining wetlands would cost landowners and taxpayers \$7.7 billion to \$30.9 billion a year in flood-related repair costs and in expenditures for flood control structures in the United States (U.S. Army Corps of Engineers, 1991).

Shoreline wetlands help reduce the impacts of hurricanes and other ocean storms on adjacent coastal areas and inland properties by buffering high winds, suppressing surf, and absorbing water from storm surges. The wetland buffer strip must be fairly wide to accomplish those tasks, and few such buffers remain along U.S. coasts. Nevertheless, it is estimated that shoreline wetlands save \$4 million in damage costs each year (Dahl and Johnson, 1991).

Erosion Control. Sedimentation degrades aquatic habitats and kills aquatic organisms, including fish. The settling of sediment in rivers and streams increases the costs of maintaining navigation channels. Wetland vegetation adjacent to rivers effectively controls shoreline soil erosion and intercepts eroded soil from upland areas.

Groundwater Recharge. Standing water percolating through the soil in some wetlands may recharge groundwater supplies. Recharge volume varies depending on the permeability of the underlying soil strata.

Harvestable Natural Products. Coastal wetlands contributed to the nearly 4.1 billion pounds of estuarine-dependent fish and shellfish landed by U.S. commercial fishermen in 1980, representing 63% of the total U.S. commercial landings valued at \$1.15 billion dockside (Office of Technology Assessment, 1984). In 1993, approximately 89.2 million pounds of seafood with a dockside value of \$145 million was reported in Texas. Estuarine-dependent shrimp constituted about 81% of total landings and 92% of total dockside value between 1989 and 1993 (Robinson et al., 1994).

Nationwide, commercially caught fresh and saltwater fish and shellfish that depend on wetlands totaled nearly \$2 billion at landing in 1991, or approximately \$5 billion

when indirect and induced economic impacts are considered (National Marine Fisheries Service, 1992). An estimated 210,000 people were employed catching commercial fish dependent on wetlands in 1991 (Bureau of the Census, 1994).

More than 164,000 people held trapping licenses in the United States in 1990. The value of trapped furs from wetland-dependent animals totaled \$10 million. Approximately 2,500 jobs were associated with trapping wetland-dependent species that year (Southwick Associates, 1993). Additionally, some people rely on food (fish, wildlife, and some plants) from wetlands for part of their subsistence. The worth of that food for non-native families was conservatively estimated to be \$37 million in 1991 (USFWS and Bureau of the Census, 1993).

In 1991, the stumpage value of trees logged on wetlands was \$462 million nationally. Accounting for indirect and induced economic impacts, the total economic activity generated by that logging is \$1.3 billion, with the total number of associated jobs exceeding 15,000 (unpublished data provided by U.S. Forest Service, 1993).

Recreation and Aesthetics. Wetlands are often used for recreation and nature appreciation. Of the 25 most-visited National Wildlife Refuges in the United States, 19 have significant wetland components, which represented approximately 50% of the total 1981 visitations to all National Wildlife Refuge units (Office of Technology Assessment, 1984).

Approximately 18 million Americans hunted waterfowl and game species associated with wetlands in 1991. Their direct expenditures totaled more than \$2.2 billion, including \$111 million paid by migratory bird and large game hunters to lease hunting areas and blinds, many of which are located on wetlands. If indirect and induced economic impacts are considered, the figure increases to \$6.3 billion (USFWS and Bureau of the Census, 1993).

In 1991, the nation's 35 million recreational anglers spent more than \$18 billion in direct expenditures while fishing for wetlands-dependent freshwater, saltwater, and shellfish species. The total value rises to an estimated \$52 billion when indirect and induced economic impacts are considered (USFWS and Bureau of the Census, 1993).

Thirty million Americans included wildlife observation in their recreational pursuits in 1991; many of the species they enjoyed watching are associated with wetlands. Those people spent more than \$2.6 billion on activities related to wildlife viewing, photography, and dining away from home. Factoring in the indirect and induced economic impacts of those expenditures brings the total to \$6.6 billion (USFWS and Bureau of the Census, 1993).

"Thank you for your efforts to work with willing landowners and provide them with that assistance they need to make informed management decisions."

Robert Buckley,
Executive Director,
Texas State Soil and
Water Conservation Board

Why have Wetlands been Lost and How Many Remain?

Nationwide

Approximately 392 million acres of fresh and salt water wetlands existed in 1780 in lands that now form the United States. Of that, 221 million acres were in the conterminous 48 states (Dahl, 1990). Since that time, humankind has caused a significant reduction in wetlands. As of the 1980s, the lower 48 states support only an estimated 103.3 million acres, a 53% loss from the original wetland acreage (Dahl and Johnson, 1991).

Certain governmental programs in the past actually encouraged wetlands conversion. The Swamp Lands Acts of 1849, 1850 and 1860 transferred swampland ownership from the federal government to the states if a state drained wetlands for agricultural use. By 1954, approximately 65 million acres of wetlands in fifteen interior and Western states

had been drained. At the same time, coastal wetlands in the northeast were drained for urban development (Mitsch and Gosselink, 1986).

Between the mid-1970s and the mid-1980s, the lower 48 states lost over 2.6 million acres of wetlands, with freshwater systems sustaining 98% of that loss. By the mid-1980s, an estimated 97.8 million acres of freshwater wetlands and 5.5 million acres of estuarine (coastal) wetlands remained. Wetlands losses in this period resulted from conversion to agricultural land use (54%) and other land uses (41%). “Other” uses include land uses that are not classified as agriculture or urban. Urban expansion resulted in 5% of the losses (Dahl and Johnson, 1991). These data indicate that losses to agriculture have declined significantly from the period between the 1950s and mid-1970s, in which agricultural conversion represented 87% of all wetlands losses (Dahl, 1990).

Since the mid-1980s, the rate of wetland loss appears to be declining. From 1987 to 1990, programs to restore wetlands under the 1985 Food Security Act (1985 Farm Bill) have added about 90,000 acres to the Nation’s wetlands (U.S. Fish and Wildlife Service, 1991). New programs created under the 1995 Farm Bill may add additional wetland acreage.

Statewide

Although wetlands in Texas comprise less than five percent of the state’s total land area, Texas is one of nineteen states that has exhibited the most significant losses of wetland ecosystems (Tiner, 1984). Several sources have estimated wetlands acreage for parts of Texas (see Table 2-1).

Table 2-1. Estimates of Texas Wetlands (acreage)

Wetland Type	Shaw and Fredine (1956)	Diener (1975)	Kier et al. (1977)	TPWD (1980)	Guthery et al. (1981)	McAdams et al. (1982)	NRCS (1994)
Statewide				7,021,637			6,290,800 ^a
Coastal Marshes	937,400	1,141,400 ^b	472,320	611,760		89,000	
Coastal Potholes				5,973,000			
Bottomland Hardwood		106,880		95,342			
Swamp					341,535		
Playa Lakes							

^aAcreage does not include federal land

^bAcreage includes tidal flats as well as emergent marsh

In 1974, Texas Parks and Wildlife initiated a statewide wildlife habitat mapping effort, which analyzed classified Landsat digital data for the eastern two-thirds of Texas (Frye et al., 1978). Additional information provided by the Bureau of Economic Geology (Kier et al., 1977) was refined by Landsat imagery for the western portions of Texas. This endeavor produced vegetation cover maps in addition to detailed quantitative inventory information for each of the mapped cover types. Wetland areas covered include coastal marshes, swamps, bottomland hardwoods, and other forested wetlands. Based on estimates from several sources (the coast and bottomlands – Texas Parks and Wildlife (1980); Panhandle – Guthery et al., (1981)), Texas contained approximately 7,021,637 acres of wetlands in the 1970s, representing a 56% loss in the last 200 years.

The Natural Resources Conservation Service (NRCS) conducts a National Resource Inventory every five years to determine conditions and trends in the use of soil, water,

and related resources nationwide. The Natural Resources Inventory provides one of the only statewide estimates of wetlands acreage available in Texas. Wetland acreage on non-federal lands in Texas, based on the Cowardin et al. (1979) wetland classification system, is estimated at 6,290,800 acres of palustrine, riverine and estuarine wetlands in 1992.

The U.S. Fish and Wildlife Service's National Wetlands Inventory program is designed to generate information and maps about the characteristics, extent and status of the nation's wetlands and deepwater habitats. National Wetlands Inventory maps have not been completed for the entire state of Texas; therefore, no statewide acreage estimates are available. Digitization of National Wetlands Inventory maps is being completed on an as-needed basis. To date, the Galveston Bay system has been digitized. Digital mapping of subsections of the Corpus Christi Bay National Estuary Program boundary are scheduled for completion in 1998.

Wetlands acreage estimates can be obtained indirectly by examining the occurrence of hydric soils in Texas. The Natural Resources Conservation Service is responsible for analyzing soil type occurrence in individual counties throughout the nation. Soil surveys are available for all but ten of Texas' 254 counties, although tabulations of hydric soils and hydric soil inclusions have not been completed for each county (pers. comm., Alan Terrell, Natural Resources Conservation Service, 1996).

Forested Wetlands

Prior to the settlement of Texas, an estimated 16 million acres of bottomland hardwood and other forested wetlands existed. This estimate is based on acreage of geologic floodplains in Texas (Kier et al., 1977) and assumes that all or most of these floodplains were originally forested.

Floodplain forests are among the most severely altered ecosystems in the United States. Between 1820 and 1920, most of East Texas' virgin timber was removed for building, commercial logging, grazing and farming (Lay, 1987). Bottomland forests have since been impacted by mining and petroleum extraction, urban development, reservoirs, agriculture, lack of forest management, pollution and minor floodplain modifications (Neal and Jemison, 1990).

Forested wetlands inventoried by Landsat totaled approximately 6,068,000 acres in 1980, including 5,973,000 acres of bottomland hardwood and other forested riparian vegetation and 95,000 acres of swamps (Texas Parks and Wildlife, 1980). A comparison to pre-settlement estimates indicates a 63% loss of the original bottomland component. Table 2-2 shows the geographical distribution of this acreage. Estimates of forested wetland acreage in East Texas conform to the Cowardin et al. (1979) definition of forested wetlands (woody vegetation that is 20 feet tall or taller that is flooded or has water-saturated soil at least on a temporary or intermittent basis).

As indicated by Table 2-2, most bottomland hardwood forests occur in East Texas. While 1.2 million acres are confined to six major river courses, an additional 3 million acres are found within the tributaries of these rivers, yielding a total hardwood acreage of approximately 4,231,000 acres. Remaining riparian forests in Texas account for an estimated 1.8 million acres.

In 1996, Texas Parks and Wildlife refined the 1980 classification of forested wetlands in East Texas and determined changes in acreage for the Cypress Creek watershed near Caddo Lake (722,456 hectare study area). Of the 22,018 hectares of bottomland hardwood forest present between 1972-1976 (based on Landsat MSS data)(McMahan et al., 1984), 14,560 hectares remain in 1994, representing an estimated loss of 33.9% (based on 1994 Landsat TM data) (Liu et al., 1996). Reservoirs may be the major reason for the

"We appreciate the opportunity to participate in the development of this Plan and commend you on your efforts to incorporate private landowners in the development of the Plan's process."

Dianna Noble,
Director,
Environmental Affairs Division,
Texas Department of
Transportation

decline, since 3,009 hectares of surface water was added since the mid-1970s. Logging and conversion of bottomland hardwood forests to pine plantations contributed to the decline as well (Liu et al., 1996).

A land-use change detection study contracted by the Texas A&M University Remote Sensing Center was completed for Texas Parks and Wildlife in 1986. The study measured changes in land use over 11 regions of Texas. Portions of river basins associated with the Sulphur, Sabine, Trinity, Colorado and Neches River systems were included in the study. Within the vicinity of the Middle Sulphur River, combined upland and bottomland hardwood vegetation decreased by 9% over a period of eight years between 1973 and 1981. The upper Sabine River basin exhibited a combined loss of 3% during the same period among upland and bottomland cover types. Portions of the middle Trinity and upper Neches Rivers actually exhibited an overall increase of combined bottomland and upland vegetation exceeding 19% between 1973 and 1981, while the Lower Colorado River region near Columbus exhibited an overall 12% decline between 1972 and 1981.

Table 2-2. Geographical Distribution of Bottomland Hardwood Forests and Riparian Vegetation in Texas in 1980 (Frye, 1987)

Location	Estimated Acres	Subtotal (acres)
Trinity River	305,000	
Neches River	257,000	
Sabine River	255,000	
Sulphur River	175,000	
Cypress Bayou	89,000	
Angelina River	88,000	1,169,000
River tributaries, riparian drainages east of the Navasota River		3,062,000
Remaining rivers, creeks, riparian drainages		1,742,000
TOTAL^a		5,973,000

^aExcludes Swamps - 95,000 acres (Texas Parks and Wildlife Department, 1980)

The change detection study also indicated that clear-cut forests resulting from ongoing commercial timber industry practices increased by as much as 64% during the period between 1974 and 1983. The U.S. Fish and Wildlife Service (1985) has reported that available data on trends contained within the U.S. Forest Service's forest statistics reports indicate commercial bottomlands have decreased by 18% between 1935 and 1975. Updates of forest statistics by Neal (1986) indicate an additional 11% decline since 1975.

Some surveys suggest upward trends in the acreage of bottomland hardwood forests in Texas. Statistical information from the U.S. Forest Service's Status and Trends Survey (Miller and Hartsell, 1992) as summarized by the Texas Forest Service (1992) indicates an increase of 249,000 acres since 1986. The increase is attributed to reversion of abandoned agricultural land and mixed pine-hardwood stands to bottomland hardwood forests. The acreage increase is largely represented by newly planted or early successional stands. While this may represent a short-term change in trend, there is not yet enough evidence to substantiate a change in the long-term continuing decline.

Future declines in bottomland hardwood forests are expected from continued land use changes. Over 1.5 million acres of natural vegetation, including over 600,000 acres of bottomland hardwood forests, are estimated to have been lost from reservoirs already constructed in Texas (Frye, 1987). The 1996 Consensus Update of the State Water Plan recommends construction of eight new major surface water supply reservoirs over the next

fifty years (Texas Water Development Board, 1997), which would eliminate 52,667 acres of remaining bottomland hardwood and riparian forests, 85% (45,036 acres) of which are located in East Texas. The total projected land area affected by these reservoirs is 145,937 acres. The state's present and anticipated future loss of bottomland hardwood forests from reservoir construction would therefore increase to approximately 652,667 acres.

These losses are projections based on direct impacts of reservoir development, including the immediate loss and modification of vegetation communities from the construction of dams and spillways, impoundment of water, and subsequent fluctuation of reservoir pool levels. Additional losses from indirect impacts also occur, which may produce more loss or modification to the riparian communities than resulted from direct impacts. Below-dam stabilization of water levels significantly reduces flood potential, which stimulates residential and commercial development, increases market potential of timber, increases agricultural production and results in long-term biological modification of downstream riparian ecosystems.

Coastal Wetlands

The coastal landscape has changed significantly in the last 200 years, which has impacted its wetlands. Some of the most severe impacts to coastal wetlands occur when hydrology is altered: saltwater intrusion due to canals, channels and drainage ditches; alteration of normal hydrologic flow by land elevation or wetland watercourse modification through filling, creation of canals, blockage of natural drainage channels or bulkheading and erosion control; wetland submergence due to subsidence from groundwater or oil and gas withdrawals; point and nonpoint sources of pollution; and from upstream water development projects, including reservoir construction, especially within or near delta wetlands or along lower river courses (Gulf Coast Joint Venture Management Board, 1990).

In 1956, the U.S. Fish and Wildlife Service estimated that Texas coastal marshes (i.e. fresh, brackish, and salt marshes) totaled about 937,400 acres (Shaw and Fredine, 1956). In the absence of other earlier estimates, this figure serves as a baseline, although by 1956 Texas coastal wetlands were already impacted by indirect and direct effects of dredging activities, agricultural drainage, and industrialization and urbanization. Table 2-1 compares the 1956 baseline with several other more recent estimates of coastal wetland acreage.

Texas Parks and Wildlife (1980) estimated that 611,760 acres of coastal marshes existed. It is likely that this estimate included some rice field acreage that could not be differentiated from naturally occurring wetland vegetation on the Landsat imagery. Based on this estimate, 35% of Texas coastal marshland acreage was lost between the mid-1950s and the mid-1970s.

The U.S. Fish and Wildlife Service is assessing the status and trends of coastal Texas wetlands to provide detailed information regarding coastal wetland loss rates (Moulton, Dahl and Dall, in press). The report analyzes data in the 12.8 million acres, or about 20,000 square miles, that comprise coastal Texas. Aerial photographs from the mid-1950s and early 1990s (mean dates 1955 and 1992) were analyzed to detect natural and human-induced changes in wetlands, deepwater habitats, and uplands acreage. Results indicate that saltwater wetlands have sustained relatively small losses compared to freshwater wetlands. Nearly one in three acres of coastal freshwater emergent marshes have been lost (net loss of 235,100 acres of the 800,000 acres in 1955) while 11% of the coastal freshwater forested wetlands have disappeared since 1955 (net loss of 97,000 acres of the 890,000 acres).

Recent studies have documented more precisely the extent of coastal wetlands in specific regions and estuaries. Estuarine and palustrine wetlands acreages in the Galveston

Bay estuary system were compared using National Wetlands Inventory data to determine changes during three time periods (Table 2-3).

Data indicate a net loss of 8% in estuarine marshlands over the 30-year period from the mid-1950s to 1989. This result must be interpreted with caution since simultaneous losses and gains occurred throughout the bay system, which resulted in the small net change in acreage. Losses due to land subsidence, dredging, filling, and shoreline development have been offset by marsh establishment in inundated upland areas and conversion of uplands to aquatic environments. Freshwater marshes sustained considerable net loss between the 1950s and 1989 (approximately 54%) due to draining of wetlands and their conversion to urban areas, rangeland or cropland.

Texas Parks and Wildlife's Coastal Studies Program is using satellite thematic mapper imagery to map and classify coastal land cover and wetland habitats (methodology based on National Oceanic and Atmospheric Administration's Coastal-Change Analysis Program). Land cover classes are similar to and can be cross-referenced with the National Wetlands Inventory classification (Klemas et al., 1993). Texas Parks and Wildlife's Coastal Program plans to classify the entire Texas coastal zone and determine wetlands and land cover change every two to five years. These classified habitat data will be part of the State of Texas coastal geographic information system (GIS) database which will be available for resource management and environmental impact assessment purposes such as freshwater inflow management and oil spill response. Presently, Texas Parks and Wildlife has produced wetland inventories for several bay systems. For more information on this database, contact Texas Parks and Wildlife at (512) 912-7012.

Table 2-3. Comparison of Estuarine and Palustrine Wetlands (Acres) in the Galveston Bay System for Three Time Periods (White et al., 1993)

Wetland Habitat	Wetland Classification	1950s	1979	1989
Salt and Brackish Marsh	Estuarine Emergent	117,640	105,880	108,160
Fresh or Interior Marsh	Palustrine Emergent	47,850	32,250	22,210
Scrub/Shrub	Palustrine Scrub/Shrub	3,430	2,300	2,570
Forested	Palustrine Forested	2,040	5,580	5,650

Coastal Potholes of South Texas

Land leveling practices related to agriculture, major drainage projects and roadbuilding have eliminated many potholes in the Rio Grande Valley. Other factors influencing the rate of pothole conversion include drought, urbanization and industrialization (Spiller and French, 1986).

A 1981 inventory of potholes in the sand plain revealed that approximately 89,000 acres of potholes (18,401 individual ponds) existed within the 2,060,567 acre area bordered by Corpus Christi, the Laguna Madre, Raymondville, and the State Highway 281 south of Falfurrias (McAdams et al., 1982).

Playa Lakes of the Panhandle

Approximately 19,000 playa lakes are located in 37 counties of the Texas Panhandle. The total area in playa basins has been estimated at 341,535 acres (Guthery et al., 1981). The High Plains of the Panhandle are among the most intensively cultivated regions of the United States. Ample water for irrigation from the unique aquifer known as the Ogallala Formation produced this broad “breadbasket.” Thousands of agricultural and municipal wells are tapping the Ogallala. Significant increases in costs of pumping water from the declining Ogallala already have resulted in efforts to more efficiently use the surface waters of the playas. About 33% of all playa lakes have been modified, including about 69% of all playas larger than 10 acres (Guthery et al., 1981).

Status of Public Wetland Ownership in Texas

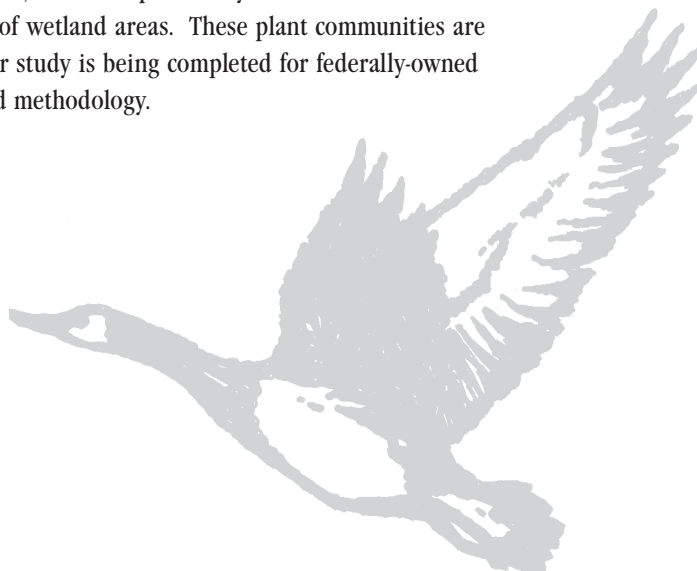
Land conservation takes many forms, including landowner agreements, conservation easements, acquisition, and mitigation, to name a few. One method of habitat protection – acquisition of property by local, state, federal or private entities – typically provides protection in perpetuity and public access, both of which are extremely important in an increasingly urbanizing state.

Only three percent of Texas is publicly-owned. Texas Parks and Wildlife is concerned about reports indicating the rate with which the State’s native lands are disappearing. Texas ecosystems reported to be at extreme risk include: Longleaf pine forests, old-growth deciduous forests, Southwestern riparian forests, forested wetlands, tallgrass prairies, native coastal communities, subtropical thorn forest/brushland, and cave and karst systems. The extent of loss or threat to other less threatened ecosystems or their components is not known.

In response, Texas Parks and Wildlife has recently completed an inventory of vegetation found on public lands that are managed exclusively or primarily for long-term maintenance of native populations or natural ecosystems (Texas Parks and Wildlife, 1996). The study found that 171,095 acres, or 14%, of lands operated by Texas Parks and Wildlife contained plant communities typical of wetland areas. These plant communities are summarized in Appendix B. A similar study is being completed for federally-owned property using the same standardized methodology.

“The Plan is consistent with the Federal private lands objectives of the Service and, together, our agencies will be able to reach the largest private land audience possible, educate them on the value of wetlands, and successfully gain private support for wetlands conservation.”

Fred Werner,
U.S. Fish and Wildlife Service





*Riparian wetlands
along the Guadalupe
River*

TPWD

CHAPTER IV. WETLANDS TOPICS

The Wetlands Definition

All wetlands are generally identified by: (1) water or saturated soils for at least part of the year (wetland hydrology); (2) plants that have adapted to life in wet environments (hydrophytic vegetation); and, (3) special soils that develop under depleted oxygen conditions (hydric soils).

The “wetlands definition” issue has inspired much discussion in recent years. Many definitions of wetlands are used in the United States, each fundamentally the same, but differing slightly depending on specific needs or points of view. The primary definition that may affect landowners is the regulatory definition as found in Section 404 of the Clean Water Act.

The U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service and the Natural Resources Conservation Service have adopted a

wetlands definition that identifies “jurisdictional wetlands” under Section 404 of the Clean Water Act. This definition is presently used by the federal government to regulate activities in wetlands:

Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. (40 CFR 230.3 and 33 CFR 328.3)

In 1989, the State of Texas adopted a definition for wetlands (V.T.C.A., Water Code §11.502) that is nearly identical to the federal definition.

Section 11.502 also identifies the broad scope of federal and state regulations and laws to which the State definition applies. Wetlands activities under the jurisdiction of these regulations will be subject to this definition. To be consistent with the majority of Texas agencies and programs, the Regional Advisory Groups and Statewide Coordination Group decided that a new wetlands definition was not necessary and would not be developed for purposes of the Texas Wetlands Conservation Plan. The Plan does not alter the existing State definition or regulations to which the definition applies.

Since the Plan is non-regulatory, recommended action items in the Plan apply to all types of wetlands, and not strictly those that are jurisdictional wetlands. Therefore, the formulation of a wetlands definition, independent of existing definitions, is not necessary to the Plan’s implementation.

One of the Plan’s most important contributions will be in resolving the confusion surrounding the perceived need for a consensus wetlands definition: non-regulatory incentive programs do not require designation of a potential participant’s land as a jurisdictional wetland for incentive program eligibility. In other words, areas that are not considered jurisdictional wetlands for regulatory purposes can qualify for funding under available incentives programs. In many instances, incentive programs are not limited strictly to wetlands, but cover a variety of habitats, including upland areas.

Wetlands Regulations

Section 404 of the Clean Water Act is the primary statutory mechanism regulating activities in Texas’ wetlands. Section 404, a federal program, is administered by the U.S. Army Corps of Engineers, with oversight authority provided by the U.S. Environmental Protection Agency. One of the principal goals of the Corps Section 404 program is the protection of the Nation’s aquatic resources, including wetlands. The 404 program has had some success in reducing wetlands loss, particularly in urbanizing areas, and in moving toward the goal of no net loss of wetlands. However, the regulatory program is just one component of

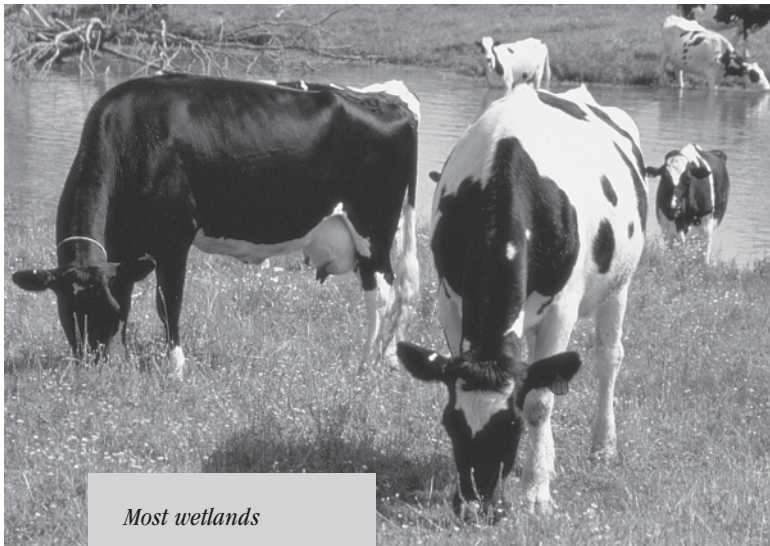
“The Texas Chemical Council is particularly supportive of the Plan’s cooperative, voluntary approach to protecting the State’s wetlands, a vital resource important to all Texans.”

Jon Fisher,
Senior Vice President,
Texas Chemical Council

wetlands protection; as such, it does not provide comprehensive wetlands conservation, in part because many wetlands and activities are not within its purview.

Texas is a private lands state with large expanses of crop, range and forest lands. Many of the activities occurring on these lands are exempt from wetlands regulations. To most effectively conserve wetlands in Texas, this Plan focuses on providing incentives (financial, technical and educational) to landowners to encourage their stewardship. These incentives are detailed in Chapter V.

Throughout the planning process, participants often commented about the inadequacies of the federal wetlands regulatory program. While some felt the program was too strict, others thought it was not strict enough. After some discussion, the Regional Advisory Groups decided that as a state initiative, the Plan is only one of a number of forces that could influence changes to the federal wetlands programs, and in particular the Section 404 program. A more effective way for the Plan to address regulations specifically is to work through the existing structure by improving landowner access to information regarding the regulatory process. Information availability can make everyone, including landowners, the development community and local, state and federal government representatives, more equipped to work with and understand the existing regulatory system.



*Most wetlands
assistance agreements
allow managed
grazing*

Private Ownership Issues

Throughout Texas, many landowners are interested in habitat conservation on their property. However, two common concerns prevent them from restoring or enhancing habitat: fear of any ensuing regulations and a lack of funds to defray restoration costs. The Regional Advisory Groups agreed that obstacles to wetlands conservation on private lands could best be overcome by offering landowners incentives to conserve their wetlands. Incentives, rather than regulations, foster pride and land stewardship since landowners are integrally involved in decision-making and planning throughout the duration of the project.

The elimination of *disincentives* to wetlands conservation would encourage landowners to consider initiating conservation activities on their property. While some disincentives do exist that may limit certain activities in wetlands, many are misperceptions; in other words, they are simply untrue or have limited application. As a general rule, incentive programs do not prohibit common land use practices (e.g., grazing, hunting); however, those activities may be managed to prevent adverse impacts to the wetlands project.

Most economic incentives to landowners are offered through specific wetlands programs. Because wetlands incentive programs are voluntary, landowners assist in determining the terms of their own conservation agreement. Each program offers different incentives; therefore, landowners should select a program that best suits their individual needs and interests.

Some of the most common perceived disincentives to wetlands conservation include:

PERCEPTION 1: *“Creating, restoring or enhancing wetlands subjects landowners to wetlands regulations.”*

FACT: Several scenarios exist for landowners who have created, restored or enhanced wetlands:

1) Created, restored or enhanced wetlands that are maintained as part of an ongoing agricultural operation are exempt from Clean Water Act regulations.

2) Agricultural fields flooded during the winter for waterfowl will not be impacted by Clean Water Act regulations unless discharges of dredged or fill material occur.

3) Landowners who enhance, restore or create non-tidal wetlands but who think they may later want to return them to their condition prior to the conservation activity can, with some advanced planning, be authorized to do so under Clean Water Act Nationwide Permit 27. This permit authorizes reversion of restored, enhanced or created non-tidal wetlands and riparian areas back to their prior condition if certain conditions are met. Interested landowners should contact the U. S. Army Corps of Engineers for details.

PERCEPTION 2: *“Having or managing habitat that encourages endangered*

species eliminates future land use options.”

FACT: Landowners are responsible for existing endangered species habitat already present on their property. However, landowners can avoid liability for endangered species that may be attracted to any new habitat by entering into a “Safe Harbor” agreement. Under this initiative, a landowner who intends to manage habitat in a way that attracts or benefits a listed species may enter into a cooperative agreement with the U.S. Fish and Wildlife Service or a state agency that protects the landowner from any additional responsibility under the Endangered Species Act, beyond those that existed at the time a landowner enters into the agreement. While landowners are required to protect the habitat of any species present at the time the agreement was signed (their baseline responsibilities), they are under no obligation to protect any *additional* individuals or species that may be attracted by the habitat improvements. Landowners not participating in Safe Harbor will be responsible for any new individuals residing on the property.

PERCEPTION 3: *“Hunting is not allowed under wetland agreements.”*

FACT: Habitat incentive programs generally do not restrict hunting by

owners or lessees. Hunting intensity may be limited by mutual agreement.

PERCEPTION 4: *“Pest treatment on crops is regulated under wetland agreements.”*

FACT: Pesticide or herbicide treatment of adjacent cropland is generally not regulated by wetland agreements.

PERCEPTION 5: *“Grazing, haying or mowing is not allowed.”*

FACT: *Managed* grazing, haying or mowing is permitted in most situations when it does not adversely impact the restoration project.

PERCEPTION 6: *“Timber harvest is not allowed.”*

FACT: Limited timber removal is permitted in most situations when it does not adversely impact the restoration project.

PERCEPTION 7: *“My land will become open to the public.”*

FACT: Public access is not a condition of wetland agreements. The incentive program contact may check on the project’s success throughout the contract period, but will notify the landowner in advance.

For a summary of wetlands incentive programs, please refer to *A Wetlands Assistance Guide for Landowners* (Texas Parks and Wildlife, 1995). This guide describes the goals and eligibility requirements for federal, state and private assistance programs in Texas. Other topics addressed include a summary of existing regulations and wetland program contacts. For a free copy, please contact Texas Parks and Wildlife at (512) 389-4328.



Nest boxes are one of many wetland wildlife improvements landowners can make to their property

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CHAPTER V. STATE WETLANDS ISSUES

Sixteen issues, identified by the Regional Advisory Groups, dominate wetlands conservation and management in Texas. Resolution of these issues will bring us closer to achieving the goal of the Texas Wetlands Conservation Plan. Eight issues apply to the entire state; the remainder are regional.

All of the issues below are important. Nevertheless, Texas agencies and groups clearly do not have sufficient information, adequate tools, enough people or money to undertake all of the individual action items simultaneously. Therefore, some prioritization of action items is necessary so that limited resources can be allocated to the most appropriate or feasible activities.

The Regional Advisory Groups have identified those action items, marked below (**), that can or should be initiated within the first two years following the Plan's completion. This designation does not reflect the item's importance as much as it indicates those items that can be initiated within a short time frame (e.g., funding or staff is available, work has already begun on the project, relatively inexpensive project). Unmarked items are not of lesser importance; their implementation is simply not projected to occur within the next two years. The Plan will be reviewed periodically to reassess this timeline.

Education

Many people think of classical “swamps” when wetlands are discussed. Because the benefits of wetlands are often only vaguely understood, wetlands conservation has not enjoyed the widespread public support that other natural systems generate. A lack of information creates negative attitudes for both landowners and agencies, which hinders wetlands appreciation, restoration and enhancement.

The vast majority of Texas’ wetlands are, and always will be, on private lands; as such, management decisions on these lands are made by the landholders. Landholder’s knowledge dictates what these management strategies will be. Conservation of Texas wetlands will occur only when landowners have convincing, accurate and readily accessible information to facilitate informed land use decisions. In order to properly manage wetlands, landowners must understand the importance of wetlands and have incentives to do so. Until this occurs, Texas will continue to lose the benefits that wetlands provide to wildlife, individuals and society.

Additionally, today’s children are our future private property owners, whose land management decisions will affect the landscape of Texas for generations to come. Unfortunately, our children are not being equipped with the proper tools with which to make these important decisions. Students are not often exposed to natural resource values unless a motivated teacher creates a framework for them to be taught. Texas must enhance its children’s understanding of the natural world to ensure that they will make and demand responsible resource conservation decisions in the future.

“A wetland conservation plan based on interest, volunteerism, land ethic and integrity will go much farther, last much longer, and accomplish far more than one predicated on forced compliance.”

Rick Perry,
Commissioner, Texas
Department of Agriculture

Issue A

How can public and private entities most effectively inform landowners and the public about wetlands?

Background

Large quantities of information have been prepared for the public by numerous groups and agencies. Often, however, a perception exists that information is not available, or that it does not adequately answer the public’s questions and is difficult to comprehend. This indicates that the information is not reaching its intended audience or that its message is not clear.

For example, landowners may be uncomfortable contacting agencies about sensitive topics (e.g., wetlands regulations, property rights issues). Agencies providing educational materials must consider this when making decisions about methods for information transfer. Educational materials should be distributed by agencies and organizations who frequently interact with landowners: for example, the Natural Resources Conservation Service, county extension agents, wildlife biologists, local universities, and non-governmental organizations.

Other groups that provide information to landowners also need clear, accurate information on wetlands. Such groups include county tax appraisers, landowner associations, mayors, councils of government, county judges, chambers of commerce, public/private education institutions, commodity associations, sportsmen groups, wildlife and forestry consultants, private companies and industries, legislators, and the Governor.

Solutions to this issue address the most effective means to disseminate educational information. Additionally, a recently published study describing the most effective methods for information transfer to landowners in East Texas complements the findings of the Regional Advisory Groups (Smith and Kellert, 1996).



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Field days provide a hands-on demonstration of wildlife management techniques

The following should be considered when preparing informational materials:

- a. Convey the same message in several ways by using different media to target different audiences.
- b. Regardless of the media, make the message consistent, especially among agencies.
- c. Use landowner examples, which provide recognition for them.
- d. Published materials should be one to two pages if possible.
- e. Assemble a packet of materials with information from all agencies.
- f. Localize information for each region.

Recommended Actions

- ** A1. Increase technical assistance (e.g., Natural Resources Conservation Service, Texas Forest Service, Texas Parks and Wildlife, U.S. Fish and Wildlife Service, Ducks Unlimited, Wetland Habitat Alliance of Texas) to landowners through individual contacts and presentations.
- ** A2. Provide well-publicized, half-day field days for a two to three county area.
 - a. Traditional sources of landowner information (e.g., Texas Farm Bureau, Texas Agricultural Extension Service, Texas Parks and Wildlife, Farm Services Agency) would be appropriate field-day sponsors.
 - b. Business sponsors could offset landowner costs of attending.
 - c. Include a meal and continuing education credits (e.g., for licensed pesticide applicators).
- ** A3. Encourage speakers to seek more opportunities to present wetland conservation and management information to local landowner or interest groups.
- ** A4. Submit articles discussing the relationship of wetlands to farming and ranching, current farm programs, economics of lease hunting, and conservation work on local properties to:
 - a. Farming and ranching newsletters and publications.
 - b. Agriculture section of local newspapers.
- A5. Increase wetlands news releases on television and radio programs within each region.
 - a. Develop short news "fillers" and highlight local conservationists.
 - b. Make documentaries to be shown on television (e.g., public television, Texas Parks and Wildlife show).
- A6. Use the following to deliver information:
 - a. Outdoor shows.
 - b. State information lines.
 - c. Distribute availability of information as a mailout (e.g., in utility bills, license renewal).
 - d. Internet.
 - e. Distribute information or plan displays at educational facilities (e.g. Texas State Aquarium).
- A7. Prepare short public service announcements featuring a recognized spokesperson.

Issue B

What types of wetlands information need to be developed and distributed to specific groups?

Background

Each day, individuals and groups make critical decisions impacting wetlands. It is essential that these groups have accurate wetlands information to facilitate informed decisions. Development of better, more timely wetlands information has consistently been identified as a high priority.

The Regional Advisory Groups identified three specific groups in Texas that have a great need for wetlands information: landowners, school children, and agency representatives. Information needs vary between groups and are defined in the action items below.

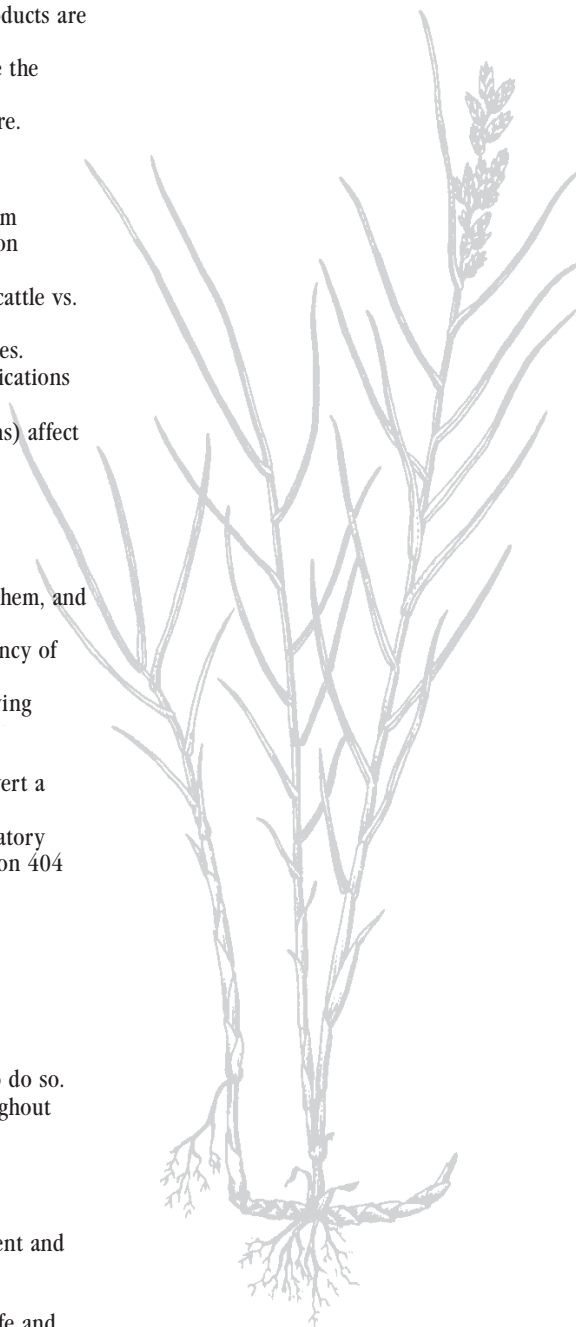
Recommended Actions

- ** B1. Identify wetlands information that is already available, its location, whether and how it can be improved, and how it can be better distributed.
- ** B2. Ensure that new information is useful and understandable to the intended audience.
 - a. New materials must answer the question: "How can it help the reader?"

- b. The Regional Advisory Groups should review the new information before products are finalized.
- c. Develop a mailback “scorecard” to be distributed with materials to determine the information’s effectiveness.
- d. Survey recipients to determine how information can be improved in the future.

Audience: Landowners

- ** B3.** Explain the economic benefits to landowners of wetland conservation.
 - a. Illustrate how a landowner can make an economic return on his property from natural resources (e.g., hunting/fishing leases, timber, flood control, recreation activities, ecotourism, agricultural compatibility with wildlife use).
 - b. Present economic implications of various land use choices, (e.g., forestry vs. cattle vs. leasing, and their combinations).
 - c. Explain what factors a landowner should consider when determining lease fees.
 - d. Develop computer program for landowners that computes the monetary implications of participating in incentive programs.
- ** B4.** Explain how wetlands and wildlife programs (e.g., regulations, incentive programs) affect or benefit landowners and communities.
 - a. Explain conservation easements.
 - b. Explain landowner liability and access laws.
 - c. Emphasize incentive programs for wetlands conservation.
- ** B5.** Provide a clear explanation of wetlands definition, criteria, and regulations.
 - a. Describe Swampbuster and Section 404 permitting, the differences between them, and their purpose and necessity.
 - b. Address misinformation about the scope of these regulations (e.g., the frequency of and circumstances under which a Section 404 permit is denied).
 - c. Explain “normal, established, ongoing silviculture,” wetlands definition, growing season, normal circumstances, and agricultural lands.
 - d. Explain Clean Water Act Section 404 Nationwide Permit 27.
 - e. Describe the circumstances in which a Section 404 permit is required to convert a forested wetland to a pine plantation.
 - f. Develop information to effectively prepare landowners to interact with regulatory agencies (e.g., a checklist of necessary information when applying for a Section 404 permit).
 - g. Encourage early informal consultation between agencies and applicants.
 - h. Prepare a brochure to update landowners on wetlands program information.
- B6.** Highlight the natural wetland benefits to society for each region.
 - a. Emphasize multiple benefits of wetlands.
 - b. Results of wetlands loss.
 - c. How to avoid and reduce impacts to wetlands.
 - d. Benefits of protecting native biodiversity in and around wetlands and how to do so.
- B7.** Describe beneficial management practices that enhance wetlands functions throughout the state.
 - a. Integrate wildlife habitat and timber production in East Texas.
 - 1. Address impacts on bottomlands of conversion to pine plantations.
 - 2. Promote management of wetland pine sites for wildlife.
 - b. Explain benefits of pasture rotation, livestock exclusion, moist soil management and maintaining riparian corridors.
 - c. Manage wetlands to maximize wildlife habitat in the Panhandle.
 - 1. Expand responsible stewardship to all natural resources, especially wildlife and their habitats, among the owners and users of lands.
 - 2. Describe benefits to landowners and wildlife of increasing natural habitat in and around playas and riparian areas.
 - 3. Provide information on when to work (e.g., grazing, plowing) in playas to avoid negative impacts to wildlife habitat.
 - 4. Address management of beaver habitats in riparian areas.
 - 5. Explain benefits of wet meadows and perched water table wetlands.
 - d. Demonstrate how low- or medium-till farming benefits winter feed supplies for wildlife.
 - 1. Acquire equipment or donations from farming equipment manufacturers to demonstrate no-till agriculture.
- B8.** Describe what kinds of wetlands maps are available statewide and how landowners can obtain this information. Focus efforts on making existing resources available, rather than on developing new mapping, unless it is needed for a specific project.
 - a. Inventory available mapping and develop a clearinghouse of existing information from all resources that use geographic information systems and/or have other maps. Mapping information should be made available in an effective and efficient way.
 - b. Promote compatible geographic information systems between different groups.



**Denotes implementation initiated within two years.

“The Wetlands Plan was developed through the voices of many groups who worked together to find common ground and mutually beneficial solutions to wetlands issues and concerns.”

John Burt,
State Conservationist,
Natural Resources
Conservation Service

Audience: Agencies and groups that impact wetland resources

- ** **B9.** Improve cooperation among agencies that affect wetlands.
 - a. Improve understanding of local wetland benefits, agency roles and other issues.
 - b. Provide information to groups and agencies on pending legislation impacting wetlands.
 - c. Emphasize to regulatory permit reviewers the importance of examining hydrological impacts to wetlands of proposed development projects.
 - d. Demonstrate to sponsors (navigation districts and the Army Corps of Engineers) the potential benefits of dredged material placement and how conservation concepts can be incorporated into dredging plans.
 - e. Incorporate wetlands benefits into determination of land values and improve inter-agency coordination when doing so.
 - f. Discuss and cooperate on wetlands projects/issues and priorities among agencies/groups.
 - g. Improve coordination of regulatory field site visits.
 - h. Change regulations/policies/funding that may destroy or degrade wetlands and establish policies, legislation or agreements within agencies that promote wetlands conservation.
- ** **B10.** Facilitate communication between landowners and agencies.
 - a. Use and support partnerships and grassroots organizations to promote mutual interests, coordinate planning, encourage stewardship and exchange information on an ecosystem or watershed basis.
 - b. Organize public annual meetings between landowners and agencies to exchange program and regulatory information.
 - c. Work with the development community to improve understanding of wetlands benefits, wetlands laws and environmentally responsible site planning.
- B11.** Improve technical assistance to local planning agencies on multiple-use/sustainability in land planning.
 - a. Provide municipal and county land use planners and partners information on wetlands/open space/floodplain needs for consideration in future planning processes.
 - b. Incorporate wetlands into watershed-based resource management plans.

Audience: Schoolchildren

- ** **B12.** Develop uniform environmental and wetlands curriculum in schools.
 - a. Identify existing available curricula on wetlands.
 - b. Provide teachers with information about grant programs for developing a student conservation curriculum.
 - c. Create regional wetlands module for specific grades (e.g., Extension Service’s “White-tailed Deer” and “Endangered Species” Modules, Playa Lakes Teaching Unit, Project WILD, Ducks Unlimited Adopt-a-Classroom).
 - d. Identify related-topic programs (e.g., agriculture) that could include a wetlands component.
 - e. Have professionals talk about their work experiences as part of the wetlands curriculum.
 - f. Use local farms/ranches as field trip opportunities for local and urban children. Plan field trips during appropriate season to demonstrate a concept (e.g., wintertime for migrating waterfowl).
 - g. Place wetlands curricula in distribution centers for teachers.
 - h. Promote curriculum through teacher training days or continuing education criteria by region.
- ** **B13.** Biologists and agriculture representatives should be included in educational materials review committee for schools.
- ** **B14.** Find informed volunteers and/or train volunteers to work with schools and clubs.
- B15.** Develop an Adopt-A-Wetland program in other regions of Texas, similar to the coastal program.
- B16.** Seek corporate and local community financial and logistical support for school wetland programs.

**Denotes implementation initiated within two years.

Economic Incentives

Ninety-seven percent of Texas’ land is privately owned, and as such, management decisions on these lands are made by private landholders. Individuals who rely on the land for their livelihood make land management decisions based primarily on the economic potential of the selected land use. Wetlands loss occurs when land conversion has greater economic value than retaining wetlands. Information, technical assistance and incentive programs enhance the economic benefits of wetlands ownership and management, which may bridge the economic gap to allow landowners to retain existing wetlands or restore wetlands on marginally productive land.

No single method for wetlands conservation is appropriate for every situation. Therefore, Texans should take advantage of a variety of conservation options, including existing

incentives programs, wetland enhancement and restoration, acquisition, transfers of property, conservation easements, market-based incentives (e.g., nature tourism), demonstration areas and technical guidance. Texas offers numerous wetland assistance programs. These programs should be supported through increased funding, education and technical assistance. Additional incentives should be developed to fill priority needs.

Issue C

What kinds of economic incentives should be developed for landowners to encourage the preservation, creation, restoration or enhancement of wetlands?

Background

Three types of incentives were proposed by the Regional Advisory Groups: tax incentives, other economic incentives and non-economic incentives.

Tax Incentives

Developing tax incentives for wetlands conservation is a priority action in the Texas Wetlands Conservation Plan. Tax incentives for retaining and managing wetlands would benefit landowners by reducing the economic costs of conserving this resource.

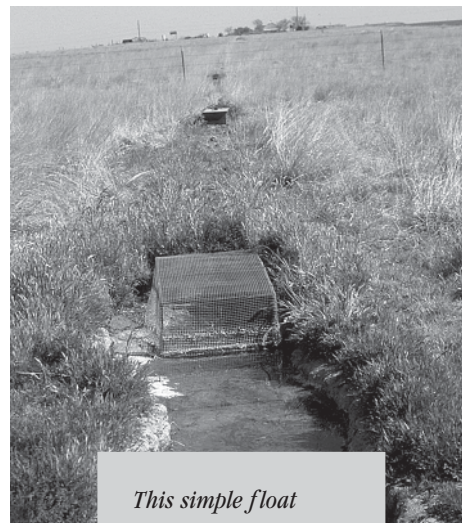
Texas Parks and Wildlife will determine which of the proposed incentives listed below (C1-C8) can most effectively encourage maintenance, restoration and enhancement of wetlands on private property. Components of this feasibility investigation, which will be developed through the Regional Advisory Groups, will include: an examination of applicable tax incentives in other states, an economic cost/benefit analysis, an estimation of the alternative's breadth and scope (how many landowners would be affected), an estimate of impact on other entities (e.g., city tax base), and an estimate of the incentive's impact on the wetlands resource (acreage, incentive for landowner to secure other funds for management).

The following incentive options will be investigated:

- C1.** Investigate revision of Texas Constitution Article VIII, Section 1-d-1 (Proposition 11) to remove the five-year agricultural valuation requirement for landowners willing to develop wildlife habitat in wetlands for a specified period of time. This change would allow landowners interested in wildlife to enroll new lands as habitat management, as opposed to agriculture, for five years before receiving an adjusted tax valuation.
- C2.** Investigate establishment of a small real estate transfer fee for urban and public land transactions, with proceeds used for wetland habitat conservation.
- C3.** Investigate establishment of a wetlands valuation that would be lower than an agricultural valuation, thereby reducing tax liability for maintaining, restoring or enhancing wetlands.
- C4.** Investigate establishment of an ad valorem tax exemption for active management of a qualifying wetland (similar concept as the Residence Homestead exemption found in Texas Property Tax Code §11.13).
- C5.** Investigate feasibility of a federal income tax credit for maintaining high-quality wetlands.
- C6.** Investigate federal estate tax changes.
 - a. Allow donation of conservation easements by beneficiaries (heirs) to reduce estates to the same degree as if decedents had made the donations.
 - b. Exclude value of land subject to a qualified conservation easement from estate taxes.
- C7.** Investigate incentives for longer forest rotation periods.
- C8.** Analyze tax structure to identify disincentives in the existing tax codes.

Other Economic Incentives

- ** C9.** Actively support legislation establishing restoration funds for non-consumptive wildlife activities, conservation provisions of farm-program legislation, incentive programs, North American Waterfowl Management Plan Joint Ventures and initiatives that reduce degradation and further loss of wetlands.
- ** C10.** Continue to include wetland protection and improvement components in forestry incentive programs.



TPWD

This simple float valve system, devised by the landowner using Playa Lakes Joint Venture funding, automatically shuts off the water supply when the levels get too high, and turns on the water when the levels are low

**Denotes implementation initiated within two years.



Chinese tallow, an invasive tree species that now dominates many coastal landscapes, is difficult to remove and control

TPWVD

- C11.** Prepare and submit an additional, consolidated, statewide-oriented North American Wetlands Conservation Act grant application for private lands projects in each joint venture area.
- C12.** Promote market-based incentives to demonstrate how landowners can generate additional income (e.g., Texas Birding Trail, waterfowl leasing, saw timber, technical guidance).
- C13.** Develop loan support program for capital investments for wetlands restoration and enhancement projects.
- C14.** Develop assistance programs for:
 - a. Operation and maintenance incentive programs for private landowners.
 - b. Allowing scientific research on private property.

Non-economic Incentives

- ** C15.** Develop a public recognition program for landowners and corporations participating in volunteer wetland conservation. Recognize activities on private land (e.g. aquaculture, livestock, forestry and hunting) when they benefit wetlands.
- C16.** Pursue non-cash incentives for landowners to protect, enhance and manage wetlands (e.g., native seed, information, technical assistance, hunting license, free cabin rental, magazine).
- C17.** Pursue incentives to encourage utilization of conservation management practices in wetlands for forestry, agriculture, fertilizer and other industries.
 - a. Develop a program recognizing commodities produced by landowners who exceed best management practice standards to promote marketing of those products or commodities ("green-labeling").

State Conservation Issues

Background

Texas' land area exceeds 266,000 square miles. The State contains 254 counties, which encompass eleven ecoregions. Texas wetland types vary regionally, as do land uses.

Wetland conservation issues reflect these regional differences.

This section addresses how to resolve state and regional wetland issues from both a biological and programmatic perspective. Programmatic recommendations typically apply to the entire state, and are addressed in Issues D, E and F.

Wetland issues and solutions unique to each region are found in Chapters VI-VIII.

Issue D

How can the preservation, restoration and enhancement of existing wetland habitat be realized statewide?

Recommended Actions

- ** D1.** A regularly updated, voluntary, regional database of potential private or public restoration or mitigation sites should be developed and made available to contractors, the Army Corps

**Denotes implementation initiated within two years.

of Engineers, the U.S. Environmental Protection Agency, Natural Resources Damage Assessment trustees, and anyone seeking restoration options.

- a. The private lands component would include landowners who are interested in using their property for restoration.
- b. The public lands component would describe potential sites on state, federal and local lands.
- ** D2.** Support riparian and buffer protection, restoration and enhancement projects in urban areas to enhance wildlife habitat, demonstrate the benefits of wetlands, and reduce property losses from flooding.
- ** D3.** Identify and implement wetland restoration and enhancement needs and opportunities on state-owned property.
- ** D4.** Minimize impacts of water development projects to wetlands.
- D5.** Encourage voluntary broader application on private lands of mitigation banking programs to compensate for wetland losses in the same watershed.
 - a. Inform landowners of mitigation options.
 - b. Encourage cooperative private banks between adjacent landowners.
 - c. Enhance interagency mitigation banking programs to better conserve existing natural wetland habitats.
- D6.** Use community services to perform wetland management work on public lands and to assist landowners with implementation of wetlands protection, restoration and enhancement projects.
- D7.** Develop a state wetland information service that compiles present and past wetland studies and materials within each region.
- D8.** Incorporate wetlands into collaborative, watershed-based resource management plans.

"We are particularly pleased with the Plan's cooperative, voluntary approach to protecting wetlands."

Zerle Carpenter,
Director,
Texas Agricultural
Extension Service

Issue E

How can noxious aquatic plants and the invasion of native habitat and fallow agricultural lands by exotic animal and plant species be controlled?

Recommended Actions

- ** E1.** Use volunteers or others (e.g. prison labor) to manually remove vegetation.
- ** E2.** Provide information on preventing the spread of exotics and avoiding future introductions.
- E3.** Address and manage introduction of exotic species.
- E4.** Seek new funding sources and partnerships for exotics control and eradication methods, including biological controls.
- E5.** Expand existing or develop new Clean Water Act Section 404 general permits to authorize removal and control of invasive species in addition to Chinese tallow.

Issue F

How can water pollution be minimized in Texas waters?

Recommended Actions

- F1.** Improve water quality in Texas.
 - a. Promote best management practices for agriculture, development and business.
 - b. Increase overland flow through emergent wetlands to improve water quality before water reaches stream courses.
 - c. Encourage created marshes for water treatment facilities and agricultural water purification.
 - d. Continue to provide permit review and comment to Texas Natural Resource Conservation Commission to minimize point and non-point source pollution.
 - e. Work to achieve no net loss of existing wetland resource base with respect to functions and values in Texas through continued implementation of Clean Water Act Section 401 by the Texas Natural Resource Conservation Commission and the Texas Railroad Commission.
 - f. Support non-point source pollution programs of Texas Natural Resource Conservation Commission and the State Soil Water Conservation Board.
- F2.** Reduce trash and pollution.
 - a. Provide better accessibility to properly-constructed sanitary landfills.
 - b. Enforce dumping prohibitions (e.g., county Beautiful/Clean programs).

**Denotes implementation initiated within two years.



*Swamplands of
Caddo Lake*

TPWD

CHAPTER VI. CONSERVATION CONCERNS IN EAST TEXAS

Background

Forests dominate the landscape of East Texas. Expansive industrial forest operations, federal and state forest lands, and small operations all rely on maintaining and improving Texas' forest resources. The majority of timber land holdings in East Texas are small landowners. Balancing the forest's ability to generate income while providing wildlife benefits is a high priority for East Texans.

Bottomlands, found along rivers and streams, are East Texas' predominant wetland type. These wetlands produce hardwoods that are valuable both for wildlife and as timber. Many bottomlands have been mismanaged, cleared for grazing, or inundated for reservoir construction. Development, which may occur in cleared bottomlands, is frequently destroyed by rising flood waters. Please refer to Chapter III for a more complete description of East Texas wetlands. Statewide conservation issues are found in Chapter V.

Issue G

How can the preservation, restoration and enhancement of existing wetland habitat be realized in East Texas?

Recommended Actions

- ** G1.** Rank wetlands by river basin to focus conservation and education efforts (e.g., areas of significant wetland loss, or unique, exceptionally high quality wetlands).
 - a. Synthesize existing bottomland rating studies.
 - b. Concentrate landowner assistance in identified areas by providing location-specific information about conservation incentives and the natural and economic benefits of protecting rivers.
- ** G2.** Encourage proper management of forested wetlands.
 - a. Promote and maintain native hardwood silviculture on bottomland hardwood sites.
 - b. Promote markets for hardwood saw timber to encourage mature hardwood stands.
 - c. Apply prescribed fire as a management tool when biologically or silviculturally appropriate.
 - d. Integrate methods of non-game and game management with hardwood silviculture.
 - e. Seek management partnerships between resource agencies, conservation groups, non-industrial private owners and private timber industries to protect unique and environmentally sensitive bottomland systems.
 - f. Support development and distribution of management recommendations for public and private lands.
 - g. Encourage compliance with Best Management Practices in bottomland hardwood forestry activities.
- ** G3.** Discourage development in floodplains.
 - a. Abolish federal flood insurance for new commercial or residential development in floodplains and coastal wetlands and phase out federal flood insurance for existing developments for these areas.
 - b. Ensure that landowners are alerted if they're building or buying in a floodplain and the economic impacts of doing so.
 - c. Include wetlands restoration and enhancement in flood control programs.
 - d. Minimize impacts of water development projects to wetlands.
 - e. Encourage the Federal Emergency Management Administration to offer flood (federal crop) insurance for planting bottomland hardwood seedlings.
 - f. Post flood zone markers on roads to indicate historic flood levels.

**Denotes implementation initiated within two years.



Panhandle playa lake

TPWD

CHAPTER VII. CONSERVATION CONCERNS IN THE PANHANDLE

Background

The Texas Panhandle, a predominantly agricultural area, contains numerous playa lakes, saline lakes and riparian areas. Panhandle wetlands, wet or dry, are critical to wildlife in this region. Conservation of Panhandle wetlands depends upon enhancing existing wetlands to maximize wildlife benefits, while maintaining productive agricultural practices. Please refer to Chapter III for a more complete description of Panhandle wetlands.

Many of the issues identified by the Panhandle Regional Advisory Group correspond to those developed in the Playa Lakes Joint Venture (PLJV) Implementation Plan. To coordinate with ongoing efforts in the Panhandle, the Advisory Group adopted those action items found in the Playa Lakes Joint Venture that supported the goals of the Texas Wetlands Conservation Plan. They are marked below (PLJV). Statewide conservation issues are found in Chapter V. Outreach recommendations for beneficial management practices in the Panhandle are discussed in Issue B.

Issue H

How can we maintain the quantity and improve the quality of all wetlands in the Panhandle?

Recommended Actions

- ** H1. Manage streams with filter strips on each side to improve water quality and wildlife cover for nesting habitat and corridors.
- ** H2. Restore wetlands and upland buffer (2:1 or 3:1 upland:wetland).
- ** H3. Minimize tillage in playas, which reduces ponding ability by breaking the playa clay base.
- ** H4. Encourage managed grazing (timing and amount of vegetation) to increase financial returns and wildlife benefits.
- ** H5. Reduce erosion and sedimentation into playa lakes and streams.
 - a. Use grass and legume buffers.
 - b. Use soil conservation practices when farming.
 - c. Encourage habitat on corners and odd pieces in fields.
 - d. Encourage flat-bottomed grass waterways to reduce sediment transportation into playas.
 - e. Retain sensitive areas in permanent cover.
- ** H6. Emphasize incentive programs that pay water pumping expenses to provide winter water for wildlife.
- ** H7. Utilize the U.S. Department of Agriculture's Farm Bill and other programs to maximize wetland and buffer protection, enhancement and restoration on a broad landscape scale.

Issue I

How can we ensure sufficient high-quality wetland habitat to encourage widespread dispersion of waterfowl and wildlife within the playa lakes? (PLJV)

Recommended Actions

- I1. Develop and enhance habitat on federal lands and state wildlife management areas.
- I2. Increase natural food resources with the use of moist-soil and other management techniques in all appropriate projects, especially on federal and state wildlife management areas.
- I3. Monitor agricultural trends and crop production, and develop strategies to offset decreases in traditional foods.
- I4. Promote agricultural practices that allow for the availability of crop residue and other products for wildlife.

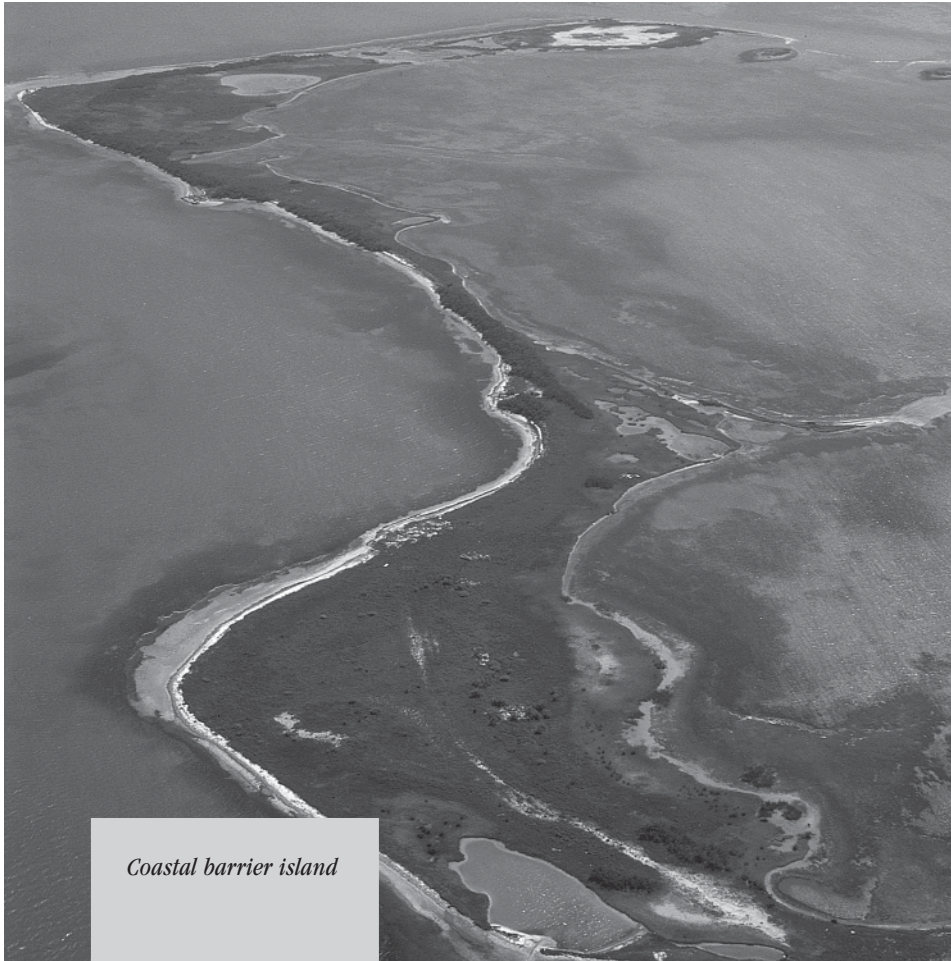
Issue J

How can healthy and secure wetland and upland habitats be provided to benefit waterfowl and other wildlife in the playa lakes? (PLJV)

**Denotes implementation initiated within two years.

Recommended Actions

- J1. Support research in the playa lakes that addresses the effects of disease, pollutants, contaminants and toxicants on waterfowl and other wetland-dependent species and their habitats.
- J2. Encourage effective enforcement of laws and regulations regarding the disposal of hazardous and toxic materials and establish liaisons with enforcement authorities.
- J3. Solicit the cooperation of industry, landowners and operators, game wardens and others in reporting sick and dead birds suspected of being diseased.
- J4. Increase liaison with U.S. Department of Agriculture agencies and agricultural conservation organizations to encourage establishment of permanent cover whenever possible on private lands.



Coastal barrier island

TPWD

CHAPTER VIII. CONSERVATION CONCERNS ON THE COAST

Background

Coastal wetland types are as diverse as the land uses occurring in and around them. The coastal issues identified below focus on ways to restore wetlands degraded by human activities. Please refer to Chapter III for a more complete description of coastal wetlands. Statewide conservation issues are found in Chapter V.

The Coastal Regional Advisory Group identified coastal wetland systems on which to focus conservation efforts:

- Lower coast – south of Corpus Christi Bay National Estuary Program planning area
- Galveston Bay Estuary Program planning area
- Mid coast
- Upper coast

- Fresh depressional wetlands
- Bottomlands
- Seagrasses

Numerous activities have disrupted coastal wetlands hydrology to expose former fresh, intermediate and brackish marshes to increased salinity and tidal activity, resulting in accelerated vegetation loss. Texas coastal wetlands can benefit tremendously from restoration activities that restore the historic hydrology of these areas.

Three extensive planning efforts complement the goals of the Texas Wetlands Conservation Plan on the Texas coast: the Galveston Bay Estuary Program (implementation phase); the Corpus Christi Bay National Estuary Program (plan in progress); and the Gulf Coast Joint Venture (implementation phase). The Plan will coordinate with these efforts in its implementation.

Issue K

How can wetland habitat conservation (e.g., preservation, restoration, creation and enhancement) be increased?

Recommended actions

- ** K1. Restore and enhance fresh, intermediate, brackish and saline wetlands along the Coast through collaborative basinwide planning. Restoration will require large public works projects, as well as the efforts of individual landowners on small systems.
- ** K2. Identify significant wetlands that can be protected by public and private conservation efforts.
- ** K3. Complete coastal preserve management plans (Armand Bayou, Christmas Bay) and approve completed plans (South Bay, Welder Flats) and implement them.
- K4. Provide coordination and attention to freshwater inflow problems related to wildlife habitat conservation needs.
- K5. Encourage additional protection for the Lower Laguna Madre.
- K6. Inventory degraded wetlands, identify the causes of deterioration, and fund remedial measures for restoration (e.g., 20 percent of degraded wetlands within 20 years). Such measures will include re-establishing sediment sources, restoring hydrology and others as appropriate.

Issue L

How can irrigation practices and policies better accommodate waterbird and wildlife habitat needs?

**Denotes implementation initiated within two years.

Recommended actions

- ** L1. Amend §11.142(a) of the Texas Water Code (Water Rights Permit Exemptions) to read: "Without obtaining a permit, a person may construct on his own property a dam or reservoir to impound or contain not more than 200 acre-feet of water for domestic, livestock *and wildlife management* purposes."
- L2. Promote and implement alternative uses for irrigation water.
- L3. Promote recycling of rice drain water.
- L4. Encourage drainage districts to manage excess water to benefit wetlands conservation on refuges or private lands.

Issue M

How can dredged material be used to restore and create wetlands?

Recommended actions

- ** M1. Encourage voluntary conservation in dredging plans and use of materials for wetland creation, restoration and enhancement.
- ** M2. Manage existing dredged material impoundments to create freshwater wetlands.
- M3. Develop a beneficial uses program for dredged material to create, enhance and restore habitat that includes viable mechanisms for funding added costs of handling and processing material.

Issue N

How can coastal erosion, including bayshore, seashore, and cut bank erosion along canals and waterways be prevented?

Recommended actions

- ** N1. Establish integrated bay-wide erosion management recommendations to develop, apply and publicize methods for erosion prevention.
- N2. Reduce dredging impacts by revegetating and sloping the channel bank at about 5:1 or greater, as opposed to cut bank dredging, to diminish wave energy and therefore reduce erosion.
- N3. Demonstrate sloped-bank dredging on public or private lands using corporate sponsors.
- N4. Support creation of a coastal erosion response program.

**Denotes implementation initiated within two years.

"The Department's staff are well-suited for the task of providing private landowners with information to assist them in making informed management decisions about their property, while simultaneously seeking to maintain the ecological functions and the quality of life benefits that wetlands provide."

Craig Pedersen,
Executive Administrator,
Texas Water Development
Board





TPWD

These flashboards, funded by the Wetlands Habitat Alliance of Texas, allow adjustment of water levels throughout the year on this East Texas depression wetland

CHAPTER IX. COORDINATION AND FUNDING

Coordination

The responsibility for wetlands conservation and management is shared among federal, state and local agencies and programs, regional organizations, businesses, agriculture, and ultimately thousands of private landowners who make day-to-day decisions about their lands. To most effectively manage the state's wetlands resources, it is imperative that these agencies and individuals share their knowledge and coordinate their work and resources.

Numerous individuals have dedicated their time and resources to development of the Texas Wetlands Conservation Plan. Texas Parks and Wildlife, who has coordinated the Plan's development, is dedicated to completion of the action items identified through consensus. The Plan's success, however, requires the continued commitment of all.

Recommended Actions

1. The Advisory Group network established during the planning process should prove sufficient to maintain cooperation and coordination between the involved groups. Therefore, the following Groups will continue to meet periodically:

- Interagency Coordination Group;
 - Regional Advisory Groups; and,
 - Statewide Coordination Group.
2. The roles of the Regional Advisory Groups will be expanded. The Groups will monitor the Plan's implementation, recommend future activities, and advise on new educational materials. The Group's role in fostering improved communication between divergent interest groups is invaluable in resolving potentially contentious wetland issues. The Groups would also act as a resource for landowners, a sounding board for regional wetland issues, and a vehicle to more sensitively implement wetlands programs and regulations.
 3. The "Wetlands Conservation Plan Update" newsletter will continue to be published quarterly to provide a progress report on implementation activities and pertinent wetland issues.

Funding

It is nearly impossible to calculate the financial resources and staff now dedicated to wetlands conservation in Texas. The State's restoration and acquisition efforts, technical assistance programs, education efforts and regulatory programs are dispersed among numerous agencies and organizations. Each of these groups must play an active role to successfully implement the Texas Wetlands Conservation Plan.

The Plan identifies numerous unmet wetlands conservation needs. Addressing these needs will clearly require a greater commitment of staff and money from many agencies and groups. The state's existing programs must be efficiently administered and carefully coordinated, but additional resources for implementation will be required.

The Environmental Protection Agency's Wetlands Protection State Development Program will continue to be an important funding source during the Plan's implementation. Texas Parks and Wildlife has already been awarded a Wetlands Protection State Development grant totaling \$111,000 (75/25) to initiate three actions defined in the Plan (pursue new tax incentives, explore new funding sources for conservation and develop a conservation easement guide).

Regional Advisory Groups identified the following actions to secure funds for wetlands conservation efforts defined in the Plan:

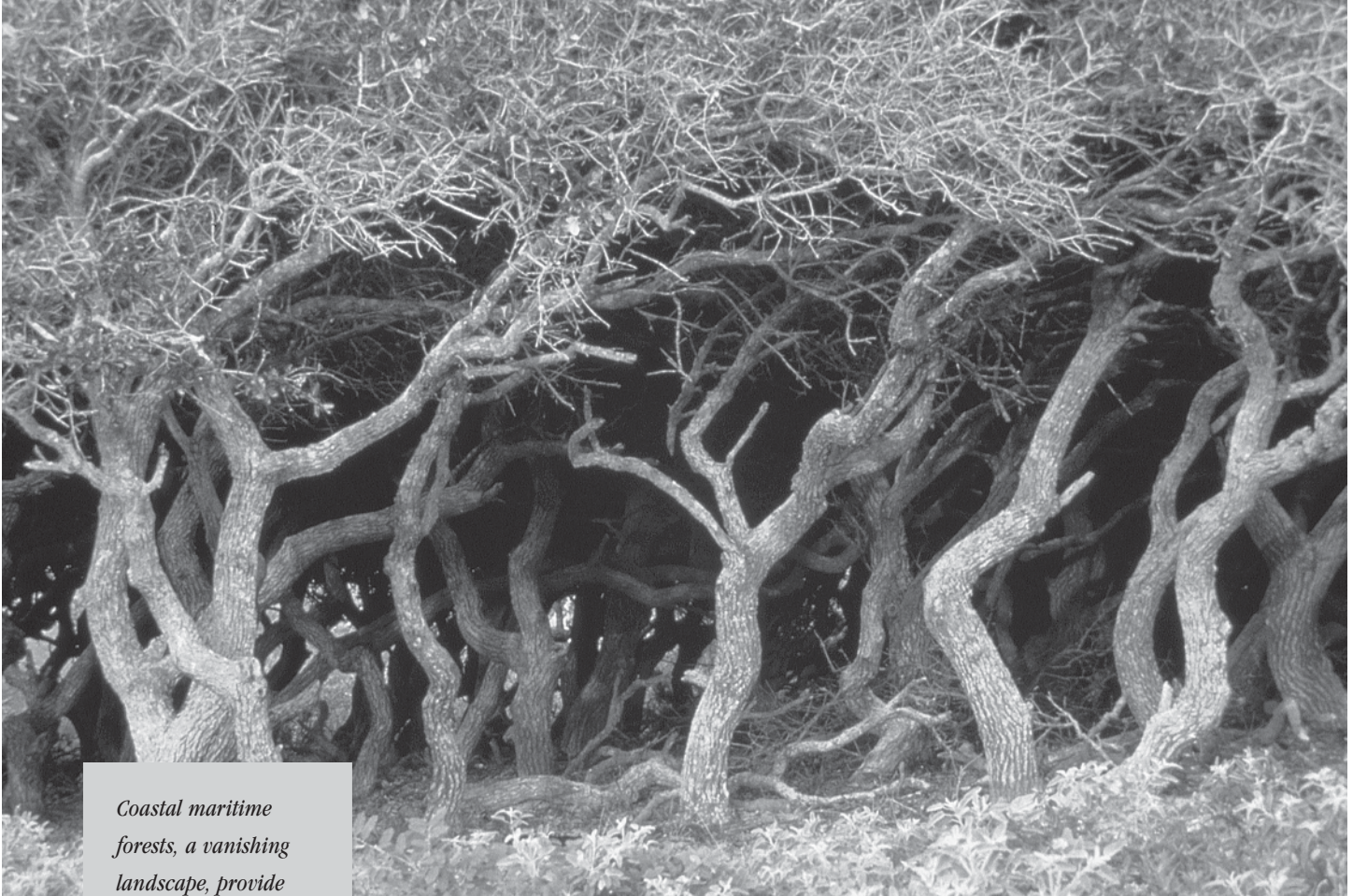
Recommended Actions

1. Continue to seek Environmental Protection Agency Wetlands Protection State Development grant funds to implement elements of the Texas Wetlands Conservation Plan.
2. Pursue wetlands restoration grants that fund construction activities (e.g., Water Resources Development Act of 1986 (Section 1135); U.S. Fish and Wildlife Service Coastal Wetlands Planning, Protection and Restoration Act; 1996 Farm Bill Incentive Program funds; Coastal Management Program grant funds; and U.S. Environmental Protection Agency 319 funds for non-point source pollution prevention).
3. Pursue partnerships (e.g. hunt clubs, environmental groups, companies) to provide funds, publicity and land for wetlands restoration. Find new sponsors for existing private programs like Ducks Unlimited and the Wetland Habitat Alliance of Texas.
4. Work with other entities to explore and secure new grant funding sources and mechanisms for wetlands conservation, including wetlands education, restoration or acquisition.
5. Seek corporate and local community financial and logistical support for school wetland programs.

Regional Advisory Groups have identified several existing programs that are efficient and effective; in particular, the North American Waterfowl Management Plan Joint Ventures; the Natural Resources Conservation Service's Wetlands Reserve and Conservation Reserve Programs; Texas Prairie Wetland Project; Partners for Wildlife; Ducks Unlimited and Wetland Habitat Alliance of Texas incentive programs; and technical guidance by field biologists in several agencies. The Plan supports continuation of these programs at current and expanded levels.

"The Wetland Habitat Alliance of Texas applauds the efforts of the Texas Parks and Wildlife Department, especially those associated with developing the Texas Wetlands Conservation Plan. This Plan provides the framework for restoring and enhancing the diverse wetland habitat throughout our great state. We fervently hope that the personnel associated with developing the Plan will now proceed toward enhancing and restoring the wetland resources for future generations of Texans. Now that Texas has a Wetlands Plan, it is time to enhance and restore the resource."

Eric Frasier,
Executive Director,
Wetland Habitat Alliance
of Texas



Coastal maritime forests, a vanishing landscape, provide essential habitat for neotropical songbirds

TPWD

CHAPTER X. ASSESSMENT AND EVALUATION

Monitoring and evaluation of Texas Wetlands Conservation Plan implementation will occur in two ways: 1) assessing the status of the State's wetlands; and, 2) monitoring and evaluating the completion of the actions specified in the Plan.

Issue O

How can wetland creation/restoration/enhancement projects be evaluated over time?

Background

Periodic evaluation of Texas' remaining wetlands allows us to determine whether the resource is being conserved in the most effective manner. To measure progress on restoration activities, a method must be developed or selected to determine wetland gains or

losses, the types of wetlands being impacted, the activities that are contributing to these changes, and changes resulting from on-going natural processes across the state. It is equally important to understand those activities and processes that are contributing to increases in the wetlands base. Assessment data can provide answers to practical questions concerning fiscal and resource responsibility:

- How do habitat gains from incentive programs compare with program expenses?
- Are mitigation dollars funding those projects that can provide the greatest benefits?
- Which management practices provide the most positive results?
- Are we achieving the goal of the Texas Wetlands Conservation Plan?

Texas’ wetlands are important components of the overall habitat fabric of our state. Their functions and importance to various wildlife and plant species, as well as their value to man, can not be assessed or managed without considering the surrounding habitat. Monitoring information, then, will be most effective when it is evaluated not solely for wetlands, but in the context of all habitat types in Texas.

Recommended Actions

- ** 01. Develop criteria and a regionalized hydrogeomorphic assessment method for Texas to track wetland quantity and quality change through time. This method would be used to assess long-term restoration project success and to determine the effect of management practices.
- ** 02. Establish a policy to conduct long-term wetland monitoring on the quantity, quality and functions of publicly-owned lands to track their status.
- 03. Assess the status of wetlands enrolled in incentives programs for the duration of the management agreement. Specify goals or functions of wetland projects in advance to measure progress.
- 04. Utilize universities to develop and disseminate assessment information.

Issue P

How will the Texas Wetlands Conservation Plan be monitored for effectiveness?

Background

Considerable time and effort by private citizens and public representatives has been devoted to developing the Texas Wetlands Conservation Plan. Participants in the planning process have stressed that their long-term participation was contingent upon the State’s commitment to implement their recommendations. Regional Advisory Groups recommended several avenues with which to track implementation progress of the Texas Wetlands Conservation Plan.

Recommended Actions

- P1. Complete action items.
- P2. Publish periodic updates discussing the Plan’s successes and failures.
- P3. Update the Texas Wetlands Conservation Plan every three years to assess progress.

“Ducks Unlimited has appreciated the opportunity to participate both the Coastal and Statewide Advisory Groups. DU’s mission is to fulfill the annual life cycle needs of North American waterfowl by protecting, enhancing, restoring and managing important wetlands and associated uplands. It is my hope that the Texas Wetlands Conservation Plan will champion that mission by strengthening existing partnerships and fostering new ones, in support of the goals set forth in the North American Waterfowl Management Plan.”
Ed Ritter,
Project Biologist,
Ducks Unlimited

**Denotes implementation initiated within two years.

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Plant drawings of Barn-yard grass (pg. 1), White Water-lily (pg. 9) and Saltgrass (pg. 41) courtesy of North Carolina Agricultural Research Station

Plant drawing of Saltwort (pg. 15) from *Trees, Shrubs and Woody Vines of the Southwest* by Robert A. Vines

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APPENDIX A. Agencies, Organizations and Programs Affecting Texas Wetlands

I. FEDERAL AGENCIES AND PROGRAMS

Federal Emergency Management Agency

National Flood Insurance Program

U.S. Department of Agriculture (USDA)

Farm Service Agency

Conservation Easement Debt

Cancellation Program

Conservation Reserve Program

Natural Resources Conservation Service

Conservation Reserve Program

Environmental Quality Incentives
Program

Texas Prairie Wetlands Project

Resource Conservation and

Development Program

Technical Assistance

Hydric Soils Mapping

National Resources Inventory

Mapping

Small Watersheds Program (PL-566)

Swampbuster

Wetlands Reserve Program

Wildlife Habitat Incentives Program

U.S. Forest Service (USFS)

Stewardship Incentive Program

Forestry Best Management Practices
Program

U.S. Department of Commerce

National Oceanic and Atmospheric Administration

Gulf of Mexico Fishery Management
Council

National Marine Fisheries Service

U.S. Department of Defense (USDOD)

U.S. Army Corps of Engineers

(USCE)

Clean Water Act Section 404 Permit
Program

Mitigation Banking Program

Water Resources Development Act

(Section 1135)

U.S. Department of the Interior

U.S. Fish and Wildlife Service

National Wetlands Inventory

Fish and Wildlife Coordination Act

Challenge Cost Share Program

National Wetlands Priority

Conservation Plan

North American Waterfowl

Management Plan

Partners for Wildlife

Texas Prairie Wetlands Project

Management of National Wildlife

Refuges

Endangered Species Act

U.S. Geologic Service

Cooperative Research Program

related to wetlands hydrology and
functions

National Water Quality Assessment

Biological Services Division

GAP Analysis

Wetlands Research and Mapping
Program

National Park Service

Land and Water Conservation Fund

Wetlands Research on Federal Lands

Managed by NPS

U.S. Environmental Protection Agency

Wetlands Protection State

Development Grant Program

(Section 104(b)(3))

Clean Water Act Section 319

Nonpoint Source Program

Clean Water Act Section 404 Permit

Program

Advanced Identification of Wetlands

II. STATE AGENCIES AND PROGRAMS

Texas Department of Agriculture

Endangered Species Pesticide

Protection Program

Texas Department of Transportation

Mitigation Banking

Texas Forest Service

Best Management Practices

(Silvicultural Nonpoint Source
Program)

Forestry Incentive Program

Forest Stewardship Program

Stewardship Incentive Program

Texas General Land Office

Coastal Preserve Program

Submerged wetlands ownership/

management

WETNET Internet site

Coastal Coordination Council

Coastal Management Program (CMP)

Coordinates consistency of state
and federal agency rules with

CMP

Permit assistance to coastal

individuals and small businesses

Texas Natural Resource Conservation

Commission

Clean Rivers Program

Clean Water Act Section 401 Water

Quality Certification

Clean Water Act Section 319 Urban
Nonpoint Source Pollution
Program
Corpus Christi Bay National Estuary
Program
Galveston Bay Estuary Program
Texas Watch
Water Diversion Permits (Texas
Water Code Section 11.121)

Texas Parks and Wildlife

Aquatic WILD
Assessment and classification of
bottomland hardwoods in East
Texas
Bay and Estuary Studies
Coastal Preserve Program
North American Waterfowl
Management Plan
Gulf Coast Joint Venture
Mississippi Valley Joint Venture
Playa Lakes Joint Venture
Texas Prairie Wetlands Project
Private Lands Enhancement Program
Private Lands Initiative
Project WILD
Texas Wildscapes Program
Wildlife Management Area and State
Park Management

Texas Railroad Commission

Clean Water Act Section 401

Texas State Soil and Water

Conservation Board

Clean Water Act Section 319(h) –
Agricultural and Silvicultural
Nonpoint Source Pollution
Program
Nonpoint Source Abatement Program

Texas Water Development Board

Bay and Estuary Studies
State Water Plan

Texas A&M University

Adopt-a-Wetland Program (Center for
Coastal Studies)

Sea Grant College Program

Texas Agricultural Extension Service

4-H Wetlands Projects
Technical Assistance

University of Texas Bureau of Economic Geology

Coastal wetlands mapping and
shoreline erosion studies

Texas Tech University

Water Resources Center

III. PRIVATE CONSERVATION AND LANDOWNERS ASSOCIATIONS

Audubon Council of Texas
Big Thicket Association
Coastal Bend Bays Foundation
Ducks Unlimited
Galveston Bay Foundation
Gulf Coast Conservation Association
Laguna Madre Foundation
Sierra Club
Sportsmen Conservationists of Texas
Texas Cattlefeeders Association
Texas Committee on Natural Resources
Texas Farm Bureau
Texas Forest Landowners Association
Texas Forestry Association
Texas Rural Development Council
Texas Sheep and Goat Raisers Association
Texas and Southwestern Cattleraisers
Association
Texas Waterfowl Association
Texas Wildlife Association
Wetlands Habitat Alliance of Texas

IV. LAND TRUST ORGANIZATIONS

The Archeological Conservancy
Bayou Preservation Association
Brazos River Preservation Society
Caesar Kleberg Wildlife Research
Institute
Connemara Conservancy
The Conservation Fund
The Cradle of Texas Conservancy, Inc.
Ducks Unlimited, Inc.
MARSH Program
Texas Prairie Wetlands Project
Galveston Bay Foundation
Gulf Coastal Prairies Foundation
Heard Natural Science Museum and
Wildlife Sanctuary
Katy Prairie Conservancy
National Audubon Society
Native Prairies Association of Texas
Natural Area Preservation Association
The Nature Conservancy of Texas
Texas Cave Conservancy
Texas Parks and Recreation Foundation
Texas Wildlife Association/Texas Wildlife
Forever, Inc.
The Trust for Public Land
The Valley Land Fund, Inc.
Wetlands Habitat Alliance of Texas

APPENDIX B.

Plant Community Occurrences on State-owned Conservation Lands

bold type = wetland plant communities
regular type = upland plant communities

Plant Community	Acres	Percent
Alkali Sacation-Fourwing Saltbush	1,252	0.1%
American Beech-Southern Magnolia	261	0.0%
Apache-Plume	715	0.1%
Ashe Juniper-Oak	27,482	2.3%
Bald Cypress-Water Tupelo	8,906	0.7%
Bald Cypress	2,098	0.2%
Bald Cypress-Overcup Oak	2,982	0.2%
Bald Cypress-Sycamore	194	0.0%
Bigtooth Maple-Oak	75	0.0%
Blackbrush	3,336	0.3%
Blue Grama-Buffalograss	7,511	0.6%
Bluejack Oak-Pine	109	0.0%
Buttonbush	4,423	0.4%
Ceniza	1,862	0.2%
Coastal Live Oak-Pecan	336	0.0%
Coastal Live Oak-Post Oak	1,216	0.1%
Coastal Live Oak-Red Bay	67	0.0%
Coastal Live Oak-Sugar Berry	137	0.0%
Cottonwood-Willow	1,273	0.1%
Cottonwood-Tallgrass	2,885	0.2%
Creosotebush	136,082	11.3%
Creosotebush-Mariola	42,072	3.5%
Curleyesquite-Sideoats Grama	285	0.0%
Eastern Juniper	996	0.1%
Emory Oak	300	0.0%
Gamagrass-Switchgrass	10,957	0.9%
Glasswort-Saltwort	1,581	0.1%
Gray Oak-Oak	425	0.0%
Guajillo	5,571	0.5%
Gulf Cordgrass	6,160	0.5%
Havard Shin Oak-Tallgrass	6,416	0.5%
Herbaceous/non-native-native	39,918	3.3%
Lacy Oak	1,086	0.1%
Lechugilla-Sotol	134,494	11.2%
Little Bluestem-Brownseed Paspalum	2,810	0.2%
Little Bluestem-Indiangrass	8,494	0.7%
Little Bluestem-Sideoats Grama	3,032	0.3%
Loblolly Pine-Oak	192,952	16.1%
Longleaf Pine-Little Bluestem	3,875	0.3%
Marshhay Cordgrass	25,249	2.1%
Mesquite-Granjeno	22,872	1.9%
Mesquite-Huisache	1,814	0.2%
Mesquite-Midgrass	2,909	0.2%
Mesquite-Saltbush	758	0.1%
Mesquite-Sandsage	1,383	0.1%

Plant Community	Acres	Percent
Mohr Shin Oak	875	0.1%
Netleaf Hackberry-Little Walnut	1,998	0.2%
New Mexico-Little Bluestem	500	0.0%
Not vegetated or not applicable	77,460	6.5%
Oneseed Juniper	8,532	0.7%
Overcup Oak	3,067	0.3%
Pecan-Sugarberry	14,663	1.2%
Pickleweed-Seepweed	5	0.0%
Pinyon Pine-Oak	7,604	0.6%
Plateau Live Oak-Midgrass	11,123	0.9%
Plateau Live Oak-Netleaf Hackberry	567	0.0%
Post Oak-Black Hickory	8,463	0.7%
Post Oak-Blackjack Oak	35,973	3.0%
Redberry-Juniper-Midgrass	26,395	2.2%
Rocky Mountain Juniper	316	0.0%
Rose-fruited Juniper-Midgrass	250	0.0%
Rough Tiquilia	50	0.0%
Rush-Sedge	6,509	0.5%
Saltgrass-Cordgrass	7,101	0.6%
Sandsage -Midgrass	10,872	0.9%
Scrub Oak-Mountain Mahogany	3,465	0.3%
Sea Oats-Bitter Panicum	1,643	0.1%
Seacoast Bluestem-Gulf Dune Paspalum	6,336	0.5%
Shortleaf Pine-Oak	27,207	2.3%
Sideoats Grama	14,054	1.2%
Sideoats Grama-Black Grama	72,455	6.0%
Smooth Cordgrass	3,899	0.3%
Spanish Bayonet	20,865	1.7%
Sphagnum-Beakrush	248	0.0%
Submerged herbs	1,010	0.1%
Sugarberry-Elm	10,800	0.9%
Swamp Chestnut Oak-Willow Oak	3,049	0.3%
Sycamore-Willow	660	0.1%
Texas Ebony-Anacua	1,028	0.1%
Texas Ebony-Snake-eyes	799	0.1%
Texas Oak	3,519	0.3%
Tobosa	2,689	0.2%
Vasey Oak	40	0.0%
Velvet Ash-Willow	10	0.0%
Viscid Acacia	6,280	0.5%
Water Elm-Swamp Privet	233	0.0%
Water Oak-Coastal Live Oak	3,309	0.3%
Water Oak-Willow Oak	50,013	4.2%
Woody/herb. non-native-native	<u>25,298</u>	2.1%
TOTAL	1,200,843	

Total acreage - wetland plant communities = 171,095 = 14%

Total acreage - upland plant communities = 1,029,748 = 86%

APPENDIX C. Public Notification

The Texas Wetlands Conservation Plan was available for public comment on December 6, 1996. The comment deadline was January 31, 1997. The Plan's availability for public review was announced in the following locations:

- 1) Texas Parks and Wildlife Department Internet home page;
- 2) Texas Register - November 15, 1996;
- 3) Office of the Governor's Texas Review and Comment System;
- 4) Texas Parks and Wildlife Department press release; and,
- 5) Over forty organizational newsletters around the State.

Public comments were received from twelve groups and four individuals. The groups who responded were: Montgomery County Forest Landowners Association, El Paso Chapter of the Audubon Society, Texas State Soil and Water Conservation Board, Texas A&M Sea Grant, Environmental Defense Fund, Texas Water Development Board, Audubon Council of Texas, Texas Committee on Natural Resources, Texas Farm Bureau, Houston Sierra Club, Trans-Texas Heritage Association and the Texas General Land Office. All comments were answered. For questions regarding public comments, please contact Texas Parks and Wildlife at (512) 389-4328.



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